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ABSTRACT BOOK

WORLD CONFERENCE ON LUNG HEALTH 2024 OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS AND LUNG DISEASE (THE UNION)

BALI, INDONESIA
12 – 16 NOVEMBER 2024

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 (RIT/JATA) has been to contribute to domestic and global tuberculosis control by conducting various studies, providing technical support as well as performing activities for international cooperation and collaboration.

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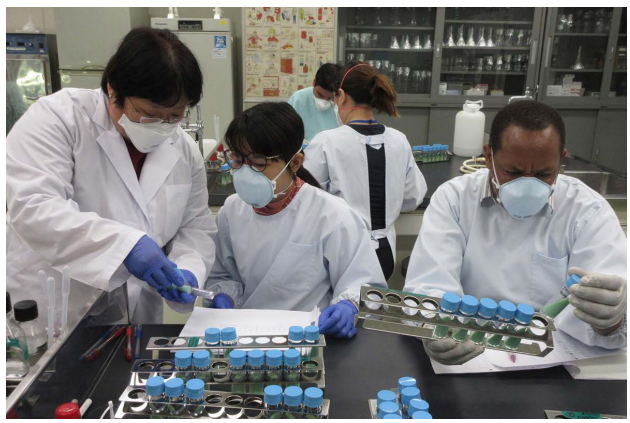
- A world where no one suffers from tuberculosis

Our Mission

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



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SYMPOSIA

WEDNESDAY, 13 NOVEMBER 2024

THURSDAY, 14 NOVEMBER 2024

FRIDAY, 15 NOVEMBER 2024

SATURDAY, 16 NOVEMBER 2024

ABSTRACT PRESENTATIONS

WEDNESDAY, 13 NOVEMBER 2024

ORAL ABSTRACT SESSIONS

SHORT ORAL ABSTRACT SESSIONS

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FRIDAY, 15 NOVEMBER 2024

ORAL ABSTRACT SESSIONS

SHORT ORAL ABSTRACT SESSIONS

PRINTED POSTER SESSIONS

E-POSTER SESSIONS

SATURDAY, 16 NOVEMBER 2024

ORAL ABSTRACT SESSIONS

The International Journal of Tuberculosis and Lung Disease (IJTLD)

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The International Journal of Tuberculosis and Lung Disease is an official journal of The Union. The Journal's main aim is the continuing education of physicians and other health personnel, and the dissemination of the most up-to-date information in the feld of TB and lung health. It publishes original articles and commissioned reviews not only on the clinical and biological and epidemiological aspects, but also on community aspects: fundamental research and assessment of field projects and action programmes for TB control and the promotion of lung health. The Journal welcomes articles submitted on all aspects of lung health, including cost-benefit analysis, legislation, epidemiology, intervention studies and health systems research.

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54th World Conference on Lung Health of the International Union Against Tuberculosis and Lung Disease (The Union) Bali, Indonesia, November 12 – 16 2024

SYMPOSIA

SP01 Fast tracking the cure: Lessons from coordinating cross country community-based advocacy to accelerate uptake and implementation of 6-month drug-resistant TB treatments

Chair: Blessina Kumar, Global Coalition of TB Advocates, New Delhi, India
Chair: Sandeep Juneja, TB Alliance, New York, United States

Scientific breakthroughs have led to simpler, safer, more effective, and faster treatments for drug-resistant tuberculosis (DR-TB). A new six-month, all-oral regimen (BPaL/M) has demonstrated cure rates of ~90% and reduces the length, cost, and pill burden of treatment. Unfortunately, many people still don't have access to this life-saving regimen.
The *Fast Track the Cure* initiative was launched in 2023 to support, coordinate and mobilize civil society and TB affected communities to advocate for fast and widespread adoption and accessibility of new six-month DR-TB cures for all who need them. Project partners coordinated and leveraged grassroots and digitally based strategies at local and global levels.
During this symposium, project partners will share outcomes, experiences, and lessons from two years of partnership and advocacy for equitable access to BPaL/M. Session participants will take away best practices, tactics, and strategies for community engagement, cross-country consortium building, storytelling, and treatment access advocacy.

Outcomes and lessons from funding and project managing a multi-partner and country community-led advocacy initiative to drive access to anti-TB treatments

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As the founding sponsor of the ***Fast Track the Cure*** initiative, TB Alliance supports project partners with many resources, including on-going partner coordination, project evaluation, strategic counsel, as well as social media analysis and asset creation and amplification support.
In this presentation the audience will see and hear the main results of the initiative to date, in the form of outputs, outcomes, and impacts. Critical lessons learned will also be shared regarding collaborative goal setting, cross-organizational coordination, and empowering advocacy communities.

Fast-tracking access to BPaL-based regimens in Indonesia: Challenges and success stories

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Indonesia's journey to adopt the BPaL regimen started in 2019 with a feasibility study and then operational research (OR) in 2022-2023. In parallel, several advocacy efforts took place, including awareness-raising campaigns leveraging testimonies of BPaL OR participants and direct advocacy to the Health Minister to showcase the OR results and encourage rapid adoption.
This work has resulted in high level commitment from the Health Minister, which led a nationwide scale up to all provinces in January 2024. In this presentation we tell the story of how Indonesia has fast tracked access to this new cure.

How people affected by TB can help speed access to new treatments like BPaL: The story of TBPeople Philippines

M Zepeda-Teng,[1] [1]TBPeople Philippines Organization Inc., Las Piñas City, Philippines.
e-mail: louiezep@gmail.com

TB People Philippines has developed a solid understanding of what it takes to run a strong public health advocacy campaign. From participating in operational research site visits to supporting those with TB receiving the new treatment, to getting commitments from politicians to support and assess the readiness for BPaL in their respective cities, TB People Philippines has deployed a series of strategies to fast track access to the new treatment for drug-resistant TB. In this presentation participants will learn how TB People Philippines used a mix of digital and traditional advocacy to campaign for access in the country.

Experiences From SCDI's activities to support BPaL/M rollout

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In supporting Vietnam's adoption of a shorter, safer and all-oral regimen for drug-resistant tuberculosis (DR TB), in 2023, SCDI implemented initiatives to raise awareness among TB-affected communities and enhance community engagement in the national rollout of this updated treatment. This presentation will outline SCDI's experience navigating the adoption of the BPaL regimen, focusing on a community-led TB response to improve DR-TB services and accelerate the implementation of new DR-TB regimens in Vietnam.

Supporting demand creation for new TB treatments through the Challenge Facility for Civil Society

J Malar,[1] [1]Stop TB Partnership, Geneva, Switzerland.
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The Stop TB Partnership Challenge Facility for Civil Society (CFCS) is the leading mechanism and movement for TB communities advancing demand creation for TB drugs and diagnostics. This presentation will share the model, experiences, and lessons learned from the mechanism and movement and discuss the important role it plays to end TB by 2030. Fast Track the Cure collaborates closely with Stop TB to ensure strategic alignment and partnership with the CFCS movement, by aligning with their community engagement, capacity building and demand creation pillars and focus.

SP02 The journey is as important as the destination: Country perspectives on implementation of next-generation sequencing for drug-resistant ?TB

Chair: Andrea Cabibbe, TB Supranational Reference Laboratory, Ospedale San Raffaele, Milano, Italy
Chair: Patricia Hall-Eidson, US Centers for Disease Control and Prevention, Atlanta, United States

Drug-resistant Tuberculosis (DR TB) poses a substantial threat to our global fight against TB. Molecular diagnostics have accelerated confirmation of DR TB but can be narrow in scope. Next-generation sequencing (NGS) for DR TB can offer a comprehensive approach to drug susceptibility testing, including resistance prediction to drugs in current WHO-recommended treatment regimens. However, routine adoption of high-cost and -complexity NGS in resource-restricted countries without prior sequencing experience can be challenging. WHO has released new guidance documents and an implementation manual supporting adoption of NGS for DR TB detection.
Here we'll highlight perspectives from high DR TB burden countries in Africa and Asia that have successfully used NGS to improve surveillance as well as discuss implementation challenges and lessons learned. These examples may support countries on their journeys to strengthen genomic surveillance for DR TB and help guide programmatic testing and treatment policies to improve TB prevention and control.

Application of NGS strengthens continuous and district-based surveillance of drug-resistant TB in South Africa

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This multi-year sequencing initiative undertaken at Centre for Tuberculosis at the National Institute for Communicable Diseases began with laboratory staff training on the principals and programmatic benefits of NGS for DR TB detection. Successful implementation of WGS *Mycobacterium tuberculosis* isolates from two high DR TB-burden districts supported longitudinal DR surveillance and timely identification of high-risk transmission clusters. Diagnostic performance, feasibility, and cost effectiveness of a tNGS model were also assessed.
These efforts demonstrate effective use of NGS can improve surveillance by early detection of drug resistance, highlighted NGS approach-specific lessons learned, and helped inform national TB surveillance and diagnostic strategies.

Establishment of WGS-based surveillance of drug-resistant TB within the National Laboratory Network of India

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The National Institute for Research in Tuberculosis, with support from the Central TB Division, successfully established sequencing-based drug-resistant TB (DR TB) surveillance in India, testing and analyzing WGS and phenotypic DST data for over 2,000 *Mycobacterium tuberculosis* isolates collected across Indian States and Union Territories. This led to development of India's first DR TB sequencing database, analytics pipeline, and national, country-specific catalogue of mutations associated with DR TB.
This work serves as a foundation for an NRL-supported sequencing-based surveillance network, in-country support for the national DR TB survey, and is being strengthened for programmatic management of DR TB in India.

Incorporation of sequencing into Eswatini's diagnostic algorithm to enhance drug-resistant TB treatment success: An evidence-informed approach

G Maphalala,[1] [1]National Public Health Laboratory, Ministry of Health, Eswatini, Mbabane, Eswatini.
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The Eswatini Ministry of Health (MoH), with technical support from WHO and through multi-stakeholder collaboration, have worked diligently to improve programmatic management of drug-resistant TB (DR TB) through several efforts including revision of their national diagnostic algorithm to incorporate new molecular sequencing technology. Implementation of tNGS demonstrated increased detection of rifampicin resistance initially missed by other molecular WHO-recommended diagnostic tests, reduced time to diagnosis, and enhanced nationwide DR TB treatment success.
The MoH also established a Clinical Advisory Committee to help advice on the use of sequence data to inform patient treatment regimens.

WHO guidelines and resources supporting implementation of next-generation sequencing for drug-resistant TB

C Nathanson,[1] [1]Global TB Programme, World Health Organization, Geneva, Switzerland.
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Recently released WHO guidance documents are now available to assist in the adoption and implementation of next-generation sequencing (NGS) for detection of drug-resistant TB (DR-TB). The catalogue of mutations in *Mycobacterium tuberculosis* complex and an implementation manual on the use of NGS for DR-TB surveillance will be reviewed. Recommendations on the use of tNGS for drug susceptibility testing included in the third editions of the WHO Consolidated Guidelines and the WHO Operational Handbook on Tuberculosis, Module 3: Diagnosis, Rapid Diagnostics for Tuberculosis will also be discussed along with the launch of the new TB Sequencing Portal.

SP03 Validation of treatment decision algorithms for the diagnosis of pulmonary TB in children: Early research experience

Chair: Chishala Chabala, University of Zambia, School of Medicine, Lusaka, Zambia
Chair: Corinne Merle, WHO/TDR, Geneva, Switzerland

The TB treatment coverage gap in children remains substantial, especially in young children, who are at high risk of severe disease and mortality if undiagnosed. In 2022, WHO issued an interim recommendation on integrated treatment decision algorithms (TDAs), with examples of evidence-based TDAs included in the operational handbook on the management of TB in children and adolescents. TDAs are designed to build confidence among healthcare workers at primary healthcare level to make decisions on initiating TB treatment in children <10 years. WHO called for generation of data for external validation of the TDAs.
To harmonize research methods, TDR and WHO developed TDA4Child, a package of generic research tools. Several studies are ongoing, including operational research studies using TDA4Child materials and other prospective and retrospective studies.
This symposium will provide an overview of emerging findings from prospective and retrospective studies, including performance in high-risk groups and describe challenges and solutions during implementation.

External validation of integrated treatment decision algorithms: Global needs and processes

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To help reduce the TB treatment coverage gap in children, WHO included two internally validated TDAs in the 2022 Operational Handbook. To facilitate operational research to generate harmonized data for external validation, TDR and WHO developed TDA4Child, a generic set of research materials, consisting of a master protocol, data collection tools and key study procedures, adaptable to the local context. Several country programmes are imple-

menting operational research studies using TDA4Child, in addition to larger consortia who are generating data on the TDAs. It is expected that these data can feed into a large individual participant dataset to inform future guidance.

Evaluation of treatment decision algorithms in children with presumptive TB: The experience of Nigeria

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Following the interim recommendation by WHO on the use of integrated TDAs in children < 10 years, the National TB programme of Nigeria (NTP) adapted the TDR4Child research package to participate in the international effort to validate the TDAs and to try to increase TB detection in primary healthcare facilities. The NTP conducted the VEDUTA study in 24 facilities across 6 states, recruiting more than 1,000 children with presumptive TB.
This presentation will focus on the TDAs performance in primary versus secondary/tertiary health facilities and report on healthcare providers' perspectives.

Evaluating the performance, feasibility, acceptability and impact of treatment-decision algorithms for pulmonary TB in children in Burkina Faso

A Diallo,[1] [1]National Tuberculosis Programme, Ouagadougou, Burkina Faso.
e-mail: adamsdiallo2014@gmail.com

TB among children remains under-detected in Burkina Faso. This study aimed at describing the performance, feasibility, healthcare workers' acceptability and effect on case notifications of the WHO TDAs for pulmonary TB in children under 10 years old under programmatic conditions in Burkina Faso.
Our mixed method cross-sectional study was conducted from November 2023 to April 2024 in 13 health facilities, including nutrition clinics (38.5%). We will present the results of the study for at least 1,000 children enrolled and of the survey administered to healthcare workers who evaluated at least ten children with the TDAs.

How accurate are new diagnostic TB algorithms in children? Interim results from a Médecins Sans Frontières study in 5 countries

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e-mail: helena.huerga@epicentre.msf.org

Following the conditional recommendation by the WHO in 2022 on the use of TDAs for pulmonary TB in children, Médecins Sans Frontières (MSF) launched an integrated project TACTiC, including a multi-country study (TB ALGO PED) to evaluate the performance, feasibility, acceptability and impact of TDAs for pulmonary TB.
Started in 2023, we present interim results from this study conducted in five countries (Niger, Nigeria, Guinea, South Sudan and Uganda), including ambulatory and hospitalized children from differing contexts such a low and high care levels, nutritional and HIV programs and unstable contexts.

TDA validation using data from established cohorts: The Decide-TB experience

M van der Zalm,[1] [1]Stellenbosch University, Cape Town, South Africa.
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In addition to the prospective evaluation of the novel TDAs within Decide-TB, the project generated a large individual-patient dataset comprising of four prospective TB diagnostic accuracy cohorts established in recent years in multiple African and Asian countries (RaPaed-TB, Umoya, TB-Speed Decentralization, TB-Speed HIV). Making use of the data from these well-characterized children (n=1,963), we externally validated the recently WHO-recommended TDAs, including subgroups at high-risk, such as children with HIV, severe acute malnutrition, and those younger than two years of age.
In addition to the diagnostic accuracy compared to NIH-consensus case definitions, we compared to local decision to treat.

SP04 Breaking the silence: Unveiling the hidden impact of TB-associated disability

Chair: Anthony D Harries, International Union Against Tuberculosis and Lung Disease, Paris, France
Chair: Denise Evans, University of the Witwatersrand, Johannesburg, South Africa

Despite advancements in TB prevention, treatment, and care, many survivors still grapple with enduring physical, mental, and social repercussions, impeding their quality of life and societal engagement. Approximately one in four persons with TB also faces disabilities stemming from impairments exacerbated or acquired during the disease and/or its treatment. These challenges extend beyond physical limitations to include pervasive TB-related stigma and impoverishment.
In 2023 the WHO Global Tuberculosis Programme released its first Policy Brief on TB-associated disabilities. This document advocates for a comprehensive approach, emphasizing timely management of TB-related impairments by multidisciplinary teams. It calls for preventive and rehabilitation services as well as education and social protection to enhance the health and social outcomes of TB survivors.
This symposium serves as a platform to discuss the magnitude, the determinants of TB-associated disabilities and how to best integrate biomedical and non-biomedical disability-inclusive strategies into TB care and support systems.

Break the silence: Voices from TB survivors

A Nguyen,[1] [1]the COMMUNITY SUPPORT NETWORK TO END TB -COSTI-net, (the Vietnam Lungs Association), Hanoi, Vietnam.
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Nguy?n Anh Phuong, m?t b?nh nhân s?ng sót sau b?nh lao t?i Vi?t Nam, s? chia s? quá trình hành d?ng c?a mình qua s? ki?n dã thay d?i hoàn toàn cu?c d?i cô. Cô s? nói v? nh?ng công th?c mà m?t ngu?i s?ng chung v?i mui khoan liên quan d?n b?nh lao ph?i m?t khi d?m nhi?m trò choi m?i trong c?ng d?ng và nh?ng bài h?c mà câu chuy?n cô có th? d?y d? th?c hi?n hành d?ng c? g?ng phát hi?n hi?n s?m và qu?n lý b?nh t?t liên quan d?n b?nh lao.

Addressing TB-associated disability: WHO guidance

F Mavhunga,[1] [1]Global Tuberculosis Programme – WHO, Switzerland.
e-mail: MAVHUNGAf@who.int

This presentation aims to present the 2023 WHO policy brief on TB-associated disability. This concise document outlines the considerations around the often-overlooked consequences of tuberculosis.
This presentation will outline its key points, emphasizing the imperative of addressing TB-related disabilities. It will present the key approaches to improve health and social outcomes for people with TB-associated disabilities, such as innovative interventions, inclusive policies, and collaborations to improve patient outcomes, discussed in the document. The presentation will also show advancement in the development of WHO guidance on the topic.

Evidence and ongoing research on biomedical interventions for TB-associated disability

B Allwood,[1] [1]Stellenbosch University & Tygerberg Hospital, Cape Town, South Africa.
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This presentation will highlight recent data and findings related to TB-associated disabilities, with a primary focus on interventions. Ongoing trials and needed interventions, as well as research priorities will be discussed. Additionally we will highlight and explore challenges that need to be considered in developing effective interventions for TB-associated disabilities.

The impact of social protection on TB-associated disability: A systematic review of the evidence

M Calvi,[1] [1]World Health Organization, Geneva, Switzerland.
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Social protection offers potential relief for challenges faced by TB-affected individuals, particularly in prevention, care, and support. However, the role of these interventions in alleviating the physical and financial consequences of TB in those suffering from TB-associated disabilities remains largely under investigated.
This session will present findings from a systematic review aiming at quantifying the impact of social protection on TB-associated disabilities and exploring the underlying pathways through which this impact is possibly exerted. The evidence gathered can inform a more comprehensive approach to TB-associated disabilities encompassing both biomedical and non-biomedical interventions.

SP05 TB preventive treatment for children: Where are we and what's next?

Chair: Ben Marais, Westmead Children's Hospital, Australia
Chair: Cecily Miller, World Health Organization, Global Tuberculosis Programme, Geneva, Switzerland

Providing treatment for TB infection to prevent TB disease is a critical component of Pillar 1 of the WHO End TB Strategy. Young children are particularly at risk of progressing from infection to disease. The availability of shorter, more child-friendly regimens for TPT for both drug-susceptible and drug-resistant TB can increase TPT uptake in this at-risk population.
In this symposium, we will describe recent updates to WHO guidance on TPT, with a focus on children, and how they can be effectively implemented by programmes thanks to child-friendly formulations of TB medicines that recently became available and are more acceptable to children. The example of levofloxacin will be used to describe acceptability studies that are essential to ensure treatment adherence in this population.
Finally, speakers will discuss programmatic challenges and opportunities for TPT implementation in children to ensure that ongoing and planned studies target interventions with the highest impact.

WHO updates on TB preventive treatment for children: Recommendations and dosing guidance

T Masini,[1] [1]World Health Organization, Geneva, Italy.
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Children below 5 years are at high risk of TB disease progression following infection. A recently conducted investment case provides strong arguments for TPT provision. Evidence emerging from recent studies has informed updates to WHO guidance on TPT for contacts of people with MDR/RR-TB of all ages. Dosing guidance for the administration of a 3-month regimen of weekly isoniazid and rifapentine (3HP) was provided based on new evidence emerging on its use in children below 2 years, with age-appropriate formulations of TB medicines available to enable implementation.
This presentation will provide an overview of these recent updates.

Protecting our young: enabling implementation of 3HP in children with age-appropriate formulations

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Makaita Gombe is the Access Lead at the Aurum Institute, South Africa and the programme lead for IMPAACT4TB, a short course TB prevention market access project that has catalyzed the uptake of more than 4 million patient courses of 3HP globally. She is a health economics and finance professional with sixteen years of strategy, research, data analytics, qualitative research, programme management, and policy analysis experience including designing the innovative results-based financing model for TB case finding. Her analytical and programme strategy experience spans across the public, private and NGO sectors.

Acceptability of dispersible and non-dispersible tablet levofloxacin formulations in children

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The acceptability of healthcare interventions is a key determinant of health outcomes. Since treatment of drug-resistant TB (DR-TB) requires taking multiple drugs over a long period, it is imperative that they are acceptable in children. While dispersible formulations of levofloxacin, a key component of DR-TB and preventive regimens, are now accessible, they are not widely available in routine care settings. We evaluated the palatability and acceptability of 100mg dispersible and 250mg crushed non-dispersible levofloxacin formulations in children.
This talk will discuss findings on children's and caregivers' reported challenges and preferences on medication taste, ease of preparation and administration.

Accelerating uptake of TB preventive treatment among children and adolescents in Uganda: experience from the National TB and Leprosy Program

M Penninah Sekadde,[1] [1]Uganda Ministry of Health – National TB and Leprosy Program, Kampala, Uganda.
e-mail: moorine.sekadde@gmail.com

Despite its pivotal role in ending TB, TB Preventive Treatment remains underutilized for children and adolescents even though they bear a significant burden of TB related adverse outcome. This session will focus on Uganda's experience in implementing strategies and innovations to accelerate the uptake of TPT among children and adolescents from a programme perspective.

What's next in TB prevention for children?

N Salazar-Austin,[1] [1]Johns Hopkins University School of Medicine, Department of Paediatrics, Baltimore, United States.
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Short, safe and tolerable regimens are needed to maximize the effectiveness of TB preventive treatment. This talk will describe current and future research into TB prevention regimens for children exposed to drug sensitive and drug resistant TB along with a short review of the care delivery models needed to implement them.

SP06 Scaling up collaborative action on TB and diabetes: Making commitments a reality

Chair: Lin Yan, The International Union Against Tuberculosis and Lung Disease, Beijing, China
Chair: Farai Mavhunga, Global Tuberculosis Programme – WHO, Switzerland

Diabetes is a key health-related risk factor of Tuberculosis, accounting for approximately 370,000 TB episodes in 2022. People with TB and diabetes are more at risk of poor TB treatment outcomes and higher mortality, and they can experience challenges in glycaemic control.
Since the release of the Collaborative framework for care and control of tuberculosis and diabetes in 2011, implementation has been limited.
At the recent UN High Level Meeting on the Fight against TB, Member States committed to assuring people-centred care for TB and related health conditions, including diabetes within the context of primary health care.
This symposium will share the latest WHO guidance on TB and diabetes, experience from countries with a high burden of TB and diabetes on the challenges and opportunities for scaling up collaborative TB and diabetes activities and will also include the perspective of a TB survivor on receiving care for TB and comorbidities.

Living with diabetes and having TB: a survivor's perspective

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Dalam presentasi ini, saya, Chanra Mustamin, akan menceritakan kisah perjuangan saya sebagai penyintas tuberkulosis (TB) sensitif obat (SO) dan resisten obat (RO), yang diperparah oleh komorbiditas diabetes. Perjalanan saya dimulai dengan pengobatan TB SO selama enam bulan, namun pengobatan tersebut gagal akibat kondisi diabetes yang saya derita. Setelah itu, saya dirujuk ke salah satu rumah sakit Rujukan TB RO/MDR di Kota Makassar untuk menjalani pengobatan lanjutan selama hampir 10 bulan.
Pengobatan TBC RO tidaklah mudah. Saya harus menghadapi efek samping obat yang sangat keras, sementara pengobatan diabetes mengharuskan saya menggunakan insulin dengan **suntikan** lima kali per hari—empat kali mempertahankan insulin dan satu kali melebihi obat TB RO. Tantangan ini bukan hanya menguji ketahanan fisik, namun juga mental saya, terutama dalam menjalankan rutinitas yang melelahkan.
Namun, dukungan dari berbagai pihak, termasuk peran sebaya dari teman-teman pasien di rumah sakit, menjadi kekuatan penting dalam proses penyembuhan saya. Kini, setelah sembuh, saya bergabung dengan organisasi penyedia layanan untuk membantu pemerintah dalam upaya penanggulangan TB di Indonesia, memberikan motivasi, dan mengedukasi masyarakat yang terdampak TB. Melalui presentasi ini, saya berharap dapat memberikan inspirasi dan wawasan lebih lanjut tentang ketangguhan yang dibutuhkan dalam menghadapi dua penyakit kronis ini dan pentingnya peran komunitas dalam proses penyembuhan.

Overview of the global joint burden and WHO guidance on TB and diabetes

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Integrated people-centred care for TB and comorbidities sits at the heart of the End TB Strategy, yet since the release of the Collaborative framework for care and control of tuberculosis and diabetes in 2011, uptake by countries has been limited. This presentation will give an overview of the evidence on the joint TB and diabetes burden, will highlight the barriers and opportunities to increasing access to people-centred TB and diabetes services and present on the forthcoming new WHO guidance to support member states meet their commitment to assuring people-centred care for TB and diabetes.

Review of evidence on collaborative action to address TB and diabetes

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Diabetes Mellitus (DM) is common, rising in prevalence due to population ageing, and increases the risk of tuberculosis (TB) disease and poor TB treatment outcomes. Collaborative action to increase awareness and management for TB-DM were recommended by the WHO over 10 years ago, but not universally implemented.
We will synthesise the findings and evidence gaps from a series of systematic reviews recently conducted on interventions to address TB and DM (including enhanced

detection or screening and treatment) to inform the development of the *WHO operational handbook on tuberculosis and comorbidities. Module 6: tuberculosis and comorbidities.*

Active TB screening among people with diabetes mellitus in Indonesia: Progress and integration efforts

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Indonesia has conducted TB screening among individuals with diabetes mellitus (DM) since 2015. Between 2021-2022 chest X-ray was introduced to enhance screening in 38 districts/cities, expanding to 47 districts/cities by 2023. In 2023, guidelines for primary healthcare services included tuberculosis screening for all people attending diabetes care. In 2023, out of 77,488 individuals screened for TB, presumptive TB was identified in 33,251 (42% of individuals screened for TB), with 6,973 testing positive for TB (9% of individuals screened for TB).
These findings underscore the importance of continued efforts in TB screening and management among individuals with DM in Indonesia.

Challenges and opportunities in scaling up TB and diabetes in China

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People with diabetes face a greater risk of contracting tuberculosis (TB) and experience unfavorable TB treatment results. China has a heavy burden both on TB and diabetes. Collaborative efforts to tackle TB and diabetes were first introduced in the National TB Programme (2016-2020). In 2020, the national TB guidelines included directions for bidirectional screening of TB and diabetes. Currently, China is developing the national TB programme(2024-2030).
Strategies to expand and enhance collaborative measures for TB and diabetes will be further strengthened, accompanied by training for healthcare workers in the relevant programmes on managing TB and diabetes together.

SP07 One dose fits many, but not all: Personalised dosing for those who need it

Chair: Jan-Willem Alffenaar, University of Sydney, Sydney, Australia
Chair: Payam Nahid, University of California, San Francisco, United States

Programmatic treatment is the corner stone of TB treatment as it provides evidence treatment feasible in high burdened settings. Despite the success of programmatic treatment, patients experience significant side effects, slow response to treatment, or acquire drug resistance. This session will provide latest insight in relationship between drug dose – exposure and effect, will identify patients who are at risk for suboptimal treatment, present technology to measure drug concentrations without invasive blood collection, shows the challenges with new TB drugs and will discuss feasibility and challenges for adoption in TB treatment guidelines. During the plenary discussion the symposium attendees will have the opportunity to ask the speaker about how to implement treatment optimizing strategies in their setting.

Why does drug exposure, pathogen susceptibility in TB treatment matter.

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A better understanding of the relationship between drug exposure and antimicrobial kill and acquired drug resistance is essential not only to optimize current standard of care regimen but also to design more appropriate dosing regimens for new and repurposed drugs with antituberculosis activity. Dr Gafar will present an overview of the broad range in pharmacokinetic-pharmacodynamic studies which are ideally complementary in providing relevant data to optimize the drug dose and regimens for treatment of TB. Examples will show the how the knowledge on pharmacokinetic-pharmacodynamic can managing patients in routine care.

Identifying patients who may benefit from personalised treatment.

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Human pharmacokinetics and pharmacodynamics are characterised in phase 2a studies and often part of Phase 2b-3 studies to further refine the understanding of the exposure-response relationship. Studies under operational research conditions are relevant to capture drug dosing, exposure, and treatment response under programmatic

care. These studies will help to understand which patients may respond less well to treatment. Dr Cousins will present which subgroups of patients are at risk to of suboptimal response to first and second-line treatment and explain how this related to drug exposure.

Personalised treatment within programmatic care; the best of both worlds

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Therapeutic drug monitoring facilitates making dosing decisions based on the measured drug concentration in an individual patient. It's use in TB-burdened settings has been limited for various reasons. With emerging technologies to test drug concentration in saliva and urine simple and affordable methods have become available. These are valuable addition to traditional HPLC-UV as the new techniques can be used in community health care centres. Prof Ruslami will present how patients suspected to have "low drug exposure" or other issues related to drug exposure can be screened and evaluated using the novel techniques.

Personalised or stratified medicine feasibility and challenges for adoption in TB treatment guidelines?

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TB programs are changing to focus on patient centered care using evidence-based patient care and support. Digital technology, medication monitoring, according to local circumstances and in line with existing evidence are utilised. Effective approaches to treatment administration, such as community or home-based treatment, instead of facility-based treatment help to decentralize care for TB patients. More recently stratified medicine has been proposed as balancing the benefits of both programmatic care and personalised medicine. In this presentation feasibility of stratified medicine and what is needed to adopt in TB treatment guidelines will be discussed.

SP08 Addressing a blind spot in the TB response: The need for adolescent-friendly TB services

Chair: Leonid Lecca, Socios En Salud, Lima, Peru
Chair: Martina Casenghi, Elizabeth Glaser Pediatric AIDS Foundation, Geneva, Switzerland

Adolescents contribute to a considerable proportion of the global tuberculosis (TB) burden. However, TB services are generally not tailored to the unique needs of this population, leading to suboptimal access to and retention in care. This session will review up-to-date evidence on the health service needs of adolescents with TB, as well as a wide range of innovative adolescent-friendly services from diverse settings. The presentations will showcase key features and lessons learned, which can contribute to successful design and delivery of adapted services, as well as their integration into routine programming.
At the end of the session, the audience will have a greater appreciation of the importance of adolescent-friendly care. Moreover, the audience will learn about different approaches to providing adolescent-friendly care, which they can apply in their own settings.

The need for differentiated care to address TB in adolescents

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Using a recently published framework of five aspects of adolescent well-being, this presentation will provide an overview of the unique needs of adolescents with respect to tuberculosis care. This presentation will provide an up-to-date review of data on this topic and identify critical research gaps. Additionally, the speaker will present results from an international expert consensus panel on how to optimally engage adolescents in tuberculosis care. These results informed World Health Organization recommendations on adolescent tuberculosis care, which were published in the 2022 WHO Operational Handbook, Management of Tuberculosis in Children and Adolescents

Implementing and evaluating adolescent-friendly interventions in the context of HIV: experiences from Lima, Peru

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This presentation will describe key lessons from experiences implementing and evaluating interventions for adolescents and young people living with HIV in urban Peru. The first is a community-engaged social media campaign, delivered with the support of locally-recognized influencers, to reduce HIV-related stigma. The second is

a differentiated-service delivery intervention designed to engage and retain young people living with HIV in care and treatment. We will share key lessons with direct applicability to the tuberculosis context and highlight ways we meaningfully engage adolescents and youth in the design and tailoring of interventions

TB screening and diagnosis amongst adolescents: experiences from an integrated service delivery approach in rural Sindh, Pakistan

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In Pakistan, significant health access challenges, prevalent comorbidities, stigma, gender barriers, and restrictive cultural norms prevent the uptake of TB services. This is especially pronounced among adolescent girls in marginalized communities.
This presentation highlights a decentralized, integrated service delivery model implemented within mobile camps in rural Sindh province. Using AI-assisted digital chest X-rays to improve TB screening, diagnosis, and linkage to care, the model also integrates services for hepatitis C and mental health. We will share insights and practical experiences that address obstacles encountered by adolescent girls to improve access and uptake of TB services in rural communities.

Integrated and patient-centered services for adolescents: experiences from the "Adolescents Clinic" in Zimbabwe

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This presentation will discuss the implementation of adolescent friendly services provided by Médecins Sans Frontières in collaboration with the Ministry of Health in Mbare, suburb of Harare (Zimbabwe). Person centred care needs to be adapted to the comprehensive needs of adolescents. Adolescent services are provided in primary health care clinics and in the community for highly vulnerable adolescents and young adults.
A comprehensive social and health care package including sexual and reproductive health services, family planning, mental health services HIV and TB prevention and care is provided in nurse- and peer-led services. Experiences and pragmatic lessons learnt will be shared.

SP09 Asymptomatic TB: How important is it?

Chair: Guy Marks, UNION, Sydney, Australia
Chair: Mike Frick, Treatment Action Group (TAG), New York City, United States

This symposium will focus on the public health significance of asymptomatic tuberculosis (TB). While subclinical TB has a long history, for many years TB strategies focused primarily on treating symptomatic people with TB. In the wake of the COVID19 pandemic and the post-DOTS era, active case finding and preventive action for TB have gained in prominence and asymptomatic TB has become a topical discussion point.
However, uncertainties persist about the feasibility of scaling up action on asymptomatic TB. The symposium starts by summarising what is known about the condition and the main knowledge gaps. This will then be followed by viewpoints from WHO, a high TB burden country and a major donor on different aspects including developing policy, burden estimation, strategies for prevention, early case finding, infection control, diagnostics and treatment, as well as the implications for a country of embedding asymptomatic tuberculosis into programmatic action, including funding.

What is known about asymptomatic TB?

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There is increasing use and awareness of the term asymptomatic TB used in relation to people with evidence of disease but who are well with few or no symptoms or signs of TB and so importantly are not seeking healthcare. This introductory presentation will clarify terminology and summarise the current scientific understanding of asymptomatic TB in relation to pathology, detection of bacilli, symptom thresholds and disease trajectories. In addition, limitations of current diagnostics and treatment approached will be highlighted.

Public health significance of asymptomatic TB: Global policy

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Patients with subclinical forms of TB present a particular challenge to global health policy and interventions. This talk will focus on the implications of tackling asymptomatic TB on global policy, including all aspects of TB care, from screening and prevention through to diagnosis and treatment.

Public health significance of asymptomatic TB: Country perspective

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The presentation will focus on the implications of tackling asymptomatic TB from the national perspective, and interventions and programmatic buy in for treating people before they become sick. Uncertainty remains about the funding needs for drugs and consumables and supply chain management. It will focus on how South Africa is advocating for the diagnosis and management of asymptomatic TB as part of programmatic efforts.

How to resource the management of asymptomatic TB?

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The main source of international donor funding for TB is the Global Fund contributing 75% of the total amount of international donor funding reported by NTPs in 2022. Despite these efforts, there remains a considerable funding gap between what is requested by countries and what can be provided by the Global Fund with the main gaps in the latest funding round being TB diagnostics, treatment, and care—particularly commodities. This session will discuss approaches to funding the management of asymptomatic TB within the current funding landscape.

Key research needs for programmatic action on asymptomatic TB

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Programmatic scaling up of action on asymptomatic TB requires research that defines the public health benefit of intervention for individuals (on morbidity and mortality) and populations (on transmission and incidence) and development of appropriate interventions, including diagnostics, treatments and implementation strategies.
This session will summarise ongoing and required research in each of these areas, highlighting priorities in discovery (new diagnostics, reference standards), repurposing (operational use of current diagnostics), surveillance (quantifying asymptomatic TB prevalence, transmission, transition time between states), treatment (trials of combinations, dosage, duration, outcome measures), prevention (vaccine endpoints) and implementation science to build an evidence base for programmatic guidance.

SP10 TB and the climate crisis: Why we need to wake up

Chair: Palwasha Yousafzai Khan, London School of Hygiene & Tropical Medicine, London, United Kingdom
Chair: Finn McQuaid, London School of Hygiene and Tropical Medicine, London, United Kingdom

A wide body of evidence exists revealing a concerning association between TB burden and basic humanitarian needs likely to be affected by climate change, such as air quality, displacement and food security. The consequences are already visible around us in disruptions to TB services as a result of climatic events. With the majority of high TB burden countries vulnerable to climate change, it is past time that the TB community begins to plan for the effects of this on TB. Developing climate-resilient TB programmes is crucial to the sustainability of the global TB response, and to the lives of those affected by TB. Now is the time to wake up to the threat of climate change to ending the TB epidemic.

How can climate displacement increase vulnerability?

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Climate-induced displacement results in substantial disruptions to livelihoods and social networks, increasing health risks, particularly among vulnerable populations affected by TB. In Pakistan, the 2022 floods magnified this crisis, forcing millions into areas with lack of essential health services. These conditions perpetuate discrimination, marginalization, and emotional distress, further increasing the vulnerability of individuals with TB or at risk of TB to poverty, malnutrition, disease transmission, and social isolation.
This presentation will explore the impact of displacement, share experiences from Pakistan, and discuss the need for a unified, comprehensive approach for sustainable, inclusive solutions.

How can worsening air quality drive risk of disease?

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With climate change and air pollution events on the rise globally, large human populations, often in TB endemic environments, are co-exposed to inhaled pollutants and Mtb. There is concern that lack of attention to environmental determinants of health, such as air pollution expo-

sure and climate change, may hinder success on the road to ending TB. This presentation will explore the current mechanistic (biological) and epidemiological research base and question if air pollution exposure impacts on TB and Mtb infection. Transdisciplinary research approaches, community interactions, and much care with exposure assessments are important requirements for research and conclusions in this space.

How can climate-driven nutritional stress affect burden?

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The rise in both the frequency and severity of climate-related events is anticipated to escalate global food insecurity and instability, due to reductions in food production and access. Heightened food instability is expected to exacerbate the prevalence of undernutrition. Undernutrition is a leading risk factor for tuberculosis, resulting in increases the risk of disease progression and mortality during treatment.
This presentation will use mathematical modelling to investigate how increases in undernutrition due to climate events may impact the future burden of tuberculosis in India.

How can climate events disrupt services?

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Having access to health services for timely diagnosis and care is critical to those who live with TB. Here I will discuss how climate events, such as flooding in Malawi and typhoons in the Philippines, already prevent access to health services, drawing on my own experience and that of others.

What do we need to do to climate-proof TB prevention and care?

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An increasing body of evidence suggests a detrimental effect of climate change on the global TB epidemic through a complex web of pathways. Ending TB as a global public health threat may not be realized if measures to mitigate TB-enhancing effects of climate change are not put in place. These include strong advocacy efforts; accelerating action to meet End TB Strategy targets; inclusion of TB-specific measures in strategies intended to mitigate the effects of climate change and development and implementation of a TB and climate change research agenda to better understand relationships between the environment, the host and the pathogen.

SP11 Standards for training content creation

Chair: Amar Shah, USAID, India
Chair: Shibu Balakrishnan, WHO, India

With rapid change and evolution of guidelines and TB programs, training material creation has been an ongoing, effort intensive and expensive activity. With increasing use of technology in training this effort has only increased tremendously; however, there is an untapped potential to collaborate globally and nationally in this effort. However, to collaborate, apart from other general requirements of training material, training material has to be interoperable and has to follow certain standards. This Symposium would draw on understanding of what standards mean for different stakeholders who have been actively working in training content development, and work towards a common global standards. This would in turn enable development of Systems for content development and global goods in training material.

Modernized Training of HCW in Netherlands

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In a low incident country as the Netherlands, maintaining knowledge and skills of HCW‘s in TB care and prevention is an important challenge. In recent years, the training of TB nurses and medical assistants has changed. KNCV Tuberculosis Foundation has developed a combined basic course for these two professional groups. E- learning is part of the basic course for TB nurses and there are plans to expand the use of e-learning methods.
The presentation shows the development of the basic course and other training courses for these groups, describes the lessons learned and the challenges we are facing.

Training Content Development in NTP Indonesia

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Indonesia needs a huge number of highly skilled Human Resources of Health (HRH) on Tuberculosis (TB). National TB control program (NTP) engages 10,339 primary health care, 1,162 public hospitals, 1,959 private hospitals,

1,415 public clinics, and 11,337 private clinics. The TB capacity building program should be accessed by the HRHs, which are distributed in various geographical areas. NTP developed the capacity-building contents, methods, and platforms in collaboration with the directorate of HRH development, the coalition of professional organizations for TB control, and associated stakeholders such as USAID TBPS.

The Union Courses

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The Union generates knowledge by implementing operational, clinical and public health research in LMICs, and seeks to disseminate the knowledge, latest techniques and guidelines through its courses at an international level. Course material are built by a panel of experts and updated on a need basis to align with the context, latest policy guidance and practice.
The courses are implemented through both virtual and in-person sessions based on implementation requirements and funds.

Training content development systems and processes in South Africa

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South Africa remains a high TB burden country with evolving guidelines aligned with WHO recommendations. Training content based on these guidelines therefore needs to effectively update and transfer critical points to the health work force. Various organisations support the national TB programme training initiatives and to afford a coordinated approach, collaboration between the various stakeholders is key to the training programme success. The processes and systems for training content development in South Africa will be shared.

Digital Content Development System for NTEP, India

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The national TB program is evolving continuously and there is an ongoing need to train diverse stakeholders on programme related processes and practices. Based on this a three-layer content development and maintenance system was designed and implemented, starting from identifying training needs and learning objectives (LOs), to building training content in alignment with the LOs and finally building a variety of cadre-wise courses from the same library of training content. Each piece of material can be updated independently and is transmitted live into the courses that use the material. This system uses an online tool called the Knowledge-Base.

SP12 TB and mental health integration is urgent and possible: Lessons from WHO feasibility pilots in Ghana, Kenya, and Pakistan

Chair: Annabel Baddeley, World Health Organization, Geneva, Switzerland
Chair: Mohammed Yassin, Global Fund to fight AIDS, Tuberculosis and Malaria, Geneva, Switzerland

Co-Chaired by leaders at the WHO Global TB Programme and The Global Fund, the purpose of this symposium is to address the urgent need for TB and Mental Health integration to enhance person-centred care, improve outcomes, and achieve TB eradication. Integration is a priority for the Global Fund Strategy (2023-2028) yet there remains a knowledge/practice gap about the most feasible, effective, scalable, and sustainable ways to do so in diverse high-burden settings.
This session will involve a detailed synthesis of current evidence on the intersection of TB and mental health, including prevalence, causes, impact, and possible solutions. Then, representatives from Ghana, Kenya, and Pakistan will summarize the results of a WHO feasibility pilot in 2021-2022.
Results from all settings suggest that TB and mental health integration is not only highly needed but feasible despite significant resource constraints.

TB and mental health: What do we know?

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This presentation will summarize the current literature on TB and mental health, including the prevalence, contributing factors, impact on outcomes, and integrated care. It will also briefly summarize the implementation and results of a 2021-2022 WHO feasibility pilot with demonstration projects in Ghana, Kenya, and Pakistan.
The results suggest that TB and mental health integration is not only essential but feasible, and essential to end the global TB epidemic.

TB and mental health integration: lessons from Ghana

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This presentation will describe the process and results of a WHO TB and mental health feasibility pilot in Ghana in which TB integration was piloted in three pilot sites representing different levels of the national health system: a regional hospital, a polyclinic, and a local health center. TB and mental health experts from the national, regional and district level, participated in a three-day planning workshop and training followed by an implementation pilot. Results, including key challenges and lessons learned will be summarized.

TB and mental health integration: lessons from Kenya

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This presentation will describe the process and results of a WHO TB and mental health feasibility pilot in Kenya in which TB integration was piloted in two provinces with strong mental health infrastructure. An advisory subcommittee was created including representatives from the Ministry of Health and the pilot counties, and other relevant stakeholders. A training curriculum covering basic principles of screening, diagnosis, care, and treatment for TB and mental health was developed collaboratively by a team of experts and implemented. Service integration was piloted, with close monitoring and evaluation, including the documentation of lessons learned to inform scalability and sustainability.

TB and mental health integration: lessons from Pakistan

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This presentation will describe the process and results of a WHO TB and mental health feasibility pilot in Pakistan in which TB integration was piloted in a rural district serving 1.2 million people. A local mental health professional conducted a situational assessment of TB and mental health services, and facilitated consultative meetings with provincial health administrators, policy makers, health professionals, and other stakeholders. Two 2-day trainings were held in the district with 59 primary health care providers from 42 health facilities across the district.

SP13 Going beyond Xpert and Truenat towards a new class of low complexity molecular technologies: WHO TB diagnostic guidelines update

Chair: Nazir Ismail, Wits University, Johannesburg, South Africa
Chair: Marguerite Massinga Loembe, Global Laboratory Initiative, Libreville, Gabon

WHO's End TB Strategy calls for the early diagnosis of TB and universal drug-susceptibility testing (DST), highlighting the critical role of laboratories in the post-2015 era in rapidly and accurately detecting TB and drug resistance. The WHO TB diagnostic assessment process has changed from recommending specific products to class-based recommendations. In 2024, a new diagnostic technology class was recommended: low-complexity automated nucleic acids diagnostic technologies (LC-aNAATs). The class-based recommendations allow new products beyond Xpert and Truenat to enter, encouraging a healthy and competitive market for TB diagnostics.
The main findings from the policy update and systematic reviews will be presented. In addition, the process for WHO prequalification for molecular TB diagnostic will be explained, and a landscape of technologies from emerging economies presented.

Update of WHO TB diagnostic guidelines: new classes of diagnostic technologies

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WHO's End TB Strategy calls for the early diagnosis of TB and universal drug-susceptibility testing (DST), highlighting the critical role of laboratories in the post-2015 era in rapidly and accurately detecting TB and drug resistance. WHO has endorsed a range of new diagnostic technologies during the past 10 years. The WHO TB diagnostic assessment process has changed from recommending specific products to class-based recommendations.
In 2024, a new low-complexity diagnostic technology class is recommended: low-complexity automated nucleic acids diagnostic technologies (LC-aNAATs). The class-based recommendations allow new products beyond Xpert and Truenat to enter, encouraging competitive market for TB diagnostics.

Systematic reviews informing the policy update

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Several rapid molecular tests are recommended by WHO as the initial diagnostic test for TB. Some of these tests can also detect drug resistance simultaneously. Due to the growing number of novel technologies with similar purposes, the WHO has introduced a class-based recommendation approach. Working with colleagues from around the world, we conducted systematic reviews to identify and synthesize published and unpublished data on rapid molecular tests to detect TB and drug-resistant TB in children, adolescents and adults to inform class-based recommendations in the 2024 update of the WHO consolidated guidelines on TB diagnosis.

Economic evidence informing WHO policy update

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This talk summarizes the result of a systematic review conducted to inform the WHO guidelines on LC-aNAATs. Since 2019 when the last review of economic evidence was performed for LC-a-NAATs an additional 35 studies were identified including 21 economic analyses. Compared to SSM, LC-aNAATs were generally highly cost-effective, at times cost-savings but this depended on the comparison and implementation strategy. Nationwide implementation of LC-aNAATs may still pose a significant budgetary burden on TB control programs.

WHO prequalification process for new TB molecular products for the diagnosis of TB and drug resistance

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The World Health Organization (WHO), through its Prequalification Unit (PQ) and Global Tuberculosis Programme (GTB), jointly work to determine procurement eligibility for tuberculosis (TB) in vitro diagnostics (IVDs). The TB diagnostic assessment process for IVDs has evolved into a mechanism which focuses on the evaluation of classes of TB diagnostic technologies for WHO recommendation through GTB while the PQ evaluates each specific product brand for quality, safety and performance within the product intended use. WHO prequalification of IVDs is a comprehensive quality assessment of individual IVDs through a standardized procedure aimed at determining whether the product meets WHO prequalification requirements.

The emerging diagnostic landscape of new low-complexity molecular technologies: A lens into Asia

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The diagnostic technology landscape for TB diagnosis, especially the WHO-endorsed products has been till recently limited and dominated by manufacturers from the Global North. Most of these technologies remain expensive or not ideal for low-resource high burden settings. However, over the last few years Asia has become hub for innovation for TB diagnostics especially new low complexity molecular technologies which are optimal for low resource settings.
The presentation will review the emerging diagnostic technologies from the Asia lens focusing on countries including India, China, South Korea and Japan.

SP14 Ending TB disparities in prisons through evidence-based, community-engaged approaches

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

Prisons continue to harbor extremely high rates of tuberculosis 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 countries on four continents, with varying epidemiologic and political contexts. Presentations will highlight novel approaches to tuberculosis case-finding and diagnosis, innovative programs for delivery of preventive therapy, genomic surveillance approaches to monitor transmission, and transitional TB care for persons leaving prisons.
Speakers will discuss ethical considerations implementing tuberculosis programs in carceral settings, share experiences of operational challenges and opportunities, and address policy and resource needs to redress the systematic gaps in care for incarcerated people.

Active Tuberculosis case finding in Indonesian prisons (the ACTION study)

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In Indonesia, which has the second greatest tuberculosis burden in the world and rapidly rising incarceration rates, there is a paucity of data on tuberculosis in prisons. Furthermore, tuberculosis diagnosis, treatment and prevention programs in prisons are often implemented suboptimally.
We conducted a multicomponent prospective study to:
1) estimate the burden of tuberculosis disease and infection in an Indonesian prison;
2) compare active case finding approaches; and,
3) evaluate acceptance and completion of tuberculosis preventive treatment.
This community-engaged program allowed us to identify effective, person-centric TB diagnosis and prevention strategies that could be scalable in other low- and middle-income countries.

From Innovation to Intervention: Advancing TB Control in Prisons as a Public Health Priority

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This presentation will highlight the importance of addressing TB control in prisons as a public health priority, given the high burden of TB in these settings and the potential for transmission to the wider community. Building upon the experiences of conducting tuberculosis care and prevention programs in Brazil's prisons for the past decade, the presentation will also discuss the challenges of implementing TB interventions in prisons and the importance of sustainable approaches. It will conclude with a discussion of strategies for scaling up these interventions and the need for collaboration between stakeholders to achieve sustained impact.

Isoniazid vs. 3HP: treatment completion and adverse events in a RCT conducted in the largest prison in Malaysia

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Most prison settings differ markedly in their screening, treatment and prevention of TB. We draw from data from a routine TB screening program from Malaysia that uses multi-model screening strategies (symptoms, chest radiograph, CRP, GeneXpert, sputum culture, tuberculin skin testing) to identify the most optimal model of detecting TB. For those found to have latent tuberculosis, a randomized controlled trial was conducted comparing standard (26 weeks of daily isoniazid) with short-course (3HP/12 weeks of weekly isoniazid + rifapentine) treatment for latent TB infection. Results will be discussed in terms of adverse side effects and treatment completion will be presented.

Spillover of excess TB risk from prisons to the community: evidence from Paraguay

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The recent increases in the incidence of tuberculosis in Paraguay, as well as in several South American countries, and the growing concentration of the TB epidemic in prisons, highlight the urgency of targeting strategies to interrupt transmission and prevent new infections inside and outside prisons. In this presentation, we will present the results of new research quantifying the risk of developing TB in prison and after release from prison, as well as phylogenetic evidence of tuberculosis transmission occurring between prison and community.

Experience of retention in care interventions for formerly incarcerated people re-entering community settings in South Africa

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Continuity in care post-release is a challenge that has been previously described. A series of studies on continuity of care post release have been done in South Africa, including using case managers and adherence clubs to improve continuity of care. The findings from both intervention studies and qualitative studies will be shared at the symposium.

SP15 TB meningitis – from bench to bedside

Chair: Fiona Cresswell, Centre for Global Health and Infection, Brighton and Sussex Medical School, UK, Nairobi, Kenya
Chair: Reinout van Crevel, Radboud University Medical Centre, Nijmegen, Netherlands

Tuberculous meningitis (TBM) is the most severe form of tuberculosis, which kills one in four adults affected, leaves many disabled, and specifically affects small children and people living with HIV. In recent years there has been a surge in clinical trials and experimental research to increase understanding of the disease and improve outcomes. This session will highlight challenges in diagnosis and treatment of TBM, particularly in people living with HIV and children, and we will review recent evidence regarding pathogenesis, pharmacokinetics, intensified antimicrobial and host-directed therapies.
The speakers will represent five high TB burden countries across three continents. The speakers are expert clinicians, basic scientists, clinical pharmacologists and all members of the Tuberculous Meningitis International Research Consortium. The range of topics presented will extend the audience's knowledge base on this neglected aspect of TB, including cutting edge information from recent large-scale studies that will directly impact clinical practice.

Diagnosis and treatment of adult TB meningitis

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TB meningitis is frequently missed or diagnosed too late, by which time long-term neurological disability or death are unavoidable. This presentation will raise awareness about the prevalence and clinical presentation of TB meningitis with a view to reducing the time to treatment initiation and improving outcomes. The optimal approach to diagnosis in TB endemic settings will be covered spanning from traditional microscopy-based diagnostics to molecular or biomarker-based diagnostics. The current WHO-recommended TB meningitis treatment approach will be discussed as well as the direction of future research to optimise treatment and outcomes.

Improving diagnosis and outcomes in children with TB meningitis

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Young children are disproportionately affected by TBM. Fatality remains unacceptably high at 20% despite antituberculosis therapy and >50% of survivors have long-term neurological sequelae. This talk will highlight recent research developments including novel diagnostic tools to facilitate early diagnosis, new insights into the pathophysiology of disease which will guide better therapeutic approaches and an overview of the largest paediatric TBM treatment trial to date - the SURE trial.
The audience will develop an appreciation for the uniqueness of childhood TBM, the diagnostic challenges which remain the biggest obstacle, and research priorities moving forward.

TB meningitis in people living with HIV: considerations for diagnosis and management

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This presentation will provide a brief overview of the epidemiology of the HIV/TB syndemics and the co-pathogenicity of these two infections. The differences in clinical presentation and the unique considerations around diagnosis of TB in those living with HIV will be discussed. Clinically relevant data will be presented from the recent ACT-HIV corticosteroid trial that may impact clinical practice. Interesting immunophenotyping insights from cerebrospinal fluid of people with HIV/TBM will be shared. The nuances of antiretroviral therapy management and immune reconstitution inflammatory syndrome will be discussed and useful points for clinical practice in high TB burden settings will be highlighted.

Clinical trials and pharmacokinetic studies to optimise antimicrobial therapy

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Pharmacological studies, both in humans and experimental models, add to our understanding of the poor outcomes of TB meningitis, and support the optimisation of treatment regimens and drug dosages. Penetration of rifampicin into the brain is low, and high-dose rifampicin – which showed a survival benefit in smaller trials and modelling studies – is now being examined in several phase 3 trials. Intensification of TB drugs with better brain penetration - such as linezolid - are also being investigated alongside host-directed therapeutics like aspirin. This talk will give an overview of pharmacokinetic studies and clinical trials that are underway worldwide.

Host genotype directed therapy for TB meningitis: new evidence from clinical trials and patient cohorts

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Corticosteroids reduce inflammation and improve survival of HIV-negative TBM patients, but mechanisms are unknown. There is evidence for heterogeneity of effects, and some patients develop paradoxical inflammation despite corticosteroid therapy. We will share unpublished data from a recently completed randomised trial on dexamethasone in 720 HIV-negative patients stratified for a genetic variant in LTA4H, which correlates with baseline inflammation.
In addition, we will present how dexamethasone treatment regulates the immune responses and outcomes through metabolic and transcriptomic pathways from >2000 TBM patients, suggesting novel host-directed therapies for TBM. This talk will thereby benefit clinicians as well as TB scientists.

SP16 Assessing national TB legal environments to facilitate stronger TB responses

Chair: James Malar, Stop TB Partnership, Geneva, Switzerland

The United Nations High Level Meeting on TB commits to ensuring enabling legal environments for the TB response. To monitor and advise on accountability and what achieving this target entails Stop TB, technical partners, civil society and affected community, with support from Global Fund, developed, piloited and rolled out a TB legal environment and human rights scorecard. This symposium will discuss the content, process and results from the Scorecard in 5 TB High Burden countries.

Developing the Legal Environment and Human rights Scorecard and piloting it in Kenya

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STP together with the KELIN in Kenya coordinated the process for developing the TB legal environment and human rights scorecard. This process will be unpacked during this presentation.

The experience of the TB Legal Environment and Human Rights Scorecard in Moldova

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Countries in the EECA region have also utilised the legal environment and human rights scorecard. This presentation focuses on the experience of Moldova.

The importance of strong TB legal environments for ending TB

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This presentation will explore TB HLM targets and commitments and the important role legal and human rights barriers/environments play in realising all TB targets.

SP17 Bridging the Gap from Policy to Practice for Effective and Ethical Integration of New Shorter MDR/RR-TB Regimens

Chair: Christophe Perrin, Médecins Sans Frontières, France
Chair: TBC

The last decade has seen remarkable progress in evidence generation that revolutionized the treatment of multidrug and rifampicin-resistant tuberculosis (MDR/RR-TB). The advent of new drugs and shorter treatment regimens offer hope; however, their practical application face persistent gaps in TB laboratory and programmatic capacities. These may range from effective regimen eligibility qualification to delivering patient-centered models of care, hindering seamless integration into routine practice.
We bring together stakeholders, healthcare providers, implementers, and affected communities to exchange insights in the uptake of BPaLM and other shorter MDR/RR-TB regimens under operational research or in routine care.
We assess key implementation hurdles, share operational experiences, and discuss how TB programs can be better prepared for integration of new MDR/RR-TB regimens.
Our inclusive discussions aim to critically review gaps to identify solutions that not only facilitate the adoption and uptake of shorter regimens but also ensure their ethical use in routine practice.

Community Perspectives on Integrating New Shorter MDR/RR-TB Treatment Regimens for Equitable Quality Care

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Understanding perceptions of affected communities regarding potential benefits and risks associated with new shorter treatment regimens is essential. In this presentation, we will address questions such as: What regimen characteristics are most important for uptake and successful treatment completion? What tools or services are required to facilitate success? Are there lessons to be learnt from the community's experiences to identify potential solutions for effective integration of shorter regimens into practice using longer and shorter regimens? How can civil society promote the uptake of new innovations and what additional support do they need to do this?

Addressing Challenges in Laboratory Capacity for TB Drug-Resistance Testing For Effective MDR/RR-TB Management.

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Targeted next generation sequencing was implemented in Eswatini in response to surveillance from 2009-2010 that first documented rpoB I491F mutations conferring rifampin resistance which were undetectable by GeneXpert, and residual inadequacies with universal pDST. The 2018 TB drug resistance survey revealed that 58% of specimens harbored this mutation and were still misdiagnosed by Xpert. This highlights a critical diagnostic gap, impacting the quality of MDR/RR-TB treatment. Preliminary findings from targeted next-generation sequencing indicate the additional resistance to bedaquiline and clofazimine. We will discuss the clinical implications of this undetected resistance and its impact on bedaquiline-containing regimens and treatment outcomes.

Insights and Experience in Navigating Patient Management and Adverse Event Monitoring with the Shorter BPaL Regimen.

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TB Alliance's Nix-TB and ZeNix, and MSF's TB-PRACTECAL trials have demonstrated that the all-oral, 6-month BPaL/M regimen can significantly improve treatment success rates for MDR/RRTB while simplifying treatment. Transitioning from initial BPaL pilots under operational research conditions in June 2020 to the WHO guidelines recommending widespread programmatic adoption in December 2022, the BPaL/M regimens shall be used routinely globally in 2024. In this presentation, we will share insights and experiences in patient management and adverse event monitoring from several countries across Africa, Asia and Europe and discuss how clinical trial findings translate into field experience.

SP18 Children with severe acute malnutrition--progress addressing the burden of TB in this high-risk group

Chair: Sabine Verkuijl, World Health Organization, Geneva, Switzerland
Chair: Olivier Marcy, Université de Bordeaux, Bordeaux, France

Tuberculosis (TB) and severe acute malnutrition (SAM) are major causes of mortality for children under five years old globally. Considering the unacceptably high burden of childhood TB and SAM worldwide, the collision of these two diseases is an important focus for improving child health. Public health officials and clinicians must understand the unique considerations for co-prevalent TB and SAM, and much research is needed in the areas of epidemiology, screening and diagnosis, prevention, and treatment to mitigate the suffering of children from these diseases. Policy-level and implementation research is needed to optimize integrated models of healthcare that address TB and SAM in children.
This session will provide an update on recent evidence on TB and SAM and discuss remaining research gaps and possible ways to bring this evidence into policies and practices.

TB diagnosis in children with severe acute malnutrition using the 2022 WHO algorithms in nutrition insecure contexts

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Data and experiences using the 2022 WHO treatment decision algorithms for pulmonary TB for children with severe malnutrition in nutrition insecure contexts are lacking. In this presentation, we share results from implementing the new algorithms in Nigeria and Niger, highlighting the specific clinical questions for malnourished children at each step of implementation of the treatment decision algorithms.
Key aspects that will be discussed include: defining presumptive TB criteria for malnourished children, appropriate timing of scoring in line with nutritional treatment protocols and potential differences for TB presentation and recognition in Kwashiorkor and Marasmus sub-types of malnutrition.

Burden and outcome of TB in children with severe acute malnutrition hospitalised with acute illness in Sub-Saharan Africa and South-East Asia

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Tuberculosis (TB) has an intense relationship with severe acute malnutrition (SAM), and in 23% cases presents with acute pneumonia. TB may also be prevalent among hospitalized children with SAM having any acute illness. However, we do not have any published data on the incidence and outcome of TB in such children. We are intending to identify the burden of confirmed, unconfirmed, and unlikely TB and compare 6-month outcomes, among SAM children (2–23 months old) hospitalized for severe illness in Bangladesh and Uganda, using TB-sub-study data from the Childhood Acute Illness and Nutrition Network (CHAIN) observational cohort study.

Screening and treatment decision algorithms for TB diagnosis in children below 5 years hospitalised with severe acute malnutrition: A cost-effectiveness analysis

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In sub-Saharan Africa, 27% of all TB infections are associated with undernutrition. TB diagnosis is challenging in children with severe acute malnutrition (SAM) because they present poorly specific symptoms or may be paucisymptomatic. We assessed the cost-effectiveness of implementing three TB treatment decision algorithms (TDAs) for children <5 years, hospitalised with SAM in tertiary level hospitals in Uganda and Zambia.
We assessed two newly developed specific TDAs for children with SAM from the TB-Speed project, with and without a screening step with potential associated cost savings, and the recently recommended WHO TDA for settings with chest x-ray.

Pharmacokinetics of first line anti-TB drugs in children with severe acute malnutrition

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Children with severe acute malnutrition (SAM) are prone to tuberculosis and are at risk of poor treatment outcomes. Malnutrition leads to pathophysiological changes that can alter the pharmacokinetics of drugs. There is limited evidence on the impact of SAM on plasma exposures to antituberculosis in children. We evaluated the effect of SAM on the plasma exposures of rifampicin, isoniazid,

and ethambutol in under-five children with and without HIV infection. We conducted intensive pharmacokinetic sampling sessions in children with/out SAM of known HIV status diagnosed with TB and here we report on the comparisons of plasma exposures of the antituberculosis drugs.

Urine LAM testing for TB diagnosis in children with severe acute malnutrition

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Urine lipoarabinomannan (LAM) antigen testing is now widely used for the diagnosis of TB in people living with HIV. Early data suggest that urine LAM testing may also be a valuable tool for diagnosis of TB in another immunosuppressed population: children with severe acute malnutrition (SAM). Urine LAM testing has the advantages of being done rapidly at the point-of-care and, especially important for young children, utilizing non-invasive sample collection.
This talk will explore the potential of urine LAM testing for children with SAM and outline future research needed to clarify the role of this testing in this TB high-risk population.

SP19 Social networks of children and adolescents: implications for when and where they are infected with Mycobacterium tuberculosis

Chair: Helen Jenkins, Boston University School of Public Health, Boston, United States

An estimated 1.3 million children and adolescents developed tuberculosis (TB) disease in 2022, of whom, only 47% were notified to the WHO. Contact tracing and subsequent provision of treatment for infection or disease is usually at the household level, assuming that children and adolescents are infected at home by another household member.
However, data increasingly suggest that many are infected outside the home. We might identify additional methods to find children and adolescents with TB infection or disease if we had a better understanding of where and from whom they are infected with TB. In this symposium, we will hear about studies to understand where children and adolescents spend their time and thus where they may be exposed to TB.
Results from these types of studies could inform policies to find children and adolescents with TB infection or disease and reduce disease and mortality due to TB.

Identifying when and where children acquire TB infection: methods and findings from the Socio-spatial Networks and TB infection in Youth (SONET) Study in Rural Uganda.

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The objective of this talk is to preset findings Socio-spatial Networks for TB infection in Children and Youth (SONET) study, a longitudinal cohort of over 5,000 children and adolescents living in rural Uganda that employs socio-spatial network analysis to characterize where and from which social network (household, close contact, casual contacts/venues) youth acquire TB. At baseline the prevalence of TB infection, defined by a positive QuantiFERON, was 9.6% among 1-17 year olds. Few infections were explained by a known household exposure. As children age, household level predictors decreased in importance and in adolescence, mobility was the most important predictor.

Shifting networks of care and exposure risk for children in families affected by MDR-TB in Namibia

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Namibia is a high-TB burden, low population density country in southern Africa. TB epidemiology in Namibia is complex, with transmission patterns differing across the central, capital region, higher-density pastoral farming region, and hunter-gathering and subsistence communities in remote regions. We mapped the kinship networks and co-residence of 96 families in which at least one person diagnosed with MDR-TB across these places. We show how families manage exposure risks to children through shifting co-habitation patterns. Further, we show how these vary by child age and gender, and by region.

Exposure risks and likely transmission pathways among children diagnosed with MDR-TB in South Africa, India, and the Philippines

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Nested in an efficacy, safety, and acceptability trial of novel formulations of Clofazimine and Moxifloxacin. We collected in-depth qualitative data including participatory activities to chart the family membership, history of diagnosis, co-residence, and known exposure contact people of 26 children (<12-years-old) diagnosed with MDR-TB. We show that although most children with MDR-TB have

a known exposure in their expanded family and social networks, this contact person is frequently outside of their traditional nuclear family. We further show how this varies by child age and across the three countries.

Studies to identify where TB transmission to children occurs in China

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Few large-scale studies have investigated where tuberculosis transmission occurs in children. Leo Martinez will describe efforts to study this question across several provinces in eastern China, combining *Mycobacterium tuberculosis* infection testing data, TB disease linkage, and household linkages. Strengths and limitations of this approach will be discussed.

Contact rates among children in Guatemala, India, and Mozambique: implications for TB transmission

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Data on social interactions have rarely been collected in low- and middle-income countries but are key inputs into infectious disease models that can guide interventions. We collected contact data in three countries with a focus on contact people of children. While daily contact rates among children under six months are similar (mean of 6 across countries), they diverge among older children: children aged 10-14 reported 7.2 contact people in Guatemala compared to 10.8 in India and 11.2 in Mozambique. Patterns are attributable to different household structures, cultural, and educational norms across countries, with implications for *Mycobacterium tuberculosis* risk among children.

SP20 Active TB case finding – impactful, fad or fantasy?

Chair: Dennis Falzon, World Health Organization / Global Tuberculosis Programme, Geneva, Switzerland
Chair: Anh Innes, Independent consultant, Vietnam

Active case finding through screening for TB disease of populations at high risk is the subject of extensive investigation, in many settings and many countries. Impetus for this has increased with the realization that we are falling short of End TB targets, and with the finding of a large number of persons with undetected TB disease during national prevalence surveys. While many research studies have demonstrated that screening can be done with various modalities, and can detect significant numbers of person with TB disease, the epidemiological impact is less certain, as is the affordability to implement this screening at national level.
This symposium will examine the yield of screening, with different tests, in different settings and populations, the measured, and modelled impact, as well as the costs and affordability in resource-poor countries.

WHO's guidance on TB screening: a key tool to ending TB

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In 2021, WHO released new guidelines on TB screening, which used the latest evidence to revise the recommended approaches for active TB case finding and encourage the use of new tools to screen, including computer-aided detection of TB on chest radiography, C-reactive protein, and rapid molecular tests. This introductory presentation will discuss how TB screening activities, combined with other TB interventions, are essential to curb the epidemic worldwide and contribute to the achievement of renewed global commitments to end TB.

Indonesia's experience with active case finding – Is it working? Is it affordable?

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The speaker will review the experience of the National TB programme in Indonesia with active case finding. A description of projects in specific populations and the measured impact will be reviewed. This speaker will also address the feasibility and affordability of scaling up active case finding for all of Indonesia?

Reality check: Survey of active case finding in high incidence and/or high burden countries

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We have conducted a survey of high TB burden and/or high TB incidence countries to assess their experience with active case finding: We will review findings in terms of current programs in different setting, their level of participation and impact, on various epidemiological measures. A particular focus is contact investigation – we will review how often this is done, and to what proportion of all contacts plus whether TPT is given to child contacts, or older contacts as well.

What will it take for active case finding to have a significant, and lasting impact?

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Active case finding has been shown to have epidemiological impact when tested in research projects with high rates of participation by the communities. What will it take for ACF to have a lasting and substantial impact at country level? This talk will review lessons learned from models of mass screening in past decades in high income countries, as well as recent studies involving large scale screening and TB preventive therapy programmes in high burden countries.

SP21 Mitigating bias and improving inference from observational studies and clinical trials of MDR/RR-TB treatment and diagnostics

Chair: Molly Franke, Harvard Medical School, Boston, United States
Chair: Mathieu Bastard, World Health Organization, Geneva, Switzerland

The objective of this symposium is to provide information on modern analytic approaches for drawing causal inferences from observational treatment cohorts and clinical trials. In this symposium we will provide illustrative examples of novel and rigorous research methods to address priority research questions related to optimal treatments for rifampicin and multidrug-resistant tuberculosis; the impact of novel diagnostics on patient-centered outcomes; external validity and generalizability of randomized clinical trial findings, and the study of associations between HIV and MDR/RR-TB treatment outcomes.
Sessions will include applied examples of target trial emulation, benchmarking of observational studies to clinical trial results, addressing selection bias in observational studies, and best analytic practices.

Target trial emulation to estimate the effect of a RR-TB diagnosis by the Xpert MTB/RIF assay on two-year mortality

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Assessing patient-centered outcomes in rifampicin-resistant tuberculosis (RR-TB) diagnostics is often limited by bias. Despite Xpert MTB/RIF's endorsement a decade ago for TB and RR-TB diagnosis, its impact on RR-TB mortality remained unexplored. We present a target trial emulation using the EXIT-RIF observational cohort study to estimate the effect of Xpert-based RR-TB diagnosis on mortality compared to pre-Xpert algorithm, employing a three-step approach: First, a reweighting step to rectify bias caused by differing screening guidelines. Second, reweighting to adjust for confounding.
Finally, we conduct causal mediation analysis to unravel the impact of RR-TB treatment initiation along the causal pathway.

Prediction or causality? Conflating concepts in TB observational research

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Conflation (defined as the erroneous merging of two or more concepts into one) of aetiology and prediction, is a common error in observational clinical research. Aetiological research aims to identify causal effects, whilst prediction research aims to forecast an outcome with the best accuracy but both types of studies are often undertaken using the same observational data. This can lead to a conflation of the approach and interpretation of findings leading to erroneous conclusions.
We present the findings of a scoping review to assess the frequency of conflation in studies assessing the association between HIV and drug-resistant TB treatment outcomes.

A novel approach to combining data from cutting edge clinical trials of MDR/RR-TB treatments

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We will discuss the novel use of an emulated target trial to compare the safety and efficacy of experimental regimens for MDR/RR-TB studied across two trials, endTB and TB-PRACTECAL.
The emulated trial permits direct comparison of the endTB regimens (9BLMZ, 9BCLLfxZ, 9BDLLfxZ, 9DCLLfxZ, 9DCMZ) against 6BPaLM (where, B = bedaquiline; L = linezolid; M = moxifloxacin; Z = pyrazinamide; C = clofazimine; Lfx = levofloxacin; D = delamanid; Pa=pretomanid).
We will explore the use of inverse probability weighting to control for potential confounding in treatment assignment in the emulated trial cohort and of E-values to quantify sensitivity to residual confounding. This approach could generate robust, valid evidence from pooled studies, useful for WHO guidance.

Assessing the generalizability of MDR/RR-TB treatment outcomes: from ccntrolled trial environment to real-world settings

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Randomized clinical trials enable the comparability of treatment groups to obtain internally valid estimates. However, selective attrition of participants may create systematic differences between the trial population and the broader trial-eligible population, potentially inhibiting the ability to obtain externally valid estimates. We explore the challenges in generalizing treatment outcomes for MDR/RR-TB from controlled trials to real-world settings.
Through the application of novel causal inference methods, this analysis will evaluate the key assumptions underpinning the generalizability of trial outcomes observed in the endTB Clinical Trial control arm to a population receiving standard MDR/RR-TB treatment in the endTB Observational Study.

SP22 Pediatric TB drug dosing: using state of the art modeling to bridge principles to practice

Chair: Tiziana Masini, World Health Organization, Geneva, Italy
Chair: Rovina Ruslami, Universitas Padjadjaran, Bandung, Indonesia

Children receiving TB prevention or treatment require tailored dosing strategies due to physiological and developmental differences with adults. However, this is hampered by limited available information from clinical data. Population pharmacokinetic modeling offers a powerful toolset to bridge these gaps. It can be used not only to assist the interpretation of sparse clinical data in a mechanistic way, but also as a simulation platform to explore dosing adjustments that have not been directly observed across different weights and ages.
The symposium targets pharmacokinetic experts, clinical pharmacologists, as well as paediatricians and policy makers who want to get insights on how paediatric dosing is informed and the critical role of population pharmacokinetic modeling. It will feature expert insights, case studies, and discussions on the application of population modeling to showcase how this technique is used to inform and refine pediatric TB dosing recommendations.

Principles of paediatric TB drug dosing: allometry and maturation to account for the effects of body size and age in children on pharmacokinetics

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The dosing of TB drugs in children must take into account the large changes in body size and physiologic processes that occur from infancy to adolescence. Extrapolating mg/kg doses from adults to children does not adequately account for these changes and will not usually result in the desired drug exposures in children.
This presentation will discuss principles of paediatric TB drug dosing with a focus on the application of allometry to account for the effect of body size and maturation to account for the effect of age on pharmacokinetic parameters.

Evaluating pediatric tuberculosis dosing guidelines: a model-based individual data pooled analysis.

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Recent pharmacokinetic studies in pediatric patients receiving the 2010 WHO-recommended first-line tuberculosis treatment revealed variable drug exposures, notably with rifampicin exhibiting the lowest levels. A pooled analysis of data from pediatric tuberculosis treatment studies was conducted, where factors influencing drug exposures were identified to optimize treatment strategies.
These findings indicate that age and body size influence drug exposure. While HIV status showed no significant association, interactions with the antiretroviral lopinavir/ritonavir increased rifampicin exposure while reducing isoniazid and pyrazinamide exposure. In order to achieve exposures in line with adult values, the doses of all first-line drugs should be increased, especially rifampicin.

Harmonizing weight-bands for paediatric dosing

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Dose recommendations in children often use discrete increments based on weight-bands. However, these bands vary across therapeutic areas, leading to complexity and potential dosing errors when treating concomitant conditions. Standardizing weight-bands would simplify drug treatment and combination formulations, but switching to a harmonized system requires thorough evaluation of whether the current dosing recommendations can be easily adapted.

In this talk, we summarize the process undertaken to propose and evaluate harmonized weight-bands: the exploration of current guidelines in different therapeutic areas, modelling and simulation evaluating predicted drug exposure, and discussion with expert panel evaluating potential safety and efficacy implications.

Pharmacokinetic modelling to inform the optimal dosing of levofloxacin in children for drug-resistant tuberculosis and tuberculosis preventive therapy.

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Each year 25 000–32 000 children develop multidrug-resistant tuberculosis (MDR-TB), and many more require preventive treatment. Levofloxacin is a key component of MDR-TB treatment and prevention.
We revised the dosing recommendations and proposed pragmatic optimal dosing required to achieve adequate exposure of levofloxacin for both treatment and prevention with the formulations available. To do so, a pharmacokinetic model built with individual patient data from 5 different studies was used for Monte Carlo simulations producing weight and age adjusted optimal dosing recommendations.

SP23 New model for technical support: PeerLINC – peer-to-peer knowledge hub to facilitate country-to-country learning to speed implementation of novel treatments

Multiple countries, including seven which are part of the TB Alliance-led LIFT-TB initiative are early adopters of BPaLM/BPaL and are implementing the regimens programmatically. The process from initial adoption to programmatic scale-up in these countries took 3-4 years which is considerably faster than the past. Other countries may also be able to implement BPaLM/BPaL faster if provided access to this collective experience.
To facilitate this, TB Alliance has formed a "Knowledge Hub" called PeerLINC (Peer-to-Peer Learning for Innovative Cures for TB) which delivers knowledge, experience, learnings, best practices on clinical, lab, programmatic management, community engagement as a comprehensive technical support package to support countries in rapidly implementing BPaLM/BPaL. Country support is customized and available free or at fraction of usual cost of technical assistance without customary delays making technical assistance more accessible and faster.
Participants will learn about PeerLINC, scope of support provided, and hear experiences of PeerLINC graduate countries.

Reimagining and simplifying Technical Assistance: the PeerLINC knowledge hub

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Technical Assistance (TA) is a key enabler for implementation of new health innovations in low- and middle-income countries. Coverage of TA is usually patchy and providing it is expensive. PeerLINC's innovative approach ensures swift and cost-effective delivery of TA through a peer-to-peer learning approach that connects countries to speed implementation of new treatments in the public sector.
While presently applied to MDR-TB, the concept is scalable to any health intervention in the public sector.
In this presentation, the rationale and model of PeerLINC Knowledge Hub will be explained to set context for rest of the symposium.

Importance of deliberate and not incidental Technical Assistance in scaling up new tools

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Usually delivered by Western agencies, TA is expensive, slow and not universally available, as it is limited to countries where TA providers have coverage. This limits penetration of innovations beyond the few highest burden countries for several years. In 2023, WHO issued a Call to Action urging countries to accelerate the rollout of new WHO-recommended shorter all-oral treatment regimens for drug-resistant TB (DR-TB), including through peer-to-peer learning. In this presentation, Head of Tuberculosis, The Global Fund to Fight HIV, TB and Malaria will share global perspective on the benefits expanding access to TA through a mechanism like PeerLINC.

PeerLINC and Peru: A case study

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In this presentation, the audience will hear real life experience of Peru, a country that had challenges accessing TA in timely and cost-effective manner and how PeerLINC met its needs, making TA easier, faster and better, and allowing the country to implement BPaL/M 2-5 years faster than what would have been expected through classic TA models. A representative of Peru's NTP will also share their perspective on how receiving learnings and knowledge from a peer country adds more value than the traditional approach.

SP23 New model for technical support: PeerLINC – peer-to-peer knowledge hub to facilitate country-to-country learning to speed implementation of novel treatments

Chair: Sandeep Juneja, TB Alliance, New York, United States
Chair: Klara Henderson, Australia's Department of Foreign Affairs (DFAT), Sydney, Australia

Multiple countries, including seven which are part of the TB Alliance-led LIFT-TB initiative are early adopters of BPaLM/BPaL and are implementing the regimens programmatically. The process from initial adoption to programmatic scale-up in these countries took 3-4 years which is considerably faster than the past. Other countries may also be able to implement BPaLM/BPaL faster if provided access to this collective experience.
To facilitate this, TB Alliance has formed a "Knowledge Hub" called PeerLINC (Peer-to-Peer Learning for Innovative Cures for TB) which delivers knowledge, experience, learnings, best practices on clinical, lab, programmatic management, community engagement as a comprehensive technical support package to support countries in rapidly implementing BPaLM/BPaL. Country support is customized and available free or at fraction of usual cost of technical assistance without customary delays making technical assistance more accessible and faster.
Participants will learn about PeerLINC, scope of support provided, and hear experiences of PeerLINC graduate countries.

Perspective of the host country

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In this presentation, the audience will hear the perspective of the Department of Health of the Philippines, which collaborated in the formation of PeerLINC, on why it is important for countries to enter into peer-to-peer knowledge exchanges with each other and how the process enriches the knowledge provider as much as the recipient. Being one of the early BPaLM/BPaL adopters, Philippines has implemented strong decentralized DR-TB management system supported by laboratory strengthening, aDSM, TB information system, sample transportation system. All the components are strongly required and can be provided as example of successful country experience in PeerLINC.

How PeerLINC works

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In this presentation, the head of PeerLINC will explain how the model works in practice and how countries can receive its support. The speaker will talk about the scope and topics for which information is provided , who will benefit from PeerLINC, how to customize support, engaging with the initiative for ongoing support, options for classroom and field training, etc. Participants will be left with a clear idea of what to expect from PeerLINC and how to access it.

SP24 Moving from consultation to collaboration: unleashing the power of Social Participation for community empowerment and people-centred care

Chair: Victoria James, Nedico, Zimbabwe
Chair: Luan Nguyen Quang Vo, Friends for International TB Relief, Ha Noi, Vietnam

The session aims to challenge existing paradigms surrounding community engagement in TB and health decision-making by highlighting the pivotal role of social participation in fostering community empowerment. Through real-world examples, and provocative discussion on how best to measure the impact of social participation along the programme cycle, speakers will highlight common barriers and facilitators of meaningful engagement towards equitable progress and transparency in TB programmes. By critically examining how social participation of communities has been defined, assessed, and applied in programme strategies in a range of settings, the session seeks to engage attendees in open discussion regarding how best to advocate for, and implement institutionalized and sustained social participation. Ultimately, the objective is to ignite a transformative dialogue that empowers stakeholders to share what strategies can be taken to prioritize genuine inclusivity, diversity, and accountability in shaping TB and health policies and practices worldwide.

Beyond rhetoric: Social Participation for policy action

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This presentation will examine the gap between rhetoric and reality in social participation for health and ending TB, offering insights into practical strategies for bridging this divide.

Inclusive governance: ensuring equitable representation in decision-making

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Addressing the importance of diverse representation, this presentation will showcase successful models of inclusive governance that prioritize marginalized voices in health policy formulation. BRAC is a community-based development organization which serves people living with inequality and poverty. It is a hub for solutions ecosystem for bringing positive changes in the lives of people striving with extreme poverty, illiteracy, disease, and social injustice through diversified services including healthcare. Equitable empowerment of these marginalized groups with their strong participation enables sustainable solutions to health challenges with an integrative continuum of care for people living with diseases.

From consultation to collaboration: fostering genuine engagement in national health responses

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Exploring the continuum of collaboration from tokenism to generative partnership, this presentation will emphasize the need for genuine engagement to drive sustainable health outcomes.

Documenting and measuring the impact of social participation in TB programming: evolving methods and indicators

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Highlighting the importance of evidence-based assessment, this presentation will offer a critical overview and update of methods, tools, and indicators that have been proposed since the 1990s to assess social participation and its impact on TB programme governance, quality and accountability at the health systems and community interface. Based on the evolution data, the session will also feature select case studies that effecively documented and measured the impact of social participation along TB programme cycle globally, including the use of creative sector in mainstreaming accountability to affected populations.

Taking a step back to allow others to take one forward

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Focusing on the strategic withdrawal of traditional top-down approaches, the granting of control over resources to non-traditional structures and distributed mechanisms of leadership, this session explores the transformative potential of ceding power to communities.
The speaker will present successful, equity-driven models of community leadership, showcasing how such approaches foster more inclusive, effective, and sustainable health interventions and empowerment at the grassroots level.

SP25 Programmatic implementation of targeted next-generation sequencing for drug-resistant TB detection

Chair: Anita Suresh, FIND, Singapore, Singapore
Chair: Patricia Hall-Eidson, US Centers for Disease Control and Prevention, Atlanta, United States

Targeted next-generation sequencing (tNGS) has been endorsed by the World Health Organization for use in the diagnosis of drug-resistant tuberculosis (DR-TB). The technology has already been piloted for DR-TB detection in multiple countries, including high TB burden countries, with an initial lens of surveillance and plans for programmatic expansion. As more countries review the updated policy and operational guidance to be able to implement tNGS in their programmatic settings, they seek real-world experience and insights on operationalization of the laboratory workflow and appropriate algorithms for tNGS deployment.
Thus, the objective of this session is to share country experiences, lessons learnt and recommendations on operationalizing tNGS for DR-TB detection in programmatic settings. This is especially timely as health ministries and implementers seek to leverage the NGS investments and capacity from the pandemic for TB.

Considerations for programmatic implementation of next-generation sequencing for drug-resistant tuberculosis

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This talk will present considerations for implementation of next-generation sequencing (NGS) for drug-resistant TB detection, summarizing key resources and tools developed by the Global Laboratory Initiative, FIND and other partners for NGS usage as well as operational considerations for using targeted NGS for DR-TB diagnosis in programmatic settings.

Indonesia experience in implementation of next-generation sequencing for detection of drug-resistant tuberculosis

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This talk will summarize the Indonesia Ministry of Health's vision, experience and progress towards country-wide implementation of next-generation sequencing for drug-resistant tuberculosis for surveillance and diagnosis, as part of their broader National Health Transformation agenda.

Bangladesh experience with programmatic implementation of targeted next-generation sequencing for drug-resistant tuberculosis

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This talk will summarize the icddr,b experience with establishing and implementation of targeted next-generation sequencing (tNGS) for drug-resistant TB detection direct from sputum samples. It will also summarize the implementation of tNGS to investigate transmission dynamics of multi-drug resistant TB throughout the country as part of the Bangladesh National TB Control Programme.
This work has been supported by the United States Agency for International Development (USAID) and the Stop TB Partnership.

Brazil experience in programmatic implementation of next-generation sequencing for drug-resistant tuberculosis

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This talk will summarize the Brazil National TB Programme's pilot and early experience in implementing next-generation sequencing for drug-resistant TB detection, and their their plans for programmatic scale-up in the country. Diagnostic network optimization ?findings will also be presented.

The New York State experience in implementing targeted next generation sequencing in tuberculosis programmatic practice

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This talk will summarize the New York State Public Health Laboratory experience and lessons learnt from implementing targeted next-generation sequencing (tNGS) for routine drug-resistant TB detection, and opportunities for faster, cheaper and more simplified tNGS workflows from sample to analysis.

SP26 Continuing the conversation on equity: checking our blind spots

Chair: Amrita Daftary, York University, Toronto, Canada
Chair: Stephen Anguva Shikoli, Network of TB Champions Kenya., Nairobi, Kenya

Support for equity in TB prevention, diagnosis, treatment, and care has heightened since Political Declarations of the UN High Level Meetings on TB. Access to biotechnological innovations and attention to human rights, particularly for populations most vulnerable to–and made vulnerable by–TB have rightly occupied a centrestage in this dialogue. Here, we look for attentiveness to equity in underexplored spaces where TB research, policy, and care unfold, to refine our foci, measurement approaches, and interventions.
The objective is to uncover blind spots in current framings of equity, claim missed opportunities to act, and imagine agendas that respond to structural, even discomfiting, dimensions of (in)equity in TB. We interrogate discourses embedded in program policies, the current menu of TB elimination indicators, rote models of engaging communities or supporting people with TB, and values underlying how we research and policy TB given fundamental first principles of global health.

Where is equity in national TB strategies: review of policies from seven countries

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Policies carry explicit and implicit discourses about TB that guide attention toward or away from the social dimensions of TB, including the complex interactions between its biomedical and socio-structural drivers and impacts. SSHIFTB analyzed how discourses in TB policies of seven countries frame the social dimensions of TB, in particular how social inequity, gender, and stigma are problematized, and responded to. The results reveal a tension wherein a socio-structural framing co-exists alongside an individualized framing of responsibility for TB outcomes. Relevant stakeholders should consider how framings of TB can shape corresponding responses to the disease, with implications for affected populations.

Beyond incidence and mortality rates: revisiting the metrics for equity

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Measurement of equity in TB has improved significantly since the first UN HLM on TB. Disaggregated, intersectional, and syndemic approaches have helped to better define disparities and to focus scarce resources on those left out. We review equity metrics and illustrate how they impact policy at national and international levels. Both the measurement of equity and the equity of measurement are reviewed as a means of understanding current efforts to flatten hierarchies in TB care. We survey current mitigation tools and the benchmarks used to track progress.

Can economic equity and universal social protection become the business of TB programs?

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TB imposes catastrophic costs on families, widening inequities in TB risk, prevention, treatment, and care. The 2023 Political Declaration of the UN HLM on TB included a pledge that all people with TB should receive a social benefits package to mitigate financial hardships. How this pledge will be actualized remains uncertain. TB funding is still focussed on medical benefits. Financial hardship terminology may also change how economic disparities are measured and addressed. In countries such as Indonesia and Nepal, local, tailored implementation of evidence-based strategies, that are supported by secure budgets, will be crucial to achieving universal social protection.

Co-design as a first principle for TB interventions

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National strategic plans (NSPs) seek to achieve equity by addressing the root causes of health disparities. TB-affected communities remain inadequately included in NSP decisions, leading to major implementation gaps. TB Proof presents two interventions from South Africa, where the

innate expertise of community members was harnessed as a first principle. In the first, members who were initially "study subjects" and shared barriers and enabling factors shaping their TB journeys were later engaged as "study developers" to co-create responsive interventions. In the second, community members gained leadership skills via a mentorship program to strengthen policy implementation.

Applying core global health values to TB prevention and care

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The adoption and application of emancipatory global health values is gaining momentum in the field, yet they remain underutilized in TB. The core global health ethics values of equity, solidarity, and decolonization have immense potential applications in TB prevention and care programs and policies. In recent years, however, I argue that the way in which the notion of equity has been used in TB research and practice is still too narrow, underselling its explicitly political and ethical dimensions. I posit what this might mean when adopting other global health values.

SP27 Computer-aided detection of TB for children and adolescents – generating data to inform global guidance

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

Computer-aided detection (CAD) of abnormalities on chest radiography (CXR) is recommended by the World Health Organization (WHO) for TB screening and triage. While CXR is part of the diagnostic approach for tuberculosis (TB) in children and adolescents, CAD is not yet validated for TB screening under 15 years of age. WHO identified this as a priority need for research in CAD for TB.
Current work is ongoing to address this gap by validating existing CAD algorithms in children and young adolescents under 15 years, developing new CAD algorithms for children with appropriate reference standards, and assessing the performance of different CAD software for both TB screening and diagnostic evaluation.
This symposium will convene key experts involved in efforts to generate these new data on use of CAD in children and young adolescents and describe plans to review these data to update global policy on both TB screening and diagnostic evaluation.

Global policy development on computer-aided detection of TB

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In March 2021, WHO revised its guidelines on the systematic screening of TB disease, including a recommendation for the use of computer-aided detection software (CAD) in place of human readers when interpreting digital chest X-rays in individuals aged > 15 years undergoing screening or triage. This supported wider use of X-ray screening in settings where radiologists were lacking, but limits its use to adult populations.
This talk will present WHO's plans for future evaluation of pediatric CAD products and highlight research gaps with an outlook towards global policy updates in a near future.

Exploring the use of CAD for disease severity stratification in children diagnosed with tuberculosis

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In 2022 the World Health Organization updated their TB treatment guidelines for children to recommend the use of a 4-month treatment regimen for those with non-severe TB. Distinguishing severe from non-severe disease relies largely on the interpretation of the CXR, which can be challenging for non-expert clinicians. Identifying methods to simplify and standardize this classification in children could improve scale-up of the shorter TB treatment regimen globally. Although the accepted use-case for CAD is TB screening and triage, we explore the accuracy of CAD for radiological disease severity stratification in South African children <16 years treated for TB.

TB Screening of children with portable digital X-Rays in nomadic communities of Nigeria

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A large proportion of children with TB are missed in Nigeria, with vulnerable and underserved populations disproportionately affected. Ultraportable CXR has the potential to reach both communities and facilities with previously limited access to CXRs while providing crucial diagnostic information in paediatric populations who typically are unable to produce sputum.
This session will present our experience and challenges of implementing ultraportable CXR (with CAD for ages 6 and above) for active childhood TB screening amongst the nomadic community in Nigeria.

Developing paediatric chest X-ray libraries for AI development

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Computer-aided detection (CAD) of CXRs is now recognised as an important tool in the diagnostic cascade for TB. However, the algorithms that underpin the technology have historically been trained on adult CXRs, potentially restricting their accuracy and use in paediatric cohorts. Good quality CXRs are essential for artificial intelligence (AI) training which can be difficult to obtain from children.
Here we present a methodology for collecting, labelling, annotating, and evaluating paediatric CXRs and dissemination to CAD software vendors for AI development.

The performance of CAD algorithms to identify TB on paediatric CXRs

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CXR plays an essential role in the clinical evaluation of children with presumed TB, but interpretation requires access to well-trained pediatric specialists. Paediatric CXR interpretation by CAD can potentially facilitate the TB diagnostic-decision making process, particularly in settings where access to experienced human readers is limited.
Through the CAPTURE consortium, we established a large, well-characterized multi-country archive of CXR images from children and young adolescents (0-15 years) with presumptive TB.
Utilizing this repository, we will present an independent evaluation of the accuracy of current CAD algorithms to identify childhood TB.

SP28 National TB prevalence surveys: new survey results and latest insights

Chair: Eveline Klinkenberg, Independent Consultant, Netherlands
Chair: Marina Tadolini, Alma Mater Studiorum, University of Bologna, Italy, Bologna, Italy

In countries with a relatively high burden of TB disease that do not yet have national disease notification systems or national vital registration systems with cause-of-death data that are of sufficiently high quality and coverage, national TB prevalence surveys are the best way to directly measure the burden of TB disease in the population. Since 2000, a total of 43 national surveys in 34 countries were implemented.
These surveys offer results beyond estimations of prevalence including those related to healthcare seeking behaviour of symptomatic individuals, health service provision, symptom and chest X-ray screening outcomes, TB/HIV co-infection, effectiveness of CAD, comparisons of Xpert versus culture, and subclinical TB.
This symposium will present how survey results are used to estimate TB burden, results from two recent surveys, the significance of non-TB chest X-ray findings, and an overview of subclinical TB and its contribution to the burden of disease and transmission.

How does WHO use results from national TB prevalence surveys to estimate the burden of TB?

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National TB prevalence surveys provide the primary source of measurement used by WHO to estimate TB incidence for countries in the absence of other direct reliable measurement. TB incidence is estimated as the prevalence of TB divided by the average duration of disease, where the duration of the disease is derived from literature reviews which have provided estimates of duration of disease in people with untreated TB from the pre-chemotherapy era.
In future developments, the use of additional data sources combined with survey results through mathematical modelling is explored. New guidance on TB prevalence surveys will be also presented.

Results from the first national tuberculosis prevalence survey of Timor-Leste, 2022–2023

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Tuberculosis is a major source of morbidity and mortality in Timor-Leste, which has one of the world's highest estimated TB incidence rates. Timor-Leste's first national TB prevalence survey aimed to obtain a robust estimate of the national prevalence of TB.
The survey was a nationally representative random cluster survey utilizing a screening algorithm consisting of symptom screening and chest X-Ray with computer-aided detection for TB. Those who screened positive were eligible for sputum testing by Xpert Ultra and mycobacterial culture. A total of 15,258 people participated in the survey, with preliminary results confirming a high burden of disease.

Results From the third national tuberculosis prevalence survey of Cambodia, 2023–2024

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Cambodia conducted its 3rd national TB prevalence survey, the first repeat survey in the world after the COVID-19 pandemic, in 2023–2024. The survey used digital chest X-ray with CAD, Xpert Ultra, MGIT and LJ cultures. Provisional analysis suggests a decline of TB prevalence over the last two decades.
However, prevalence of TB is still high, and most people with TB in the general community are subclinical or with lower bacteriological load that were not detectable by previous survey tools i.e. smear microscopy and solid culture. Field operations were completed in May 2024 and full survey results will be presented.

'If not TB, what could it be?': chest X-ray findings from TB prevalence surveys of high-TB-burden countries in Africa

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TB prevalence surveys offer benefits beyond the estimation of prevalence of TB disease. Use of digital chest X-rays (CXR) in TB population-based studies have the potential to identify a large number of people with non-TB-related abnormalities. This presentation will share CXR findings of prevalence surveys from Kenya, South Africa and Zambia. Though surveys recommend referrals for other abnormalities as appropriate, there is no structured system for the detection and management of these individuals.

These studies will offer insights on common conditions whose referral pathways, diagnostics and follow-up plans could be incorporated during the planning of TB prevalence surveys.

Asymptomatic TB: who are these people with TB but with no apparent symptoms?

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Since national tuberculosis prevalence surveys systematically perform X-ray screening of populations according to largely standardized protocols, these surveys are providing invaluable information on the burden of TB without typical symptoms. This presentation will review recent evidence from TB prevalence surveys regarding the importance, clinical features and distribution of subclinical TB. It will furthermore discuss limitations of the available data with regard to study design, case definitions and reliability of symptom measurement.
Finally, it will suggest ways in which future TB prevalence surveys can deepen our understanding of subclinical TB and its contribution to the burden of disease and transmission.

SP29 Promoting Equitable Access through Community-based Integrated TB Service Delivery Models of Care

Chair: Uzma Khan, IRD Global, Montreal, Canada
Chair: Toufiq Rahman, Stop TB Partnership, Geneva, Switzerland

The proposed symposium aims to showcase best practices in integrating tuberculosis (TB) interventions within community-based care delivery, leveraging insights from TB REACH projects. During this session, we will explore operational aspects on how to address access barriers and logistical complexities in diverse settings, including crisis environments and selected key vulnerable populations.
We will emphasize the relevance of disease-specific interventions, encompassing TB prevention, screening, diagnosis, treatment, and community-based monitoring. We will discuss how TB services can be optimized alongside prevalent comorbid conditions including hepatitis C, HIV, diabetes, hypertension and common mental health issues.
Experiences shared will highlight community engagement strategies in designing integrated service delivery models to address social, cultural barriers, discrimination, and stigma. Presentations will feature innovative approaches from Vietnam, Nigeria, Democratic Republic of the Congo, and Pakistan, demonstrating integrated screening, diagnosis, linkage to care, community-based monitoring, and empowering communities for holistic care delivery in challenging contexts

INTEGRATE: Integrating NCDs and TB to Enable Greater Reach of ACF towards TB Elimination in Vietnam

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This presentation will cover the implementation and outcomes of community-based integrated screening events for TB, TB infection, hypertension, diabetes and COPD across seven provinces of Viet Nam. We quantify multimorbidity and share the challenges and lessons learned of health service integration.

Operationalizing a community-driven model to increase access to people-centered care for TB, HIV, and non-communicable diseases (NCDs) in the Democratic Republic of the Congo (DRC).

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DRC ranks among countries with the highest TB and TB/HIV burden globally, with 34% of estimated deaths being attributable to NCDs. Decentralized integrated screening within communities holds promise for reaching people

living with HIV, TB, and/or NCDs, especially in semi-rural areas where healthcare access is hampered by poor infrastructure and limited clinics and clinic-based workforce.
This presentation will highlight aspects of our door-to-door integrated screening model to demonstrate improvements in uptake and acceptability of household screening and follow-up diagnostic and care services, as a part of an optimized community adherence support approach.

Fostering Equitable Care: Community Engagement in Integrated Health Services for TB, Hepatitis C, and Mental Health in Rural Sindh

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Our presentation will highlight community engagement and empowerment in developing and implementing an integrated service delivery model for TB, hepatitis C, and mental health. Over the course of 9 months, we screened over 27,000 individuals in remote, rural communities of Sindh, Pakistan. We will share stories and insights from our Community Action Groups (CAGs), emphasizing their effectiveness in building more equitable outreach and gender-responsive care delivery pathways.
Additionally, we will explore the use of multisectoral partnerships to introduce social protection measures, ensuring sustained support communities affected by TB.

Community-Led Approach: Transforming TB, Leprosy, and NCD Care among Key vulnerable populations in Northeast Nigeria

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In Nigeria, the fight against TB and leprosy in key, vulnerable, and underserved communities call for a comprehensive and community-centric intervention. While progress has been made in integrating TB and HIV care, leprosy services have remained predominantly vertical. Our intervention targeted among nomadic communities, miners and internally displaced people (IDPs) in three states of Northeast Nigeria. Communities were actively engaged in the planning, implementation, monitoring, and evaluation phases to foster local ownership and improve service delivery.
This presentation will share insights from our experience, outlining a holistic approach to address TB, leprosy, and NCDs strategy through an integrated community-led approach.

SP30 Filling the gaps: An update on advancements in maternal TB

Chair: Jyoti Mathad, Weill Cornell Medicine, New York, United States
Chair: Sanjaykumar Tambe, BJ Government Medical College, India

Tuberculosis is a leading cause of maternal mortality worldwide. Historically, progress has been impaired by the near systematic exclusion of pregnant people from TB trials, resulting in knowledge gaps in TB epidemiology, pathogenesis and prevention and management in this high-risk population. But hope is in sight. In this session, speakers will present new insights into maternal TB pathogenesis and outcomes in pregnant people living with and without HIV. The audience will also learn about innovative trials in maternal TB, including qualitative research of pregnant people considering TB trial participation as well as past and present clinical trials that have included or plan to include pregnant people.
The symposium will serve as a platform for researchers, health care professionals, policy makers and advocates to assess the current landscape of maternal TB, identify emerging challenges, and develop strategies to ensure pregnant people benefit equally from advancements in TB management.

Immune profiles of TB during pregnancy

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The highest risk time for women to develop active TB is during and immediately after pregnancy. However, the immunology of why this happens is unknown and hampers attempts to prevent TB in pregnant people and their infants. In this talk, Dr. Barreto-Duarte will discuss recent insights into the immune profile of TB infection and TB disease in pregnancy, including TB progression. She will also present national data from Brazil on outcomes of pregnant people with TB disease.

Maternal-TB infant outcomes from the PARTHISA study

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If left untreated, maternal TB results in poor outcomes for the woman and her baby. However, little is known about TB and pregnancy outcomes when TB is treated in the modern era, especially in people living with HIV.
In this talk, Dr. Alexander will present data from India and South Africa on TB and pregnancy outcomes in people living with and without HIV. She will highlight lessons learned and current research needs.

Clinical Trials Round-up in Maternal TB

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Pregnant and postpartum people have been almost completely excluded from TB clinical trials resulting in little progress for the prevention or treatment of TB during pregnancy and lactation.
In this talk, Dr. LaCourse will review current and planned TB trials that will include pregnant and breastfeeding women. She will also discuss strategies in clinical trial design that can help advance the field of maternal TB.

Measuring TB drug levels in breast milk: results of IMPAACT 2001

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Breastfeeding women with TB infection and disease often want to know if the medications will affect their infant through their milk. Yet, there is a dearth of data about the transmission of TB drugs to infants via breast milk. This is a unique and important consideration when including pregnant and postpartum people in clinical TB trials.
In this talk, Dr. Jayachandran will discuss breast milk assays for TB drugs, highlighting the results of the IMPAACT 2001 breast milk data for 3HP and implications for counseling.

What a girl wants: Evaluating pregnant participant preferences in TB clinical trials

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Pregnant people are often excluded from TB clinical trials because of the perceived potential safety and acceptability concerns among pregnant and breastfeeding ?people and their health care providers. But how often are pregnant and breastfeeding people adequately represented on study teams, scientific review boards, or even community advisory boards? How do we actually know which factors pregnant populations consider when deciding whether or not to participate in a trial?
In this talk, Dr. Hirsch-Moverman will discuss an innovative ?study, Radiant-Moms, which assesses facilitators and barriers to TB clinical trial participation among pregnant people and their health care providers.

SP31 Smoking cessation intervention for TB patients: urgent need on translating research finding into policy action

Chair: Kobto Ghislain Koura, International Union Against Tuberculosis and Lung Disease, PARIS, France
Chair: Wenhong Zhang, Fudan University, Shanghai, China

Smoking is a well-known risk factor for TB infection and progression from latent infection to active TB disease, delays accessing health service, developing drug resistance and having unfavorable treatment outcomes. Currently, more than 20% of global TB incidence may be attributable to smoking.
However, whilst there is ample evidence demonstrating the feasibility and effectiveness of smoking cessation intervention (SCI), it has yet to be meaningfully incorporated into National TB Programs in most high TB burden countries though WHO and the Union jointly called inclusion of SCI in TB programs, prompting the WHO End TB Strategy to call for global action on the co-management of TB and smoking, along with other comorbidities as an integral part of clinical management.
This symposium aims to provide an in-depth understanding of SCI for TB patients, which is vital for redesigning TB services to address patient needs during treatment.

Smoking is independent risk factor for TB recurrence: finding from a longitudinal study in China

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A study was carried out to determine whether smoking status and cessation effort could have impact on TB recurrence after completion of anti-TB treatment. Of 634 successfully treated patients, there were 96 (15.2%) patients with at least one episode of TB recurrence over 7-year follow-up. Factors independently associated with TB recurrence were age 34-73 years ($P<0.01$) and smoking ($P < 0.01$). Patients who continued smoking had a higher TB recurrence rate than those who successfully quit during treatment (log-rank statistic, $p < 0.01$). With increase number of cigarettes smoked daily, TB recurrence risk increased accordingly (log-rank statistic, $p = 0.02$).

Effectiveness of smoking cessation intervention with ABC Approach for tuberculosis patients in the Philippines - a final report

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This pilot study aimed to assess the effectiveness of "ABC approach" as a tobacco-smoking-cessation intervention for TB patients at a primary healthcare level in the Philippines.
2,174 TB patients were enrolled upon TB registration. The smoking rates have been consistently low in the intervention group. The odds ratios of both tobacco-smoking status ($p<0.001$) and domestic secondhand-smoking status ($p<0.01$) in the intervention group were significantly lower than those in the control group. TB treatment success rates were similar between the groups ($p=0.201$).
The ABC approach successfully reduced the tobacco-smoking rates, maintained low domestic secondhand-smoking exposure, and maintained the TB treatment success.

Integration and scale up tobacco cessation within the national and provincial TB programmes in Pakistan

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As part of University of York consortium and multicenter trial Pakistan was part of trial. Pakistan and Bangladesh have conducted two-arm, parallel, double-blind, placebo-controlled, multicenter individually randomized controlled trial (RCT) on TB Patients who smoked on regular basis known as "TB & Tobacco trial" for smoking cessation in 2472 patients with pulmonary TB.
Analyzed data of 2273 (92%) trial participants showed that, 25% (577/2273) of participants stopped smoking. By comparing non-quitters, with those who quit had better TB cure plus treatment completion rates. The indicators relevant to smoking were incorporated in national surveillance tools and scaled up across the country.

Integration of smoking cessation Intervention (SCI) into routine care for TB Patients in West Africa: findings from an intervention in Benin and Burkina-Faso

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There is a positive correlation between tobacco use and TB, but Smoking cessation intervention (SCI) is not a meaningful component of routine care to TB patients in most west African Countries. We have therefore implemented a project of integration of SCI into routine TB service.
This study shows that SCI can be integrated in routine TB care in west African countries; with 75% of smoking cessation over 6 months of TB treatment. Africans NTP should actively include SCI and scale up in the TB clinics for improving TB treatment outcomes. This intervention is well accepted by patient and healthcare workers.

SP32 Social protection to End TB: The role of implementing partners in catalyzing and complementing country efforts for People with TB.

Chair: Beatrice Wangari Kirubi, Stop TB Partnership, Geneva, Sweden
Chair: Delia Boccia, Global Tuberculosis Programme – WHO, Italy

We will never end TB if the most vulnerable in our communities lack food, shelter, and access to medical care. Last year's UN High Level Meeting urged that by 2027 all TB-affected people should have "access to a health and social benefits package so they do not have to endure financial hardship." Yet, resource limitations pose challenges for many countries to achieve this target. Consequently, grassroots social protection interventions conducted by implementing agencies and partners can complement and catalyze National TB Program (NTP) efforts.
This session will spotlight efforts in Uganda, Pakistan, Vietnam and Brazil to showcase how implementers and researchers can support their national social protection agendas through transportation subsidies, food baskets, differentiated care and income generation.
The discussion will focus on how the new WHO/TDR toolkit for social protection implementation research can be adapted to monitor small-scale projects and standardize measurements of future interventions, enhancing comparability.

Improving TB Prevention Treatment (TPT) uptake through Social protection interventions in Uganda

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In Uganda, TB preventive therapy (TPT) is recommended for all household contacts of people with bacteriologically confirmed TB. However, uptake and completion of TPT has been low. Social factors such as lack of transport fares to commute to and from health facilities hinder TPT uptake and completion. These social factors are worsened by the fact that half of these households already face catastrophic costs while accessing TB diagnosis and treatment.
This presentation will describe an intervention that utilized a person-centered model and social protection to improve TPT uptake and adherence among household contacts in twenty-six health facilities in Uganda.

Reducing income loss during drug-resistant TB care: A household-based intervention in Vietnam

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This presentation will investigate efforts to increase household income and address socioeconomic challenges faced by people with drug-resistant tuberculosis (DR-TB) in Ho Chi Minh City, Vietnam. We created a predictive model and risk assessment tool to categorize individuals into three tiers of differentiated social protection: income generation, cash transfers, and social health insurance procurement.
We will share mixed-method results focusing on the intervention's impact on household income and catastrophic costs, along with the perceptions and acceptability of the support packages.
This presentation will provide lessons on addressing the socioeconomic impact of DR-TB and best practices when supporting vulnerable populations.

Saving Lives: Social Protection Initiatives for people affected by Drug-Resistant Tuberculosis

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People with drug-resistant tuberculosis (DR-TB) in Pakistan face many challenges resulting in low treatment success and high lost-to-follow-up rates.
This presentation will describe the implementation of a comprehensive intervention combining social support packages, a home-based care model, and systemic health improvements to tackle transportation costs, food costs and shorten the time to treatment initiation.
We will share the outcomes of the intervention on treatment success and lost-to-follow-up rates among people with DR-TB in the south Punjab region.

A research toolkit to evaluate the impact of social protection schemes for people affected by TB and their family

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As national TB programs begin to implement social protection schemes for TB-affected individuals, there is a need for generating robust evidence on the impact of such schemes and moving forward the social protection agenda. TDR, in collaboration with the WHO Global Tuberculosis Programme and partners at the University of California San Francisco Center for Tuberculosis, led the development of an implementation research toolkit that aims to facilitate the evaluation of the implementation of

social protection programs and their impact for affected individuals and their families. In this presentation, we will present the key elements of this open-access research toolkit

SP33 Cost modelling in childhood TB

Chair: Edina Sinanovic, Health Economics Unit, University of Cape Town, Cape Town, South Africa

Accurate information on the costs of health and program interventions is essential for developing evidence on value for money. However, the complexity and diversity of childhood tuberculosis (TB) presents challenges when modelling costs to inform research and policy.
Building on developments in cost collection and cost inventories, this session will introduce recent approaches to cost estimation and modelling in childhood TB research studies. The session will demonstrate how costs can vary substantially based on disease severity, child age and weight, regimen choice, and context.
The session will address both drug-susceptible and drug-resistant TB across preventive, diagnostic, and treatment interventions. The session will introduce new tools and approaches for rapid and accurate estimation of costs. Discussion will include reflection on differing approaches to costing in childhood TB, and how researchers and analysts can balance accuracy, feasibility, and data availability when developing, using, and interpreting cost parameters.

Costing in the CATALYST and TB CHAMP studies: introduction to a regimen costing tool in childhood TB

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A dynamic, publicly available online costing tool in childhood RR-TB will be introduced, enabling analysts and researchers to quickly and accurately estimate RR-TB medicine regimen costs across weight bands, age ranges, formulation types, and procurement mechanisms, representing different guidance sources including from national TB programmes and the World Health Organization.
Approaches to costing within the CATALYST pharmacokinetics, tolerability, and acceptability study (RR-TB treatment regimen for children in South Africa, India and Philippines), and the TB CHAMP study (levofloxacin preventive treatment for children in South Africa) will be presented.

Leveraging different data sources to estimate the costs of paediatric tuberculosis intervention

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The WHO recommends using decentralised and family-centred, integrated care models for children with signs and symptoms of tuberculosis and/or those exposed to tuberculosis. These innovative models of tuberculosis detection and management in children are urgently required to reduce morbidity and mortality.
However, evidence on their costs and cost-effectiveness is minimal but required to inform policy decisions on their adoption and is a research priority.
We will describe how we leveraged data from pivotal clinical trials (INPUT and CONTACT), implementation studies (TIPPI) and public sources to estimate costs for child tuberculosis interventions across ~10 African countries and at a global level.

Modelling the costs of providing childhood TB services in six high TB incidence countries: Lessons learnt from the TB-Speed Decentralization and TB-Speed SAM studies

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Worldwide, modelling suggests that 96% of deaths are occurring among children not receiving treatment for TB. In sub-Saharan Africa, 27% of TB cases are associated with undernutrition. The TB-Speed project aimed to implement a comprehensive diagnosis package at tertiary level for children with severe acute malnutrition, and at lower levels of healthcare to increase treatment coverage. We conducted cost estimation and modelling at various healthcare levels.
We report on the results and challenges associated with data collection and analysis. We provide insights into how cost estimates vary across healthcare levels, with their implications for conducting economic evaluations and financial planning.

Cost effectiveness analysis of VQUIN trial: Levofloxacin versus placebo for the treatment of latent TB among contacts of patients with MDR-TB in Vietnam

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The VQUIN study was a double-blinded randomised control trial in Vietnam assessing the effectiveness of levofloxacin preventive treatment in adult and child household contacts of people with MDR-TB. We developed a Markov model to assess the cost effectiveness of levofloxacin versus placebo.
The general approach to developing costing parameters for this study will be described. Over a lifetime horizon, levofloxacin preventive treatment in contacts of people with MDR-TB saved 41.0 QALYs and $4490, averted 14.1 MDR-TB cases 26.9 deaths. The ICER was $51.1 per utility averted, indicating increased effectiveness at a modest cost.

Cost analysis in a pragmatic cluster-randomized trial of home-based preventive treatment for TB (CHIP-TB) in Ethiopia

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We estimated patient and health service delivery costs of home-based versus facility-based pediatric (<15years) contact person management (contact tracing, TPT initiation, and follow-up) in Ethiopia. We used a modified societal perspective (health systems and patient costs), nested in a pragmatic cluster-randomized trial in nine home-based and nine facility-based clinics (CHIP-TB). Household out-of-pocket costs and lost income were captured from a subset of 125 participants. Time-and-motion observations captured health system staff effort for TPT provision. We estimated ranges for health service delivery costs using trial expense reports and project staff interviews. We estimated costs per household and per child completing TPT.

SP34 Tuberculosis screening using Computer Aided Detection software enabled digital Chest X-rays: Lessons from field implementation.

Chair: Brenda Mungai, Centre for Health Solutions-Kenya, Nairobi, Kenya
Chair: Zhi Zhen Qin, Stop TB Partnership, Dubai, United Arab Emirates

In 2021, the World Health Organization (WHO) recommended systematic screening for tuberculosis (TB) disease using digital Chest X-ray (CXR) with computer-aided detection (CAD) software. Countries are currently adopting CXR screening in combination with CAD software systems, both for mass community TB screening activities and in healthcare settings to increase case finding and early detection of TB.
This session aims to equip countries in various stages of adopting CAD enabled digital X-rays TB screening with knowledge on what considerations should be in place, from planning to implementation. The session will provide an overview of WHO guidance on TB screening and triaging 2021 guidance and share CAD and digital X-rays available in the market, and insights on what countries should consider when making the selection. Additionally, experience sharing from early implementers will give insights on the road map as well as successes and challenges in the roll out.

Navigating WHO Guidance on TB Screening and Triage

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This talk will describe the WHO guidance for use of CXR and CAD for screening and triage for TB, including what populations are recommended for screening and when CXR with CAD is a recommended screening tool. Guidance on how to calibrate CAD to ensure best performance in all settings will also be provided, as well as a summary of future developments in WHO assessment of CAD for TB.

Strategic selection of digital X-ray and radiation safety considerations for Ultraportable X-ray use

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Access to X-ray is limited in many low- and middle-income countries. There is a wide range of traditional fixed, mobile, portable and ultraportable X-ray and processing systems available. We will provide an overview and key considerations in the appropriate selection of X-ray equipment.
We will also present findings of a radiation safety study measuring scattered and leakage radiation from four UP X-ray devices, with modelled calculations to determine the total radiation in various clinical scenarios to determine the minimum distances required to remain below international dose limits to the public.

Programmatic roll out of portable digital chest X-rays and computer aided detection software for systematic tuberculosis (TB) screening: The Kenya Experience

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Kenya, a high burden TB country was one of the countries in the programmatic roll out of new tools for screening and diagnosis through USAID and STOP TB partnership funding. We will describe step by step programmatic roll out of CAD-DCXR using a health systems approach to conduct systematic TB screening among adults and adolescents at facility and outreach settings in Kenya. We will highlight the lessons learnt to guide scale up in similar settings.

Planning for scale up of computer aided detection software enabled portable digital chest X-rays in Nigeria: Lessons learnt

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Nigeria has implemented the digital CXR with Artificial intelligence for about three years with the roll out of more than 50 machines in the states. The country is in the planning stage of massive scale up of more than 350 machines through Global Fund support in the year 2024-2025.
This presentation will delve into the lessons learnt during initial roll out and the impact of CAD DCXR screening in Nigeria. Also, it will describe the country's preparatory steps towards the massive scale up of this intervention leveraging on the lessons learnt.

CAD calibration for TB detection in active case finding activities in the Philippines – A practical approach

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CAD4TB v7 was implemented with digital chest X-ray for TB active case finding in the Tondo District, a densely populated urban area in Manila, Philippines. A practical method of threshold calibration was used based on a reactive adjustment approach. This approach involves selecting an initial threshold to match CAD performance to local radiologists' sensitivity for TB screening with consideration of the confirmatory testing capacity, and subsequently adjusting the threshold based on periodic evaluation of data (e.g. screening and test positivity).
We will describe our methodology and rationale, and adaptive method of adjusting the threshold, highlighting the successes and challenges.

SP35 Assessing the epidemiological impact of strategies to address social and structural determinants: the underutilised role of modelling

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

We will not end TB without addressing social and structural determinants that increase the risk of disease and limit access to care. Recent studies have investigated strategies to reduce burden from these determinants; however these studies are not able to inform long-term impacts on measures such as incidence and mortality. Modelling is a tool that has been used in many other areas to build evidence of impact and to inform implementation decisions from trial design through to policy, but its use with social and structural determinants has been limited.
This symposium will explore new ways in which determinants are being investigated using transmission models. We will discuss undernutrition and nutrition support, gender differences in TB and increasing mens' access to care, the inverse associations of increased diabetes prevalence and increased mean BMI on TB, mass incarceration policies driving community TB, and social and behavioural risk reduction strategies in Inuit communities.

The potential impacts of scaling up the RATIONS trial in South-East Asia

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Undernutrition is one of the key risk factors amongst countries in the WHO South-East Asian (SEA) Region. The recent RATIONS trial highlighted the substantial impact of providing nutritional support to household contacts of TB patients. Focusing on the SEA Region, we present modelled estimates of the reductions in country-level TB incidence and mortality, if such interventions are taken to scale.
We also show the potential impact of expanding nutritional support beyond household contacts, to reach those with undernutrition in the general population. These interventions yield broad health benefits beyond TB, underscoring their vital role in public health initiatives.

Modelling the impact of strategies to increase men's access to care

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Globally, men have a higher burden of tuberculosis disease than women, and this can be attributed to a large number of factors that vary across countries. However, a common theme is a lower rate of access to healthcare when compared to women.
This presentation will discuss the potential impact that strategies aiming to increase access to healthcare for men can have on incidence and mortality across the whole population. We will consider case studies of four distinct countries in Africa: Kenya, Malawi, Nigeria, and Uganda.

Modeling the impact of increased diabetes prevalence and mean BMI on tuberculosis control in high burden countries

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Evidence from prospective cohort studies suggests an inverse association between body mass index (BMI) and risk of tuberculosis. Diabetes on the other hand has long been shown to be associated with increased risk of tuberculosis. It is unclear how the current global nutrition transition (resulting in increased mean BMI and diabetes prevalence) would impact global tuberculosis control.
I will present findings from an ongoing modeling study which incorporates evidence from recent epidemiological studies on the joint impact of BMI and diabetes on tuberculosis, as well as ecological observation on the trends of BMI and diabetes at the country level.

Modelling social and behavioural risk reduction strategies in communities at risk: Findings and key challenges

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In Canada, there exist major health disparities between some Inuit communities and other populations involving TB and also key determinants and risk factors such as income, housing and tobacco use. This presentation will describe potential interventions addressing several upstream determinants and risk factors; the interventions were informed by persons from Inuit communities and local health programs. It will summarize their potential impact and cost-effectiveness, based on transmission and decision analysis models.
Finally, it will emphasize key challenges and points to consider when undertaking and interpreting modelling work in this context.

The role of incarceration as a driver of the tuberculosis epidemic in Latin America

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In Latin America, where the prison population has quadrupled over the last few decades, the risk of TB in prisons is 26 times higher in prisons than in the general population. However, the full impact of mass incarceration policies on the TB epidemic, accounting for effects beyond prison walls, is unknown.
Here, we present recent work utilizing modeling to quantify the true role of incarceration as a leading TB driver in the region. We also highlight key considerations, challenges, and opportunities for modeling incarceration and interventions targeting this vulnerable population.

SP36 Biomarker studies in the TRUNCATE-TB trial: identifying people who can stop treatment after 8 weeks with low risk of relapse

Chair: Nicholas Paton, National University of Singapore, Singapore, Singapore
Chair: Erlina Burhan, Department of Pulmonology and Respiratory Medicine, Faculty of Medicine Universitas Indonesia - Persahabatan Hospital, Jakarta, Indonesia

TRUNCATE-TB is a randomised controlled trial conducted at 18 sites in 5 countries (Indonesia, Philippines, Thailand, India and Uganda), coordinated from Singapore. The trial investigated a treatment strategy using an initial 8-week treatment course (4 novel regimens, based on modified standard treatment with additional sterilising drugs; including bedaquiline, linezolid, clofazimine), extended to 10 or 12 weeks for persistent clinical disease, followed by cessation and close monitoring and early re-treatment of any people that relapse.
The trial provides an unprecedented opportunity to discover and validate biomarkers that predict relapse-free cure with 8-weeks treatment; and a series of biomarker studies were nested within the trial protocol to do this.
In this session, we will present new data from these biomarker studies that provide evidence for the ability to identify people who can be cured with 8-week regimens; and new evidence on the value of integrated biomarker studies to compare novel treatment regimens.

Bacterial biomarkers

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This presentation will describe findings from nested sub-studies of bacterial strain type (by whole-genome sequencing), sub-threshold variation in bacterial drug-susceptibility (by plate MIC testing) and measures of bacterial burden, to assess impact on treatment outcome in TRUNCATE-TB.

RNA transcriptome biomarkers

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This presentation will describe discovery and validation studies of blood RNA biomarkers of treatment response and relapse-free cure in TRUNCATE-TB.

Proteome biomarkers

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This presentation will describe discovery and validation studies of proteome biomarkers of treatment response and relapse-free cure in TRUNCATE-TB.

Chest X-ray biomarkers

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This presentation will examine how artificial-intelligence interpretation of chest X-rays can contribute to standardisation of radiological outcome parameters in clinical trials; and the potential for using such measures to assess treatment responses and predict outcomes after an 8-week treatment course in TRUNCATE-TB.

SP37 Mtb infection – what we know, what we don't know and what should we know?

Chair: Rein Houben, London School of Hygiene and Tropical Medicine, London, United Kingdom
Chair: Hanif Esmail, University College London, London, United Kingdom

The concept of M.tuberculosis (Mtb) infection has been around for over 100 years but is still inferred from evidence of immune sensitization to Mtb. Our ability to identify or quantify viable Mtb in the body in the absence of disease remains therefore severely limited, with new experimental insights making the concept more, not less, confusing.
In this symposium we will reflect on what we know Mtb infection is, and what it is not, and how recent insights change our estimated burden of individuals harbouring viable Mtb. We will also present empirical data that challenge our current beliefs around Mtb infection, from post-mortem examinations to recent clinical studies. Finally we will reflect on why this matters for current TB care and elimination policies, and what science is needed to enable scientific progress in this critical but complicated area of TB.

Mtb infection: What we know, what we don't know and what should we know?

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The term Mtb infection is commonly understood to mean that an individual has Mtb in the body but no disease and hence may benefit from preventive therapy. However, current diagnostic tests for this state, TST and IGRA, detect evidence of immune sensitization to Mtb and not the presence of the organism itself. These tests remain positive after treatment of infection and hence are an inaccurate surrogate marker of viable Mtb. However developing a test for viable Mtb infection is a challenge.
This talk will introduce the symposium and highlight some of the possible approaches to address this important knowledge gap.

How much Mtb infection do we think is there - updates from a global estimation project

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It has been estimated that one-quarter of the global population is infected with Mycobacterium tuberculosis (Mtb), a figure that assumed both unchanging tuberculous immunoreactivity and persistent infection—assumptions that are now under scrutiny.

This presentation will introduce a refinement of the previous estimate, using a mathematical model of Mtb infection that operates based on national annual risk of infection trends, accounting for immunoreactivity reversion, age-specific mixing, and self-clearance of infection. This approach provides an estimate of the global population with a recent or distal viable Mtb infection, and thus, a more accurate estimate of the population at risk of TB disease.

What can we learn from the dead?

V Rozot,[1] [1]South African Tuberculosis Vaccine Initiative, Cape Town, South Africa.
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This presentation will highlight the shortfalls current immunology based immune-sensitization tools available to detect Mtb infection might present. Forensic autopsy studies allow access to human organs and tissues in a representative snapshot of the population who died of unnatural causes.
Findings, so far, depict a vastly different picture than previously assumed: informed by the combination of pathological examination, detection of Mtb in tissues using various methods, as well as the assessment of Mtb-specific immune sensitization, we are now able to to capture the highly granular definition of the TB spectrum from infection to disease.

Why do we care - potential and problems of current 'measures' of Mtb infection in policy

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This presentation discusses the complexities of identifying and treating individuals with TB infection. Current diagnostic tools are constrained, hindering the efficient targeting of TPT to individuals at high risk of developing active TB disease.
Insights from the ACT5 trial, combining TB case finding and LTBI screening on a large scale, revealed that the need for TPT, given current diagnostic capacities, becomes significant and potentially overwhelming National TB Programs. Barriers to TPT uptake and completion complicate the implementation further. However the actual number benefiting may be lower. Addressing these challenges demands improved understanding and testing for optimal identification of TB infection.

What do we need to do - what is the experiment we need to develop a gold standard test run?

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Emerging tools with enhanced sensitivity over current tests have the potential to diagnose viable *Mtb* presence. Yet many show discordance with current gold standard tests of *Mtb* infection (immune-sensitisation) and viable *Mtb* (culture). So, how do we validate tools to detect infection and disease states that our current gold standards fail to detect?
This presentation will discuss emerging new tools and propose study designs needed to validate these tests, with a particular focus on the states of *Mtb* infection and non-infectious subclinical TB, for which tests of viable *Mtb* are currently absent but critical for accurate diagnosis and treatment monitoring.

ABSTRACT PRESENTATIONS WEDNESDAY 13 NOVEMBER 2024

ORAL ABSTRACT SESSION (OA)

OA01 TB prevention and care capacity building

OA01-100-13 Strengthening capacity for TB Services: Institutionalising an education and training unit at the National Tuberculosis Control Program in Bangladesh

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Background and challenges to implementation: The Bangladesh NTP is responsible for training health cadres that support TB services across all service delivery levels. However, capacity building initiatives have been hindered by a lack of standardized training curriculums and processes to facilitate and evaluate trainings. Training commonly required participant travel to Dhaka, and the NTP lacked systems to track trainees and coordinate trainings across geographic areas.
These challenges decreased consistency and quality of trainings while resulting in training duplication and high costs.
Intervention or response: In 2021, the NTP formed an ETU to coordinate and harmonize training activities, facilitate the development of training modules in alignment with the latest clinical/professional guidelines, and conduct annual reviews of training activities undertaken by NTP and its partners. The ETU meets quarterly to analyze what is needed to make training processes results-based.
An advisory group called the TB Training Working Group was formed to build the ETU's capacity to plan, design, implement and coordinate nationwide TB training to avoid duplication and improve training standards.
Results/Impact: Since its formation, ETU has developed a Training Management Information System (TrMIS) to track training participation, distribute training resources and map geographical training coverage to inform evidence-based policy decisions. The TrMIS data helped to reduce 15% cost by avoiding duplication and all trainings are allocated based on mapping analysis.
The ETU also developed a resource pool of trainers to support training, on the job consultations and mentorship for TB professionals, field workers and caregivers.
Conclusions: Establishment of an education and training unit enables NTP to effectively coordinate national TB training and equip TB care professionals with practical tools and skill sets to provide high-quality care. The TrMIS provides real-time data for decision-making, identifying training needs and prioritizing capacity building initiatives.

OA01-101-13 Building capacity of community health officers (CHOs) through an innovative digital learning pedagogy for achieving a "TB-free India"

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Background and challenges to implementation: Tuberculosis remains a significant communicable ailment, despite being treatable, accounts for around 2 billion cases, contributing to almost 1/6th of global disease burden. India contributes largest number of TB mortality, amounts to 10.6 million/year. Despite Government's effort to make 'India TB free by 2025' there have been challenges such as inadequate primary healthcare services, insufficient resources, shortage of trained personnel, inadequate screening and reporting, and rise in drug-resistant strains.
In 2019, the government launched, new cadre of healthcare professionals called Community Health Officers for providing expanded range of services for various national health programs, including National TB Elimination Program at Health and Wellness Centres, the initial point of contact for public.
However, they lack appropriate skills to deliver efficient services due to lack of standardized practical-oriented training.
Intervention or response: A one-year online training program was created specifically for CHOs in state of Odisha, India. Training curriculum was introduced through learning management system, incorporating live lectures, skill demonstration videos developed from Objective Structured Clinical Examination checklists, discussion forum, and peer-to-peer evaluation of video assignments. These assignments involved, producing skill videos on diagnostic tests, conducting counselling, and raising awareness about prevention strategies.
Results/Impact: The program enrolled 398 CHOs. 88% (n=352) completed pre-test, 70% (n= 279) successfully submitted 60 skill videos covering diagnostic tests for TB, patient counselling, and disease prevention within 10 months. Feedback was gathered on parameters including communication, clarity, and content with 90% (n=359) rating them excellently.
Continuous monitoring of 398 CHOs are ensured through physical assessments by Medical Officers. Concurrent evaluation in pilot phase examines program impact on

engagement, efficacy, feasibility, facility readiness, beneficiary satisfaction, knowledge, skills, and stakeholder perceptions.
Conclusions: This innovative digital learning pedagogy for frontline healthcare worker presents, cost-effective solution for capacity building of CHOs toward achieving TB free India and its potential replication in other national health programs.

OA01-102-13 From TB to beyond: Envisioning disease-specific databases modeled after TB portals

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Background and challenges to implementation: There has been an increase in deaths and disability due to respiratory diseases (RD) over the past three decades, and recently RD comprised three of the top 10 causes of death. To address this challenge, a new generation of IT systems, taking advantage of modern technologies and AI, should help in data analysis, training of doctors, and aiding the researchers. In our presentation, we highlight most important TB Portals features, that make it a useful prototype for other disease-specific databases.
Intervention or response: All TB Portals components work with data submitted and curated by doctors and researchers from 19 countries. In addition to original clinical and microbiological data, we add AI annotation of clinical images, and pathogen genomic data. As a result, TB Portals ecosystem allows for holistic, patient-centric view of tuberculosis. TB Portals works with countries with heaviest burden of drug-resistant tuberculosis, helping with genomic research and analysis, and making their clinical and radiological data freely accessible. The structure and operations of TB Portals program and resources are streamlined to optimize the data input, analysis and modeling, and democratizing access to information.

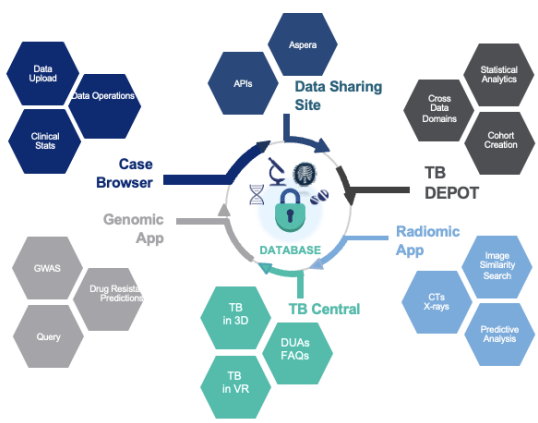

Figure. TB portals data flow, analysis, presentation, apps.

Results/Impact: TB Portals features:
1. User-Friendly Interface: Its intuitive design enables researchers, clinicians, and even patients to navigate the platform efficiently, making complex datasets approachable and facilitating the dissemination of information.
2. Advanced Querying Capabilities: TB Portals offers sophisticated querying features that enable users to filter and extract specific data subsets based on their research questions or clinical needs.
3. AI and Machine Learning Integration: The database's incorporation of clinical images annotations by AI helps to enhance disease diagnosis and progression.
4. Ethical and Secure Data Handling: TB Portals was built to protect sensitive patient information while facilitating research.
Conclusions: TB Portals invites collaborations with TB and other RD specialists, interested in building IT systems for current and future health care challenges.

OA01-103-13 From knowledge nodes to cadre-specific courses: A system approach to TB training content development

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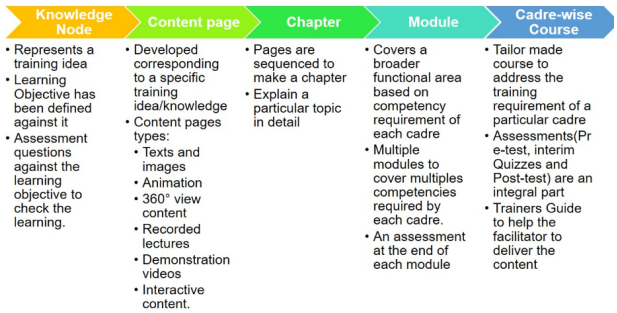
Background and challenges to implementation: The TB control program is evolving, demanding continuous training for its diverse workforce. Preparing robust training content in alignment with the rapid pace of program evolution, while addressing the needs of a diverse workforce, with varying education levels, language proficiency and desired competency is a significant challenge. One that traditional training content and development methods are not designed to address.
Intervention or response:
A 3 layer content creation and maintenance system was designed. First, the training needs of all program staff are identified and listed as knowledge nodes with specified Learning Objectives(LO).
The second layer, content Pages are built against these LOs, each lasting about 3 minutes, accumulating into a Page library.
In the third layer, depending on the training needs of a cadre, pages from the library are selected and organized into chapters, modules and cadre specific Courses.
The Course meets all training requirements of a specific cadre. This allows Nodes/ LOs, Training Content and cadre wise courses to exist independently, and update/ upgrade of content pages easily transmit to the course level live. Based on the LOs, questions are also built, enabling assessment. Three key roles, the maintainer, reviewer and content creator work with each other to ensure quality of content.



Results/Impact: Over 2000 knowledge nodes have been identified and content pages consisting of text/images, animations, demonstration videos, 360o view and interactions have been developed, and updated based on need. These translate to about 100 hours of content in 6 languages. Twelve cadre-specific courses have been built using them and is being utilized to train the extensive TB workforce across India.

Conclusions: The three layered content development and maintenance system addressed the challenges of evolving training content and diverse training needs of the program. The approach is easily replicable to any other training programs.

OA01-104-13 Competitive targeted patent medical vendors (PMV) training can enhance TB case finding: The Benue experience

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Background and challenges to implementation: Public-private mix (PPM) is a widely recognized strategy to improve tuberculosis (TB) prevention and care. The private health sector contributes as high as 70% to the health care delivery system in Nigeria. In Nigeria, 66% - 92% of all cases of respiratory diseases including those with symptoms suggestive of tuberculosis utilize the Patent medicine vendors as the first point of contact in the communities due to provision of easily accessible and affordable care.

Intervention or response: KNCV have collaborated with 150 PMVs across 9 LGAs in Benue state but yield from them remained poor. To improve the TB case finding strategies, the engaged PMVs were retrained and equipped to carry out TB case finding activities in their immediate vicinity, they were also supported with onsite mentorship and skills for community outreaches, we ensured prompt payment of incentives and equally paid a capped sum for those who could not find TB cases as motivation.

Results/Impact: Comparative 4 months data from previous year was extracted to compare with similar period for the year, this result showed better cascade performance in the later and TB yield 5 times higher compared to pre-intervention period. The retrained PMVs expresses gladness as they feel they are now impacting the communities better with their improved skills, this has also translated to more patronage for their services generally.

Period	Screened	Presumptive TB	TB cases diagnosed
Nov-22	7504	340	14
Dec-22	6995	273	19
Jan-23	6963	359	20
Feb-23	7314	405	21
Total	**28776**	**1377**	**74**
Nov-23	11886	1391	96
Dec-23	10238	1333	77
Jan-24	11335	1415	95
Feb-24	10627	1430	98
Total	**44086**	**5569**	**366**
Cumulative			
Nov 22-Feb 23	**28776**	**1377**	**74**
Nov 23-Feb 24	**44086**	**5569**	**366**

Table 1. Before and after intervention

Conclusions: Ensuring close look at all the intervention is important if we must close the gap of missing TB cases. Retraining 50 selected PMVs has changed the narrative about poor PMV cascade performance under the LON project in Benue state, it will be worth it to retrain the remaining 100 PMVs if resources are available. Other implementers who are not performing well can try this approach to see if it works for them.

OA01-105-13 Meaningful engagement of TB survivors within the TB programme: An innovative initiative in Mumbai, India

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Background and challenges to implementation: The involvement of "Peer" Counsellors has proven effective in the HIV/AIDS interventions. This engagement paves the way for a "meaningful engagement" of TB Survivors within the TB Programme. TB Survivors can be a role model for treatment adherence given their own journey of becoming TB free. Unlike the HIV/AIDS experience, the TB survivors are not "Living with TB". While most of the TB Survivors are interested in supporting Persons with TB (PwTB) and feel rewarded by undertaking this activity, the efforts are not sustained and the involvement is sporadic.

Intervention or response: Saksham (means capable) is a project of the Tata Institute of Social Sciences. In collaboration with the National TB Programme and the Mum-

bai District TB Control Society, Saksham undertook an initiative to meaningfully engage TB survivors. The TB Survivor were selected through a participatory exercise and were provided training for the required skills for telephone counselling. Moving from the TB tag, The TB Survivors chose to be identified as "Saksham Saathi" (Capable Friend) and were provided with ongoing mentoring and handholding. More importantly they were provided with a modest honorarium for their time.

Results/Impact: Between Feb 2020- Dec. 2023, Saksham Saathi have retrieved 59% of PWTB who interrupted the treatment (1-29 days of interruption) and 54% of the PwTB who were lost to follow up (>30 days of interruption). Furthermore, Saathis have also provided post treatment follow up to >38,000 DS TB patients thus ensuring the relapse signs are identified at the earliest.

Sr. No.	Indicators	Achievement
1.	**Total No. of PwTB who interrupted on the treatment and information received by Saksham Saathi**	**341**
2.	Out of 1, No. of treatment interrupting PwTB were called	341
3.	Out of 2, No. of PwTB responded to the call	225 (66%)
4.	Out of 3, no. of PwTB retrieved on treatment through peer counselling	133 (59%)
5.	Total telephonic counselling sessions by Saathi for treatment interruption	531
6.	**Total No. of Lost to Follow-up (LFU) PwTB information received by Saathi**	**862**
7.	Out of 6, No. of LFU PwTB called by Saksham Saathi	862
8.	Out of 7, No. of PwTB responded to the call	390 (45%)
9.	Out of 8, no. of PwTB retrieved on treatment through peer counselling	211 (54%)
10.	Total telephonic counselling sessions by Saathi for LFU retrieval	1152

Conclusions: TB Survivors can be a resource for encouraging PwTB to continue on treatment and need to be meaningfully engaged within the TB programme with continued training, handholding and some form of compensation.

This intervention was piloted in 9 regions of Mumbai and owing to the demonstrated benefits this model was integrated within the Mumbai TB programme from November 2021.

OA01-106-13 Enhancing directly observed treatment short-course (DOTs) initiatives via a robust monitoring and evaluation framework: Lessons from Plateau State TB Program

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge globally, particularly in low- and middle-income countries. DOTs is a widely recommended strategy by the WHO for TB control. DOTs ensure that patients receive their medication under direct observation to improve treatment adherence and reduce the risk of drug resistance (NTP, 2019).

Plateau State, Nigeria, has implemented DOTs initiatives to combat TB. However, the effectiveness of these initiatives depends on the presence of a robust monitoring and evaluation (M&E) framework. A well-designed M&E system allows for the systematic collection, analysis, and utilization of data to track progress, build capacity, identify challenges, and make informed decisions for program improvement. KNCV Nigeria started implementing the TB LON 1&2 project in the state in the third quarter of 2020.

Intervention or response: In 2020, the State TB program had 206 active DOTs sites with 7% TB yield, 85% enrolment rate and a treatment success rate (TSR) of 60%, a deep dive analysis of the state performance was done and identified gaps included poor capacity building and lack of well-trained DOTs staff.

The KNCV team, developed a robust M&E framework, which involves implementing standardized data collection tools and protocols, training healthcare workers in M&E techniques, engaging communities in TB control efforts, adopting technology solutions for data management, and conducting regular supervision visits to DOTs centers to ensure adherence to treatment protocols and patient-centered care principles.

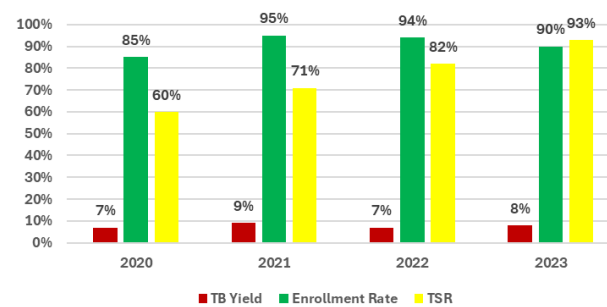

Figure 1. Cascade analysis of plateau performance from 2020 to 2023.

Results/Impact: Between the third quarter of 2020 to 2023, more DOTs sites were activated and both new and old sites were trained, giving a total of 506 active sites in the state, TB case findings improved as seen in figure 1.
Conclusions: By leveraging evidence-based approaches and strengthening health systems, Plateau State has made significant strides in reducing the burden of TB and improving treatment outcomes, providing valuable lessons for other regions grappling with similar challenges.

OA01-107-13 Assessment of facility-based mentorship by professional nurse mentors to determine clinical proficiencies of healthcare workers in KwaZulu-Natal, South Africa

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Background and challenges to implementation: Quality of care at healthcare facilities can be strengthened through capacity building of the health workforce. Department of Health (DoH) clinical teams were trained across five districts in KwaZulu-Natal province through the USAID TB LON-SAFT programme (2019- 2023). Face-to-face and hybrid trainings on TB- related activities evolved into facility-based mentorship in 2022, with clinical teams mentored by professional nurse mentors (PNMs).
Evaluation of skills transferred during centralised training sessions can be assessed through on-site mentorship and is integral to identification of further training needs.
Intervention or response: Programme PNMs designed an electronic competency assessment tool to record TB-related activities; including completion of the integrated TB-COVID-19 and TB identification registers, TB specimen collection and utilisation of lateral flow urine lipoarabinomannan (LF- LAM) assays.
Each step in an activity was evaluated per staff member with a competency "score" above 80% indicating full proficiency of the activity and below 80, requiring additional training and mentorship.

Activity	Number assessed as competent	Total assessed	Level of competency
Hand hygiene practice	30	39	77%
Infection control practice/ safety measures	36	48	75%
Completion of TB identification registers	33	45	73%
Review of quality of sputum sample	28	43	65%
Instructions to patients for sputum sample collection	27	40	68%
Instructions to patients for urine sample collection	31	42	74%
Completion of laboratory form	20	32	63%
Use of LF-LAM assay	24	42	57%

Table 1: Activities in which staff were not deemed proficient.

Results/Impact: In total, 70 DOH staff across 4 districts were assessed on various individual activities; 71% were nurses and 60% were clinic- based. Direct observation of an activity was the commonest method of evaluation. Proficiency was observed in completion of TB/ COVID-19 screening tools and documentation of TB treatment outcomes. Table 1 reflects activities DoH staff members were not deemed proficient in.
Conclusions: Facility- based mentorship of skills shared during centralised training is critical to assess clinical practice proficiencies. Additional mentorship can then be directed to address identified gaps. In doing so, poorly performing TB programme indicators linked to certain proficiencies might improve; for example, by addressing the poor proficiencies in LF-LAM assay use, the current under-utilisation of the assay might change.

OA02 Digital technologies for TB treatment adherence

OA02-108-13 Impact of SMS reminders on TB medication adherence: An analysis of adherence levels of people with TB pre and post 99DOTS Pilot Implementation in Nigeria

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Background: Poor medication adherence may increase rates of loss to follow-up, disease relapse and drug resistance for individuals with active tuberculosis (TB). Digital adherence technologies (DATs) have emerged as an alternative to Directly Observed Treatment Shortcourse (DOTS) for supervision of tuberculosis (TB) treatment. DATs models such as 99DOTs provides SMS reminders to patients which can improve adherence support and empower TB patients to self-manage their own treatment. This study aims to evaluate the impact of SMS reminders on medication adherence using the 99DOTS pilot by KNCV Nigeria as a case study.
Design/Methods: We sampled TB patients enrolled between October 2020 – September 2021 before 99DOTs implementation and October 2021 – September 2022 during the implementation of 99DOTs across 98 health facilities that implemented the DATs pilot project in 8 states of Nigeria. 99DOTs patients were provided medication labels affixed on the blister pack of their TB medication with a hidden unique code per label. They were required to log-in their medication intake daily by texting the code to the country short-code 3340 daily for free. TB patients who did not log-in their codes were sent reminder SMS by 6pm to take their medication. 206 patients each were sampled from before and during the implementation of 99DOTs to evaluate their treatment adherence.

Results: For the non-DATs patients before 99DOTs, 53.4%(110) had completely adhered to TB medication with no missed doses documented on their treatment cards while 46.6% (96) did not completely adhere to their medication. For the DATs patients during 99DOTs, 86.5% (199) completely adhered to medication with no missed doses recorded on the adherence platform while 13.5%(31) did not completely adhere to medication
Conclusions: Our findings suggest that SMS reminders can improve the level of medication adherence by TB patients which may in turn result in better treatment outcomes.

OA02-109-13 Exploring engagement and adherence to the TB Treatment Support Tools intervention to support individuals with active TB

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Background: Digital health technology success relies on user engagement, often measured by frequency of use. The TB Treatment Support Tools (TB-TST) is a DAT combining an interactive progressive web app connecting patients to treatment supporters and an objective adherence drug metabolite test.
This study evaluates user engagement with the app in a pragmatic randomized controlled trial, examine characteristics associated with adherence and treatment outcome.
Design/Methods: Engagement was captured in a real-time log of interactions by app users (n=277). Adherence was assessed via daily report of self-administrated medication and weekly submission of photo of a drug metabolite test to confirm adherence. Participants could report medication side effects, request assistance, or directly message treatment supporters.
Survival analysis identifed characteristics associated with the risk of non-adherence (not reporting for 28 consecutive days) and logistic regression models examined associations between adherence on treatment outcome.
Results: Participants sent a total of 24,902 daily reports, 2,926 messages, 2,465 photo submissions, 1235 reports of side effects, and 128 requests for help. When assessing adherence to the intervention, 78% were adherent at 60 days and 50% were adherent at 180 days. Males, poverty, hospital of care, and lack of stable employment had higher risk of nonadherence.
Logistic regression results showed that those nonadherent to the intervention had lower odds of success (OR 0.48 [0.22 - 1.03]) and receiving treatment at one of the hospitals (OR 2.34 [1.12 - 4.92]) showed a higher odds of success.
Conclusions: This study offers an understanding of the impact of engagement with the app features on treatment outcomes. Although total app usage decreased over time, participants who adhered had higher rates of success. Further research is needed to explore factors of app engagement for future refinement.

OA02-110-13 Findings from a pragmatic multisite randomised controlled trial of the Tuberculosis Treatment Support Tools in public health hospitals in Argentina

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Background: The impact of digital adherence technologies on tuberculosis (TB) treatment outcomes remains poorly understood. We evaluated whether the TB Treatment Support Tools (TB-TST), combining an interactive web app with treatment supporters and an adherence drug metabolite test, can improve treatment outcomes in patients under self-administered treatment.
Design/Methods: Pragmatic randomized controlled trial in four public reference hospitals in Argentina. Participants newly diagnosed with drug-susceptible TB aged 16 and older were randomized 1:1 to standard of care (SC) or SC plus intervention (TB-TST). Participants in the TB Companion app were instructed to report their medication intake daily using the app, upload a photo of a drug metabolite urine random test run weekly to confirm adherence and exchange messages with a treatment supporter for assistance. The primary outcome was treatment success (completion or cure). We used intention-to-treat (ITT), exit surveys and interviews.
Results: We enrolled 555 individuals, 51% female, mean age 33+/-13, 95% completed primary school or higher, 51% employed, and 63% reported a household income at or below poverty line. 30 patients were deviated from protocol and 17 patients never started the intervention. Treatment success was 81.6% vs 74.4%, and default was 17.2% vs 24.4%, both p=0.04 for intervention and control respectively. In an exit survey, 80 participants described the companion app as very helpful, practical, and efficient and would highly recommend it to others. Results differed among the 4 hospitals.
Conclusions: TB-TST intervention improved treatment outcomes in the study population. It is important to explore how COVID-19 pandemic, site differences, and app

engagement impacted implementation, but the findings suggest a need to explore further implementation of this intervention to support patients on self-administered treatment as a feasible alternative to directly observed therapy for a substantial proportion of patients with TB.

OA02-111-13 Enhancing TB care in Nigeria: The Impact of digital platforms on information accessibility and peer group support for persons on treatment

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in Nigeria, posing severe burden to persons on treatment.

This burden is further exacerbated by barriers in accessing on-demand medical advice, vital information about TB, patients' right and access to peer group support, necessary to improve care of persons on treatment.

Intervention or response: The "OneImpact Nigeria" mobile application was developed in response to these obstacles, aiming to facilitate access to essential TB-related resources and support networks for persons on treatment, thereby providing comprehensive TB care and support.

Persons on treatment are expected to download and install the mobile application on their mobile device.

Results/Impact: A structured survey assessed the app's impact among 96 persons on treatment [67.7% male (n=65); 32.2% female (n=31)] who have been using the mobile app for over four weeks.

The survey measured variables such as information access, peer support, stigma perception, awareness on rights of persons on treatment, DOTS facility locations, and overall service satisfaction. Respondents rated their experiences to gauge the app's effectiveness in addressing TB care challenges.

Analysis of survey responses showed that more than 96% of participants reported positive experiences across all measured parameters.

Specifically, 95.8% (n=92) rated access to TB information and advice from medical experts high. 94.7% (n=91) gave a high rating to access to peer support network, 98.9% (n=95) rated access to information on right of persons on treatment high, 97.9% (n=94) benefited from the DOTS locator service.

Satisfaction with the services provided by the app was high, with 96.8% (n=93) expressing approval.

Key Parameters	Percentage of Positive Ratings from Respondents
Access to information on TB from medical experts	95.8% (n=92)
Peer support (connection to other persons on treatment)	94.7% (n=91)
Information on rights of persons on treatment and the obligation of state and non-state actors	98.9% (n=95)
Reporting of barriers to accessing treatment (eg. stigma)	93.7% (n=90)
TB service (DOTS) locator to access nearby DOTS centres	97.9% (n=94)
Satisfaction with service	96.8% (n=93)

Conclusions: The "OneImpact Nigeria" app significantly contributed to improving TB care by ensuring access to critical information, support networks and services, evidenced by the high positive ratings from users. These findings advocate for the app's broader promotion among persons on treatment and integration into the National TB program effort.

OA02-112-13 Automated adherence system integrated with public health action improves TB treatment adherence (98%): Scope for usage in TB-DM

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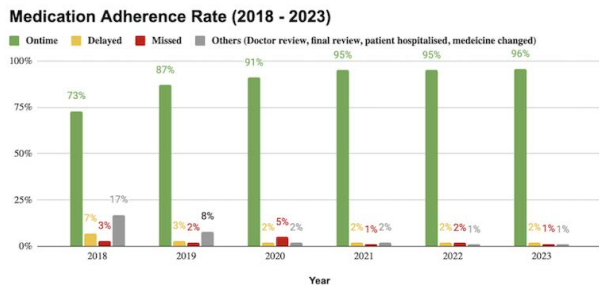
Background and challenges to implementation: In 2020, the TB treatment success rate was 86%, rising to 88% in 2021 (Global TB Report 2023). Support for Treatment Adherence Medication Protocol (STAMP) is a digital system for improving medication adherence and improving treatment outcomes. STAMP helps to address the challenge of non-adherence in TB medication regimens through automated reminders to PwTB and escalated alerts to caregivers and healthcare workers if medication is missed.

Intervention or response: The study, conducted at a partner organization in southern India, focused on PwTB enrolled in the national TB program to measure STAMP's impact on medication adherence rates. The device aided in medication dispensing provided personalized reminders, and enabled real-time monitoring by HCWs. Data collection involved adherence tracking through STAMP and statistical analysis of adherence rates.

Results/Impact: The analysis revealed a significant improvement in medication adherence rates among PwTB after the implementation of STAMP. There was a noticeable reduction in missed medication doses, leading to improved treatment outcomes. The study observed a statistically significant increase in on-time medication adherence among PwTB, rising from 73% to 96%. Furthermore, delayed adherence decreased from 7% to 2%,

(p-value is .04), and missed medication reduced from 3% to 1% between 2018 and 2023. The "Others" category encompasses activities like doctor review, final review, patient hospitalization, medication adjustments, or network and system issues due to which PwTB was unable to take their regular medications.



Conclusions: The implementation of STAMP led to significant improvements in medication adherence among PwTB. Additionally, there was a reduction in HCW workload, indicating enhanced efficiency and improved patient care due to automation in adherence monitoring and patient communication.

These findings highlight the effectiveness of STAMP in improving medication adherence among PwTB, showcasing the potential benefits of innovative interventions like STAMP in healthcare management. The integration of STAMP with health programs can help address non-adherence challenges and improve outcomes.

OA02-113-13 Intervention fidelity of digital adherence technologies for TB treatment support: A mixed methods process evaluation of pragmatic cluster randomised trials in five countries

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Background: Digital adherence technologies (DATs) have the potential to enhance the person-centredness of TB treatment. While results are mixed on their effectiveness in improving treatment outcomes, DATs are highly acceptable.

Our objective was to understand the fidelity of the interventions within five cluster-randomized trials.

Design/Methods: The trials assessed two DATs (pillbox, medication labels), with real-time adherence data accessed by healthcare providers (HCPs) from a digital platform, in Ethiopia, the Philippines, South Africa, Tanzania, and Ukraine. A framework was devised based on four components: inputs, processes, outputs, and outcomes. Quantitative indicators were developed to evaluate fidelity of intervention components and analysed by country and DAT type. Content analysis of qualitative sub studies supplemented some indicators.

Results: Phone ownership was high, though varied by country; South Africa at >90% versus the Philippines at 63%. There was variation in method and frequency of HCPs accessing the adherence platform; >50% of logins were from mobile phones in Ukraine and Philippines.

In Ethiopia, Tanzania, and Ukraine there was ≥ one login to the platform on 71% of weekdays, contrasting with the Philippines and South Africa at 42% and 52% respectively. Engagement with DATs was high among participants, particularly for pillbox users, with digitally recorded doses ranging from 82% to 91%.

Finally, over 95% of participants surveyed agreed that using a DAT made them feel connected to their HCP in Ethiopia and Tanzania, this was 84% in South Africa and 76% Philippines, a finding underpinned by qualitative data. See Table 1 for further results.

Indicator	Ethiopia	The Philippines	South Africa	Tanzania	Ukraine[1]
Number of participants starting a DAT in the main enrolment phase: pillbox/labels	1249 / 1034	1473 / 1371	1788 / 76	1705 / 716	850
Number of HCPs trained per facility	3.0 (155/52)	4.9 (157/32)	2.6 (79/30)	2.0 (72/36)	7.4 (89/12)
Number of support visits by project staff per facility	1.7 (89/52)	2.4 (78/32)	1.3 (39/30)	1.8 (65/36)	0.7 (8/12)
Percentage of weekdays with at least one login to adherence platform per facility	69%	42%	52%	68%	76%
Percentage of digitally recorded doses-pillbox	90% (177,599 / 196,352)	83% (172,234 / 208,130)	88% (207,569 / 235,417)	91% (202,282 / 222,076)	82% (91,712 / 111,901)
Percentage of digitally recorded doses-labels	81% (126,718 / 156,832)	69% (119,304 / 171,786)	62% (3,815 / 6,154)	84% (63,862 / 76,231)	na[1]
Percentage of participants - agreed that using DAT made them feel more connected to their HCPs – pillbox	100% (50/50)	84% (42/50)	92% (41/49)	97% (59/1)	na[2]
Percentage of participants - agreed that using DAT made them feel more connected to their HCPs – labels	98% (49/50)	69% (36/52)	86% (25/29)	95% (36/38)	na[2]

1. Labels not implemented
2. Data unavailable

Table 1.

Conclusions: Variation was observed in level of fidelity per country. Timeliness and intensity of utilization of real-time data, and subsequent performance of actions is

impacted by staff and health system capacity. Acceptance of DATs is high; therefore, further work is needed to optimize implementation of digital support mechanisms.

OA02-114-13 Equity and cost-effectiveness of digital adherence technologies to support TB treatment adherence in Ethiopia

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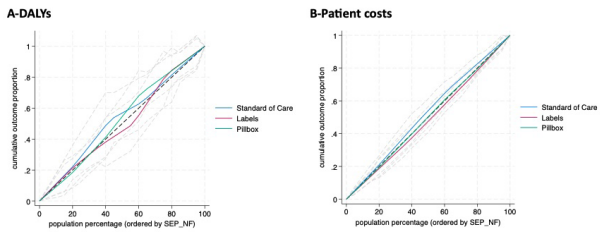
Background: Digital Adherence Technologies (DATs) with differentiated care have been recommended to support tuberculosis treatment adherence as an alternative to Directly Observed Therapy (DOT). However, evidence of cost-effectiveness has been limited.
We investigated the equity impact and cost-effectiveness of two DATs for tuberculosis treatment support, medication labels (Labels) and digital pillboxes (Pillbox), compared to the standard of care (SOC) in Ethiopia.
Design/Methods: We conducted trial-based equity and cost-effectiveness analyses alongside the ASCENT cluster-randomised trial [PACTR202008776694999], evaluating the effectiveness of Labels and Pillboxes to support tuberculosis treatment adherence in 78 health facilities in Ethiopia, between May 2021 and July 2023. We estimated costs, cost per disability-adjusted life year (DALYs) averted and equity impact of DATs.
Costs and DALYs were estimated at participant-level from the trial outcomes and patient events collected during the trial and compared using mixed effects models and illness concentration indices (ICI).
Results: 3858 participants enrolled. There were 20 (95%CI 14; 26, pValue<0.001) and 20 (95%CI 14; 27, pValue<0.001) fewer health facility visits per treatment episode in the Pillbox & Labels study arms, respectively, versus SOC. Total societal cost per trial participant was SOC:US$491.35 (standard deviation[SD]:$618.05); Labels:US$192.48 (SD:$299.70) and Pillbox:US$193.20 (SD:$371.08).
Evaluating uncertainty in the incremental cost-effectiveness ratio against a range of cost-effectiveness thresholds, we found a 48.6% (Pillbox) and 55.7% (Labels) probability that the interventions improved the cost-effectiveness of tuberculosis treatment, assuming a cost-effectiveness threshold of $100 per DALY averted.
There was no difference in DALYs between socio-economic position groups, however, the concentration of patient costs among the poor compared to the wealthy were reduced in the intervention arms of the study SoC ICI:-0.046(0.012); Labels ICI:0.032(0.009), and Pillbox ICI:0.003(0.008). See Figure 1.



	Index value (cluster-robust SE)	pValue
SoC	-0.062 (0.090)	0.496
Labels	0.004 (0.070)	0.380
Pillbox	0.007 (0.067)	0.923
Between grps	**Fstat: 0.481**	**0.618**

	Index value (cluster-robust SE)	pValue
SoC	-0.046 (0.012)	<0.001
Labels	0.032 (0.009)	<0.001
Pillbox	0.003 (0.008)	0.730
Between grps	**Fstat: 14.765**	**<0.001**

Figure 1. Equity impact of digital adherence technologies.

Conclusions: We found DATs to be cost-saving and reduced the inequitable distribution of patient costs compared to the SOC. No difference in the distribution of health outcomes was observed.

OA02-115-13 Effectiveness of a mobile health application on treatment outcomes among people with TB in Shanghai, China: A multicenter randomised controlled trial

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Background: Treatment compliance is considered significant for curing tuberculosis. Digital adherence technologies (DATs) have been recommended to support medication for tuberculosis. However, the effect of DATs on tuberculosis treatment outcomes varied depending on

interventions as well as study settings. In this study, we aimed to estimate the effect of a mobile application on treatment adherence and outcomes among patients with tuberculosis in an urban area in China.

Design/Methods: We conducted a multicentre, two-arm, open-label, equivalent, stratified block randomization trial. Participants were randomly assigned to a 1:1 ratio between the intervention and control groups. Eligible conditions were adults aged≥18 years, and newly diagnosed patients with GeneXpert-positive, rifampicin-sensitive pulmonary tuberculosis. Patients in the intervention group were trained to use a mobile app for daily medication reminders, and patients in the control group received standard of care. All eligible participants were followed up at 12 months after completion of treatment. The primary outcome was a compound that included death, treatment failure, loss to follow-up, and relapse by 18 months after patients' enrollment. The trial is registered at ChiCTR2000037575.

Results: Between Mar 1, 2021, and Dec 31, 2022, 4670 patients were evaluated for eligibility and 822 were enrolled, 741(90%) of whom (371 in the intervention group and 370 in the control group) were included in the intention-to-treat population. 430(58%) of 741 patients were male, and the median age was 33 years (IQR 27-49). 80 (22%) patients in the intervention group with adverse treatment outcomes compared with 104 (28%) patients in the control group; the adjusted risk difference for the intervention versus control was -7.04 percentage points (95%CI-13.25 to -1.14, p=0.025).

	Adjusted Risk difference (95%CI); P value	Unadjusted Risk difference (95%CI); P value	Adjusted Risk Ratio (95%CI); P value	Unadjusted Risk Ratio (95%CI); P value
Treatment outcome				
Composite outcome	-7.04 (-13.25,-1.14); p=0.025	-6.93(-12.58,-0.71); p=0.025	0.75 (0.58, 0.96); p=0.026	0.76 (0.6,0.98); p=0.027
Recurrence in 18 months	-0.04 (-1.58,1.65); p=0.964	0(-1.62,1.62); p=0.998	0.97 (0.23,5.57); p=0.99	1 (0.2,4.98); p=0.999
Treatment failure	-1.15 (-6.57,3.1); p=0.634	-0.53(-5.11,4.6); p=0.832	0.92 (0.64,1.25); p=0.638	0.96 (0.7,1.4); p=0.834
loss to follow-up	-6.39 (-10.52,-2.72); p=0.001	-7.09(-11.42,-3.57); p=0.001	0.44 (0.26,0.75); p=0.002	0.41 (0.23,0.67); p=0.001
Secondary outcome				
Sputum smear test at 2nd month	6.1(1.29,11.44); p=0.019	7.62(2.94,13.66); p=0.005	1.08(1.02,1.15); p=0.02	1.1(1.04,1.18); p=0.005
Sputum smear test at 5th month	2.99(-1.89,9.3); p=0.302	4.25(-1.45,9.64); p=0.14	1.04(0.97,1.14); p=0.302	1.06(0.98,1.14); p=0.141

Table. Intervention effects on tuberculosis treatment outcomes and adherence.

Conclusions: The mobile health application improved tuberculosis treatment adherence and outcomes significantly, especially for loss to follow-up. Future research should be focused on the application of the intervention in various settings to prove the effectiveness further.

OA03 Immunosuppressive states and TB: The role of the undernutrition and beyond

OA03-141-13 Undernutrition assessment, nutrient intake of people with TB, and feasibility of NACS in outpatient TB clinics in the Philippines

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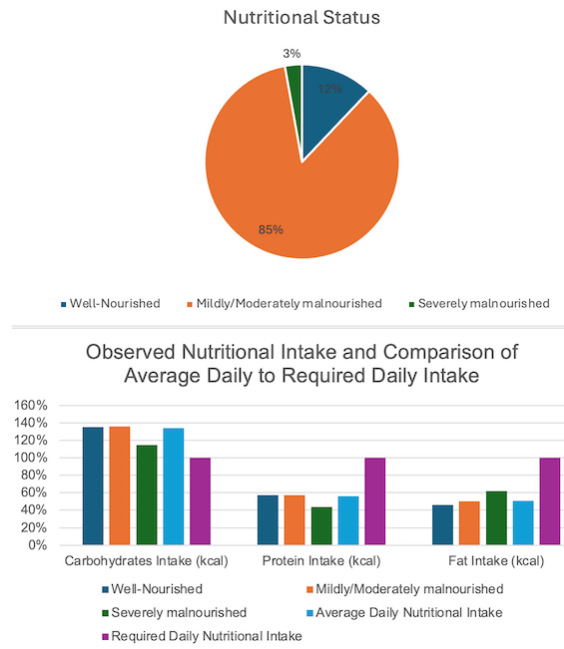
Background: Tuberculosis (TB) prevalence in the Philippines is alarming, necessitating effective management strategies. Malnutrition exacerbates TB outcomes, yet data on its prevalence and nutrient deficiencies among TB patients in the country are scarce, hindering the implementation of standardized nutritional care processes.

Design/Methods: This cross-sectional study, conducted in Cavite, Philippines, aimed to assess the nutritional status, dietary intake, and feasibility of implementing nutritional assessment, counseling, and support (NACS) in outpatient TB clinics. The sample population consisted of adult patients with TB across six catchment areas in the province. Nutritional status was evaluated using the Subjective Global Assessment (SGA) questionnaire. Dietary intake was measured via a 72-hour asynchronous video creating a directly observed nutrient diary using the SureAdhere application. The feasibility of NACS delivery by healthcare workers was assessed based on adherence to defined guidelines. Statistical analyses included mean and percentage calculations for the nutritional status and feasibility of NACS, while ANOVA and paired sample t-tests were used for assessing dietary intake.



Results: A total of 141 participants were enrolled. All 141 participated in the first objective, while 30 were enrolled in each of the second and third objectives. The study revealed 88% malnutrition among TB patients, with 85% classified as mildly/moderately malnourished and 3% as severely malnourished. Macronutrient deficiencies were prevalent, particularly in protein (56% of required) and fat (51% of required) intake. Despite these challenges, delivery of NACS was found to be feasible, with all participants completing the assessment and receiving nutritional support as per study protocol.
Conclusions: The study found high rates of malnutrition and macronutrient deficiencies among patients with TB which highlight the importance of integrating comprehensive nutritional care into TB management. The feasibility of NACS implementation in outpatient TB clinics offers promising opportunities for improving patient outcomes and reducing TB burden in the country.

OA03-142-13 Feasibility study for operationalisation of BMI-based field charts for nutritional assessment of adults with TB in South India

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Background: WHO recommends nutritional assessment, counseling, and support as integral components of TB-care. This is limited by the need for calculation of body mass index (BMI) and uncertainty about target weights to be achieved. We tested the operational feasibility of the use of BMI-based field-charts that obviate the need for complex calculations, provide nutritional status based on BMI, and the target ideal weight (BMI 21 kg/m^2) to be achieved.
Design/Methods: We enrolled 214 PwTB from 39 government primary care facilities where height and weight were done under programmatic conditions. We trained the health-care providers (HCP) in each of the facilities in the use of field-charts, provided hard copies of the field-charts, and a handout explaining the usage to them. They were trained to classify the nutritional status using the charts and identification of the ideal target weight for the adult PwTB diagnosed in the facility.
Here we report the uptake of field-charts among the HCP, the nutritional status of PwTB, and indicate the weight deficit to be addressed to attain ideal body weight.
Results: The HCP used field-charts and correctly documented the BMI in 155 (72.4%) PwTB using the field-charts. They correctly identified target weight in 147 (68.7%). The median (IQR) BMI was 17.4 kg/m^2 (16.0, 19.9) in men and 16.6 kg/m^2 (13.9, 19.3) in women. The prevalence of undernutrition (BMI<18.5kg/m^2) was 146 (68.2%) and among these, 65 (44.5%) had BMI <16 kg/m^2. The median (IQR) weight deficit between the ideal body weight and the baseline weight was 9.8kg (5.3, 12.5) in men and 10.3kg (5.4, 17.9) in women.

Nutrition parameter		Men (%)	Women (%)
BMI (kg/m^2)	≤ 13.9	9 (6.6)	19 (24.4)
	14.0 – 15.9	19 (14.0)	18 (23.1)
	16.0 – 16.9	40 (29.4)	8 (10.3)
	17.0 – 18.4	23 (16.9)	10 (12.8)
	18.5 – 24.9	36 (26.5)	20 (25.6)
	≥ 25	9 (6.6)	3 (3.8)
Weight at baseline	Median (IQR) kg	46 (40.7, 53.0)	37 (33.0, 45.0)
Height	Median (IQR) cm	162 (153, 168)	153 (148, 157)
BMI	Median (IQR) (kg/m^2)	17.4 (16.0, 19.9)	16.6 (13.9, 19.3)

Table: Nutrition status of adult PwTB

Conclusions: The implementation of these field charts led to estimation of BMI and target weights to be attained in two-thirds of PwTB. Prevalence and severity of undernutrition in PwTB were high, reinforcing the need for nutritional care and support.

OA03-143-13 Direct benefit transfer for nutritional support of people with TB and its association with treatment outcomes in India: Analysis of routine programmatic data of 2022

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Background: Nikshay Poshan Yojana (NPY) is one of the initiatives of National Tuberculosis Elimination Program (NTEP) India whose objective is to provide nutritional support to TB patients as a monetary scheme through Direct Benefit Transfer (DBT). Provision of NPY is expected to enhance the patient compliance and thus assist in improved treatment outcomes. Our study looked into Ni-kshay data of 4 States to see if there is any effect of NPY on the treatment outcomes.
Design/Methods: Objective: To describe the pattern of DBT payment status including delay in payments and its effect on treatment outcome.

Method: We conducted the study with analytical support from the Word Bank. Secondary data from Ni-kshay (NTEP case-based web-based surveillance portal), of patients whose outcome was declared between January 1, 2022 & December 31, 2022 from 4 states was analyzed. These states were randomly selected based on DBT performance.

Results: Of 286,654 notified patients with TB, 88% patients reported successful outcomes. Average 75% of patients were paid all the benefits among the cases till the time when data was collected. Median duration between treatment initiation to payment of first instalment of NPY was 135 days (IQR: 63–221 days) with the highest of ~178 days for Bihar and the least of ~74 days for Andhra Pradesh. The multiple logistic regression revealed that across all states, having received DBT benefits has 2 times higher chances of successful treatment outcome (aOR=2.19, p<0.01).

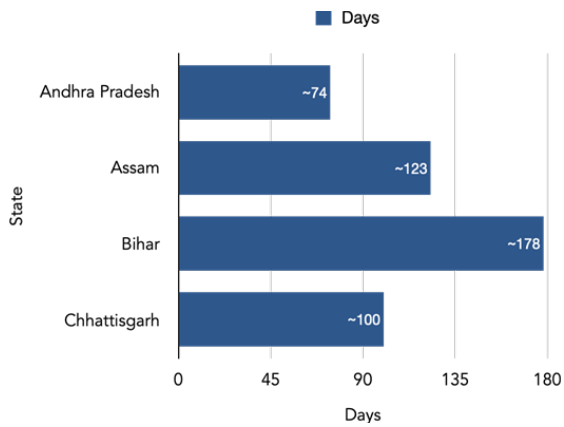

Figure. The median days between treatment initiation and first NPY payment.

Conclusions: NPY is positively associated with favorable treatment outcomes, however disbursement of payments is delayed with difference of ranges across the states. NPY is influenced by multiple factors as there are various underlying processes and generated benefits are at various stages of payment across the States. Efforts should be taken to identify the reasons and determine the strategies to cut the delay time to achieve desired impact.

OA03-144-13 Estimating the epidemiological impact of scaling up a nutritional intervention for TB-affected households across India

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Background: Approximately 20% of global tuberculosis (TB) incidence is attributable to undernutrition, which increases risk of developing TB disease and risk of TB death. Despite this, nutritional assessment and support is rarely provided in TB programmes.

Design/Methods: We used results from a recent trial of the provision of nutritional support to people with TB (PWTB) and their households to explore the epidemiological implications of expanding the intervention to everyone treated for TB in India. We developed a transmission model of TB infection with explicit body mass index strata linked to disease progression and treatment outcomes. We modelled, separately and together, the provision of nutritional support to PWTB, and the provision of nutritional support to their household contacts.

Results: Compared to a baseline with no nutritional support intervention, at 50% coverage of those on treatment (~15% of all TB-affected households) providing nutritional support to PWTB would avert 1.7% (95% uncertainty interval 1.4-2.3) and 0.1% (0-0.1) of cumulative TB mortality and incidence respectively in India by 2035, with 134,600 (108,200-179,000) fewer people dying of TB and 11,800 (-8,700-32,600) fewer developing disease. Extending this support to household contacts would avert an additional 136,600 (123,100-152,300) TB deaths and 893,400 (817,900-988,000) cases. To prevent one person from developing or dying of TB would require nutritional support to 5 and 18 TB-affected households, respectively. Cost-effectiveness results will be presented as well.

Conclusions: A nutritional support intervention for TB-affected households could avert a substantial amount of TB incidence and deaths in India, with a low number needed to support.

OA03-145-13 Addressing the dual burden of malnutrition and TB in affected paediatric populations: Lessons from Katsina State Pead TB Surge Project Implementation

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Background and challenges to implementation: The co-existence of malnutrition and childhood tuberculosis (TB) presents a significant public health challenge, particularly in high-burden settings. Malnutrition weakens the immune system, increasing susceptibility to TB and hindering treatment outcomes. The Katsina State Paediatric TB Surge Project aimed to address this dual burden by integrating TB screening within high-burden malnutrition clinics within the state alongside other interventions.
Intervention or response: The project implemented a multi-pronged approach;
- TB screening was incorporated into routine package of care for malnourished children at participating nutrition clinics.
- Healthcare workers received training to identify presumptive TB based on clinical signs and symptoms
- Identified Presumptive TB underwent evaluation either through molecular rapid diagnostic tests or chest Xray by engaged certified radiologists.
- Confirmed TB cases were promptly initiated on appropriate treatment regimens and notified to the TB Program.
Results/Impact: The project screened 195,080 children (96.5% of attendees) during the implementation period (August 2022 to September 2023). This intensive screening identified 13,565 presumptive TB patients, of which 13,332 underwent diagnostic evaluation. A total of 410 malnourished children were confirmed with TB. Furthermore, TB Screening in nutritional clinics intervention contributed 40% to the total TB cases diagnosed in the project within this period as shown in Figure 1.

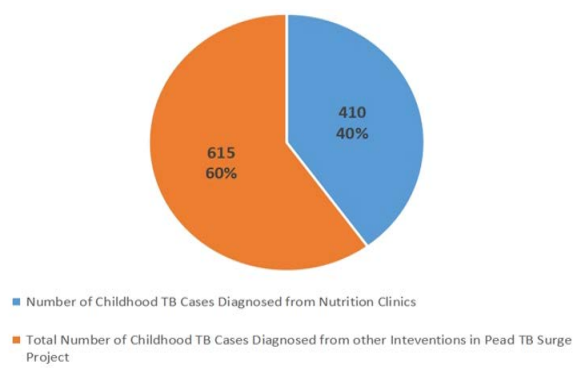

Figure 1: TB Case Finding Contribution from Nutrition Clinics.

Conclusions: The Katsina State Pead TB Surge Project demonstrates the effectiveness of integrating TB screening into existing malnutrition clinic structures. This approach achieved a high screening rate and identified a substantial number of paediatric TB cases among malnourished children. The project highlights the importance of collaborative efforts to address the dual burden of malnutrition and TB, contributing valuable lessons for future interventions in high-burden settings.

OA03-146-13 Vitamin A and D deficiency and their predictors in a subset of participants in the RATIONS trial (India)

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Background: Vitamin A and D deficiencies (VAD, VDD), affect immune function and have been linked to risk of TB incidence, and outcomes in patients with active TB (PwTB).
We estimate their prevalence and predictors in adult PwTB and their household contacts (HHCs) in a substudy within the Reducing Activation of Tuberculosis by Improvement of Nutritional Status (RATIONS) trial.
Design/Methods: Samples were collected at baseline before the nutritional supplementation from 250/2800 PwTB and 250/10,345 HHCs.
Estimations were done using High Performance Liquid Chromatography (HPLC) at the National Institute of Nutrition, Hyderabad. Serum retinol <20ug/dl was considered as VAD; 25-hydroxyvitamin D [25(OH)D] level <12ng/ml as VDD, while 25(OH) D levels of 12-20 ng/ml were considered vitamin D insufficiency.
Levels were expressed as medians and interquartile range (IQR), compared using Mann-Whitney-U test, and predictors of VAD and VDD were assessed using multiple logistic regression.
Results: The prevalence of VAD and VDD was 20% and 9.6% in the PwTB; the same was 3.6% and 4% in HHC respectively.
Overall, in all participants, VAD was associated with active TB (aOR:2.95, 95%CI: 1.29,6.75) male sex (aOR: 2.8, 95%CI: 1.35,5.82), low body mass index (BMI <18.5kg/m^2) (aOR: 3.34 95%CI: 1.39,8.06). In PwTB, sputum grade was also a predictor (aOR =17.17, 95% CI: 4.47,66.02).
Tobacco use was associated with aOR of 6.92 (95% CI: 1.39, 34.41) in contacts. In the case of VDD, the predictors were PwTB (aOR: 3.64, 95%CI: 1.49, 8.90) and female sex (aOR =2.36, 95%CI: 1.03, 5.42).

	Patients with TB	Household contacts	p-value
Vitamin A Median ug/dl (IQR)	36.2 (22.3, 54.3)	53.5 (39.5, 81.0)	<0.0001
Vitamin D Median ng/ml (IQR)	33.2 (19.7, 49.5)	33.3 (22.6, 47.6)	0.98

Table: Vitamin A and D in adult patients with TB and their HHCs in RATIONS trial

Conclusions: In this rural population, the prevalence of VAD and VDD was modest in PwTB and low in contacts. VAD was associated overall with active TB, male sex, and low BMI, while VDD was associated with active TB and female sex.

OA03-147-13 The interplay between nutrition and helminth infection correlates with microbiota associated with negative immune responses in individuals with M. tuberculosis

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Background: The interplay between *Mycobacterium tuberculosis* (Mtb) infection, malnutrition, and helminth infections is understudied despite high geographical overlap. The influence of nutrition and helminths on the gut microbiota may impact the immune system negatively in the context of Mtb infection, as helminths can influence the immune system toward a Th2 response conducive to Mtb survival, and malnutrition is a known risk factor for TB disease and affects the immune response negatively. Furthermore, the impact of malnutrition and helminth infections on the gut microbiome, which in turn affects the immune system, underscores a complex interrelationship not yet investigated within the context of Mtb infection.

Design/Methods: Mtb-infected individuals without active disease were assigned to one of four groups depending on helminth-infection and BMI: Helminth-absent-malnourished (n=13), helminth-absent-well-nourished (n=9), helminth-present-malnourished (n=6), and helminth-present-well-nourished (n=5). Stool samples were collected from each individual, and 16S sequencing was performed and analyzed for microbiota identification using the Metascope and Animalcules packages in R.

Results: Genera and species differences were present in each of the four groups. *Blautia* and *Bifidobacterium* show varying abundances among groups. *Akkermansia*, was absent in malnourished individuals with helminth infections, while *Bifidobacterium* levels were lower in malnourished individuals overall. *Turicibacter* exhibited the lowest abundance in helminth-absent, well-nourished individuals but was more prevalent in those with helminth infections, particularly in malnourished individuals.

Conclusions: Our study reveals distinct patterns of microbiota composition associated with different immune, helminth infection status, and nutritional states. *Akkermansia* and *Bifidobacterium* were reduced in malnourished individuals and those with helminth infections, while *Turicibacter* were lowest in well-nourished individuals without helminth infection. These bacteria have previously been associated with changes in immune responses, including Th1 and Th2 responses.

These findings underscore the complex interplay between microbiota, immune status, and nutritional factors, suggesting the potential benefits of nutrition supplementation and helminth treatment to aid in TB treatment.

OA03-148-13 The effect of steroid therapy on IFN-γ level after M. tuberculosis stimulation in systemic lupus erythematosus

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Background: Immune dysregulation in systemic lupus erythematosus (SLE), an autoimmune disease, together with steroid therapy, are associated with increased infection susceptibility, including tuberculosis (TB). Interferon-gamma (IFN-γ) plays a crucial role in host defense against infection. We aimed to evaluate the circulating and post-TB antigen stimulation of IFN-γ production level in SLE patients.

Design/Methods: This analytical study included female SLE patients, divided into 4 groups: newly diagnosed SLE (n10), flare (n30), low (n30) and high dose steroids (≥ 7.5 mg prednisolone/day) (n30). All subjects had no history of tuberculosis. Interferon Gamma Release Assay (IGRA) was employed and compared with the age-matched healthy controls (n30). The IFN-γ levels in tube nil was measured as a circulating IFN-γ production, and TB antigen stimulated production capacity of IFN-γ was determined (tube2-nil). Anova test was used to analyze the data.

Results: One hundred SLE patients were enrolled, with median age (years) of 30.5 and 28.5 in healthy control group. No significant difference in circulating IFN-γ

levels between SLE and healthy controls group (p0.73), however the difference was significant, after stimulation with TB antigen (p<0.01). Median (range) IFN-γ levels of the low dose steroid group 0.09 (0.01-8.23) IU/ml, high dose steroid group 0.06 (0.02-2.41) IU/ml and flare group 0.06 (0.02-7.53) were significantly lower compared to healthy control 0.24 (0.05-7.94) IU/ml (p=0.01 p<0.01, and p<0.01 respectively) after stimulation, interestingly, IFN-γ production level in newly SLE diagnosed group was not significant different (p0.26).
Conclusions: The capacity of SLE patients in steroid therapy are insufficient to produce IFN-γ after tuberculosis infection. This finding enriches the immunopathology concept of infection susceptibility in SLE, especially the role of steroid.

OA03-149-13 The global incidence of TB in people with chronic kidney disease: A systematic review and meta-analysis based on data collected from 1,548,774 people

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Background: Even though patients with chronic kidney disease (CKD) have high tuberculosis (TB) risk, there is limited data that describe its burden at the global, regional, and country levels. Thus, this study aimed to assess the pooled incidence of TB in patients with CKD.
Design/Methods: The PRISMA method was followed to perform the study. Electronic and grey literature sources were investigated for studies published between 2000 and 2021. Studies that reported tuberculosis in CKD patients were included. The JBI checklist was used to assess the study quality, and STATA version 16 was used for analysis. The I^2 heterogeneity test was employed to assess study heterogeneity. To examine publication bias, funnel plots, and Egger regression tests were performed. We conducted the trim-and-fill analysis to adjust publication bias.
Results: In total, 104 studies conducted in 32 countries with a total sample size of 1,548,774 were included. The incidence of tuberculosis in CKD patients ranges from 60/100,000 in the United Kingdom to 19,270/100,000 in China. The pooled TB incidence was estimated as 3,718/100,000 (95%CI; 3024, 4411). Higher pooled TB incidence was found among CKD patients residing in the African Region (9952/100,000, 95%CI; 6854, 13,051) followed by South-East Asian (7200/100,000, 95%CI; 4537, 9863) and Eastern Mediterranean (5508/100,000, 95%CI; 3470, 7547) regions. In particular, patients on hemodialysis (5611/100,000, 95%CI; 4186, 7035) and on peritoneal dialysis (3533/100,000, 95%CI; 2220, 4846) had higher incidence compared to post-renal transplantation (2700/100,000, 95%CI; 1878, 3522) and pre-dialysis patients (913/100,000, 95%CI; 407, 1418). Besides, extrapulmonary TB (2227/100,000) was shown to be more common than pulmonary TB (1786/100,000).
Furthermore, TB incidence in CKD patients was relatively stagnant being 4052, 3402, and 3508 per 100,000 CKD patients in studies published from 2000 to 2009, 2010 to 2015, and 2016 to 2021, respectively.
Conclusions: This study identifies high tuberculosis incidence in CKD patients with regional disparities.

OA04 Strategies for detecting TB in children

OA04-124-13 A country's drive to improve childhood TB case notification: KNCV Nigeria experience from national childhood TB testing week

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Background and challenges to implementation: The proportion of TB cases notified among children (aged 0-14 years) in Nigeria was only 7% according to 2023 Global TB report. This was below the country's target of 12%. To improve childhood TB case finding, the National TB Program in collaboration with partners introduced a National Childhood TB testing week (NCTW). KNCV Nigeria TB-LON project shares its experience from the testing week.
Intervention or response: The NCTW was held across the 14 TB LON implementing states from May 22 to 27 2023. Planning meetings were held with TB stakeholders, advocacy to the settings/communities identified for screening and massive sensitization of communities and facilities through traditional and social media were carried out.
Laboratories were optimized, consumables provided, and sample referral systems strengthened. TB screening was done in various child clinics, formal/informal primary and secondary schools, homes of children with disabilities, IDP camps, orphanages and communities.
Results/Impact: A total of 100,257 children were screened and 13,429 (14%) presumptive TB identified. Of these 13,160 (98%) were evaluated with 439 (3%) TB cases di-

agnosed and 431 (98%) enrolled on treatment. Childhood TB case contribution to overall TB case finding during NCTW was 27% compared to program average of 6-8%. The average Number Needed to Screen was 228. Home of children with disabilities recorded the highest TB yield of 8%. Beyond TB cases diagnosed, the NCTW created massive awareness amongst communities, schools and health facilities on childhood TB. New TB ambassadors and change agents were identified amongst school children and teachers and within communities. These play key roles in a sustained TB awareness creation.

Type of Setting	# Screened	# Presumptive	# Evaluated	# Diagnosed	# Clin. diagnosed	# DR-TB	# Stool Xpert pos	# Enrolled	NNS	NNT	TB yield
POPD	3714	455	455	16	3	0	4	16	232	28	4%
Orphanage	484	253	253	4	3	0	0	4	121	63	2%
Nutrition/Child welfare clinic	4165	603	548	34	1	0	0	33	123	16	6%
Informal school	17991	2919	2907	141	9	1	7	136	128	21	5%
Immunization Clinic	1461	152	152	11	2	0	1	11	133	14	7%
IDP Camp	4616	424	424	6	2	0	0	6	769	71	1%
Home of children with disabilities	34	15	13	1	1	0	0	1	34	13	8%
Formal school	52852	6504	6304	150	43	0	9	150	352	42	2%
Community outreach	14940	2104	2104	76	10	1	24	74	197	28	4%
Total	**100257**	**13429**	**13160**	**439**	**74**	**2**	**45**	**431**	**228**	**30**	**3%**

Table 1. Childhood TB screening cascade in the various settings.

Conclusions: The NCTW beyond massive awareness creation and unveiling of nontraditional settings for childhood TB case finding, showed that Paediatric TB is still prevalent within our settings. We propose a mainstreaming of NCTW with increased frequency into our routine programming for TB case finding.

OA04-125-13 Leveraging district-led capacity-building initiatives to improve childhood TB case-finding in Western Uganda

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Background and challenges to implementation: Childhood tuberculosis (TB) poses a critical public health threat as it reflects recent transmission and poses a high risk of disease severity. By September 2020, cases found among children <15 years in Bunyoro Region, Western Uganda, represented only 6% of total notified TB patients, compared to the national target of 15%. The intervention's objective was to improve childhood TB case finding in Bunyoro Region.

Intervention or response: Focusing on continuous quality improvement capacity building, a collaborative intervention was implemented by Baylor Foundation Uganda, Uganda Ministry of Health and district local governments to improve childhood TB case finding. Teams of ten mentors from each of the nine districts were selected based on their work ethic and clinical mentorship skills. A three-day regional training of trainers was conducted for the 90 district-based TB mentors who then facilitated quarterly two-day on-site child-TB mentorships in their respective districts. Paediatric TB-related standard coaching guides and Continuing Medical Education sessions were used to train health workers on multi-entry integrated TB/HIV screening, timely diagnosis, contact tracing and commodity management.

We trained cough monitors, strengthened bacteriologic diagnosis, implemented artificial-intelligence-guided digital x-ray TB screening and disseminated learning materials for clinical reference.

Community resource persons were trained on effective referrals while clinicians were incorporated into contact tracing teams to improve suspicion and diagnostic confidence. Weekly data reviews were conducted to monitor site-level progress and provide targeted support.

We retrospectively analyzed District Health Information Software-2 quarterly data collected over three years to assess the intervention's impact.

Results/Impact: Quarterly childhood TB case notifications consistently increased, from 34 to 284 and the proportion of child TB patients notified increased from 6% in July-September 2020 to 20% in April-June 2022 and was sustained until October-December 2023 (Figure).

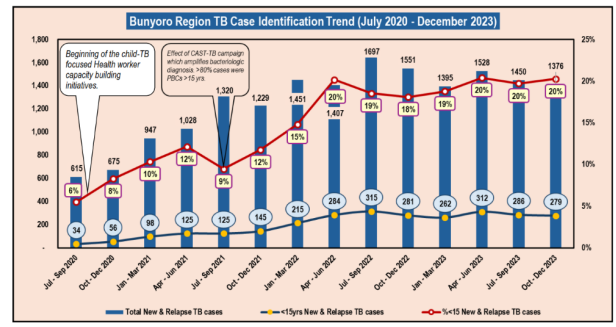

Figure.

Conclusions: District-led capacity-building initiatives addressing health system gaps resulted in sustained improved childhood TB patient identification.

OA04-126-13 TB case detection in children and adolescents in high-load health facilities in Ethiopia: Lessons from health facility intervention

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Background and challenges to implementation: Tuberculosis (TB) causes significant morbidity and mortality in children and adolescents. TB screening and case detection is usually sub-optimal in resource – limited settings. The WHO recommends using integrated TB treatment decision algorithm for diagnosis of pulmonary TB in children and adolescents including use of Gene x-pert as a primary test from different specimens including stool. Proportion of childhood TB notification fell around 10% nationally with regional disparities. The study aimed to evaluate the progress in TB evaluation cascade of care in children and adolescents in high load health facilities in Ethiopia.
Intervention or response: A prospective observational study was conducted between August – December 2023 in 30 high load health facilities in Southern regions, Ethiopia. Customized training on standards of TB diagnosis and management was provided to mix of HCWs from pediatrics service outlets including laboratory. Follow up mentoring and supportive supervision were conducted including monitoring of TB evaluation cascade of care.

Month (2023)	# of children visited the HF	TB screened (%)	Presumptive TB (%)	Gene x-pert tested	Gene x-pert tested (%)	# TB cases detected (all forms)	B+PTB (%)	% diagnosed from presumptive TB
August	14741	92.20%	3.10%	229	53.90%	56	25.00%	13.20%
September	17275	90.40%	4.30%	434	64.80%	82	28.00%	12.20%
October	16076	93.10%	4.70%	513	73.00%	92	31.50%	13.10%
November	17290	97.00%	4.10%	519	75.70%	105	37.10%	15.30%
December	19624	98.80%	3.70%	539	75.70%	90	40.00%	12.60%
Total	85006	94.50%	4.00%	2005	62.70%	425	33.20%	13.30%

Table 1: TB evaluation cascade of care in children and adolescents

Results/Impact: During intervention period 80,340 (94.5%) under 15 years children were screened for TB, of whom 4.0% (n=3196) had TB symptoms and evaluated for TB. 62.7% (n=2005) undergone Gene x-pert tests. Overall, 425 active TB cases were diagnosed, of which 33.2% were bacteriologically confirmed. The yield was 13.3% from presumptive TB cases (12.3 % in children <5 years vs 14.4% in those 5-14 years). Progressive improvements were observed in presumptive TB identified (3.1% to 4.7%), Gene Xpert testing (54% to 76%), TB cases detected (13.2% vs 15.3%) and bacteriologic confirmed TB (25% to 40%).
Conclusions: The study showed progressive improvement along TB evaluation cascade in children and adolescents through continuous capacity building of HCWs in multi-disciplinary team approach. Targeted support and interventions need to be scaled up for enhancing facility-based active TB case finding among children and adolescents in TB high burden areas.

OA04-127-13 Overcoming barriers to detecting paediatric TB in health facilities and community settings in Vietnam: Results and lessons

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Background and challenges to implementation: There is an estimated incidence of 6,300 (4%) children under 15 years old with Tuberculosis (TB) in Vietnam (Global Report 2023). The proportion of pediatric TB detection remains low, representing only 1% of cases notified in 2022. The National TB program enhanced TB screening among children by applying the high-yield Double-X strategy.
Intervention or response: The USAID Support to End TB project integrated pediatric TB screening with intensified and active TB case finding (ICF, ACF) efforts in five provinces. In 2021, pediatric ICF was introduced at general health facilities implementing ICF for adults. Pediatric TB detection was included in ACF (campaigns in communities and efforts to engage community-level health workers) and hybrid ACF/ICF approach (regular tracing and referral of household contacts at health facilities). In August 2022, Pediatric standard operating procedures (SOPs) were introduced in specialized pediatric departments/hospitals, emphasizing clinical TB diagnosis among symptomatic children without bacteriological evidence. Symptomatic household contacts of people with TB, children with pneumonia unresponsive to antibiotics, individuals with wheezing unresponsive to bronchodilators, or severe malnutrition were evaluated with CXR and GeneXpert simultaneously.
Results/Impact: From 2021-2023, 40,410 children were screened for TB at health facilities and communities, yielding 69 children with TB, 56 (81%) found after ap-

plying the pediatric SOPs. The ICF model identified 75% of children with TB in three years. ACF yield increased from 147 to 428 per 100,000 screened with pediatric process. Hybrid ACF/ICF found 6 cases (yield: 348/100,000 screened), compared to no cases identified before the new SOPs. Eighteen children were clinically diagnosed with TB under the new SOPs, accounting for 1/3 of pediatric notifications after the change.

Results by model overtime	Population screened for TB	Screened with CXR	No. (%) TB- presumptive CXR	No. Tested with Xpert	No. (%) Xpert positive	No. Clinically diagnosed TB	No. TB Diagnosed (All forms)	No.(%) Initiated TB treatment	Yield per 100,000 populations
Results by model (January 2021 – July 2022), combining pediatric TB screening with ongoing efforts for adults									
ICF in health facilities	2,621	2,621	125 (4.8%)	125	10 (8.0%)		10	9	382
ACF in community (campaigns, Single X, QRcode referrals)	2,038	2,038	160 (7.9%)	445	3 (0.7%)		3	3	147
Hybrid ACF/ICF (household contacts at health facility)	398	398	39 (9.8%)	45					
Results by model (August 2022 – December 2023), with new separate screening approach for pediatrics									
ICF in health facilities	31,765	31,765	2,159 (6.8%)	2,434	27 (1.1%)	15	42	42 (100%)	132
ACF in community (campaigns, Single X, QRcode referrals)	1,865	1,613	84 (5.2%)	374	6 (1.6%)	2	8	8 (100%)	428
Hybrid ACF/ICF (household contacts at health facility)	1,723	1,723	223 (12.9%)	336	5 (1.5%)	1	6	6 (100%)	348
Total	40,410	40,158	2,790 (6.9%)	3,759	51 (1.4%)	18	69	68 (98.6%)	171

Conclusions: Specific SOPs for pediatric TB screening implemented in pediatric departments/hospitals and promotion of clinical consultations significantly improved implementation results. NTP plans to standardize guidelines for a nationwide pediatric TB scale-up.

OA04-128-13 Pre-adoption pilot Implementation of stool-based GeneXpert Testing for paediatric TB diagnosis in Mozambique

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Background and challenges to implementation: Pediatric tuberculosis (TB) presents a significant challenge in Mozambique, with delays in diagnosis contributing to poor outcomes. Stool-based GeneXpert testing, specifically the simple one-step (SOS) method, offers a promising, non-invasive, and potentially more sensitive diagnostic approach. Mozambique aims to integrate this method into its paediatric TB diagnostic toolkit.

Intervention or response: A pre-adoption pilot implementation was conducted in Maputo City, Maputo Province, and Gaza Province to assess the feasibility and diagnostic performance of SOS stool-based GeneXpert testing.

This approach was integrated into routine TB screening, diagnosis, and management services across 59 health clinics from 21st August 2023 to 29th February 2024. Screening and diagnosis adhered to recommended guidelines, with stool samples collected from all presumptive TB cases under 10 years and tested using SOS GeneXpert.

Results/Impact: A total of 4,418 children were enrolled with signs and symptoms of tuberculosis TB, 2,044 children were excluded from the analysis due to the lack of stool sample collection. Stool samples were successfully collected from 2,374 children. Among these, 44 children (2%) tested positive for *Mycobacterium tuberculosis* (MTB). Of the 44 children with MTB detected, all were initiated on TB treatment.

Additionally, 106 children who tested negative for MTB were clinically diagnosed with TB and also started on treatment. Through stool tests, 29.3 % of children who started treatment had their diagnosis confirmed bacteriologically.

Conclusions: The pilot study demonstrated the feasibility of integrating SOS stool-based GeneXpert testing into routine pediatric TB diagnostic services in Mozambique. While stool-based testing has a low sensitivity, it enabled a bacteriological confirmation rate higher than the national average (17%).

Its non-invasiveness and ease of use make it a valuable addition to the diagnostic arsenal for bacteriological confirmation.

Further supervision and monitoring are required to optimize the screening of presumptive cases, as well as the stool sample collection, storage, and SOS stool-based GeneXpert testing techniques.

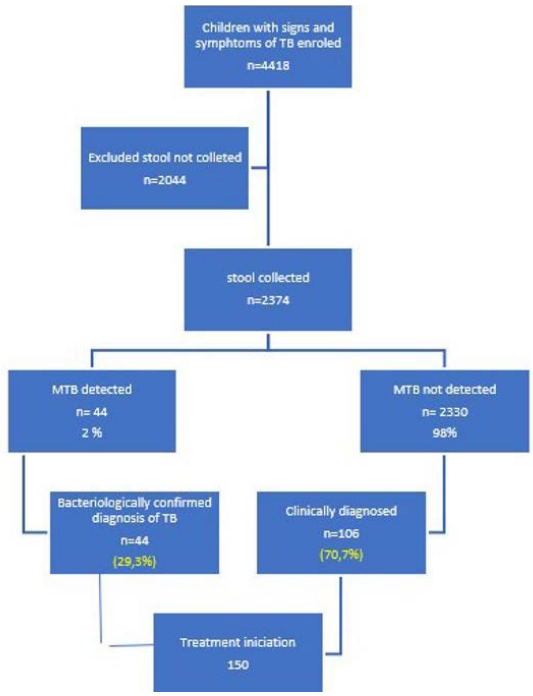

Figure 1. TB diagnostic cascade in children under 10 years.

OA04-129-13 Enhancing paediatric TB specimen collection and diagnosis: Insights from a multi-state intervention in India

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Background and challenges to implementation: The key challenges in diagnosis of pediatric TB include shortage of trained health care providers (HCPs) in peripheral Public and Private health facilities to collect non-expectorated specimens, and their transportation to diagnostic facilities (HCF). As a result, the children with presumptive TB are referred to tertiary centres for diagnosis resulting in delay and loss to follow-up. FIND, in collaboration with the National TB Elimination programme (NTEP), India and funding support from USAID-Tuberculosis Implementation Framework Agreement (TIFA) project implemented interventions to address these challenges. This abstract documents the experience of the project over 15 months.

Intervention or response: In Dec'22, the intervention was rolled-out in four districts across four states of India (peri-urban/rural/tribal geographies). The activities were expanded to four additional districts in Oct'23. Key activities included training of HCPs from public and private sector on specimen collection in children (e.g., gastric aspirate, induced sputum, extrapulmonary samples), identification of tertiary HCFs that could act as mentoring institutes and linking peripheral HCFs to higher centres through a hub-and-spoke model to decentralize specimen collection. Linkages were established between collection and HCFs within the districts.

Specimen transportation was facilitated by strengthening existing mechanisms such as NGOs/community volunteers/guardian etc. Data reported between Dec'22-Feb'24 were analysed..

Results/Impact: The project trained 197 pediatricians, 174 medical-officers, 160 nurses and 172 frontline workers/NTEP staff on specimen collection techniques in children. Linkages were established between 198 HCFs (70% public, 31 hubs, 163 spokes, 4 mentoring institutes) ***(Figure 1).***

Approximately 6,000 specimens were referred/collected from children with presumptive TB through 69 sites (72% peripheral/private facilities) operational under the intervention and 28 health camps. Among these, 7.4% (N=442) specimens were diagnosed positive for TB.

Distribution of facilities engaged by the project and those collecting/referring samples under the hub and spoke model

Type of health care facility	Hubs		Spokes	
	Engaged	Collecting/ referring sample	Engaged	Collecting/ referring sample
Tertiary (public)	16	16	4	3
Peripheral (public)	6	6	109	6
Private hospitals and nursing homes	13	11	50	27

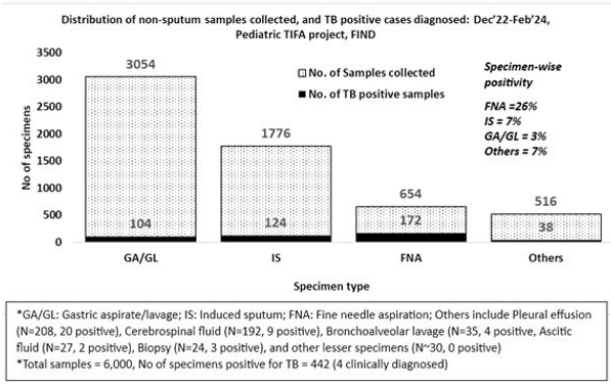

Figure 1. Key parameters, pediatric TIFA project, FIND.

Conclusions: The project has successfully demonstrated an innovative model to improve pediatric TB specimen collection and diagnosis which is being scaled up by NTEP through domestic funding.

OA04-130-13 Accelerating TB case finding among children: A novel intervention involving hub and spoke model in Punjab, India

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Background and challenges to implementation: In Punjab, despite notifying 33 cases per 100,000, over half of pediatric TB cases go undiagnosed and unreported. The main programmatic challenges can be attributed to the unavailability of skilled healthcare personnel to collect non-sputum samples and sub-optimal linkages to diagnostic facilities.

Therefore, a novel intervention involving the hub and spoke model was piloted in December 2022 in the Ludhiana district to assess the impact of this intervention on TB case finding among the pediatric population.

Intervention or response: Tertiary health facilities were identified to act as mentoring institutes and provide hands-on training to healthcare professionals on non-sputum sample collection methods such as gastric lavage/aspirate, induced sputum, and fine needle aspiration.

An augmented hub and spoke intervention was established under which trained public and private facilities were mapped as hubs (TB detection centres) and spokes (collection centres). Human carriers were utilized for sample transportation.

Data from December 2022 to January 2024 was quantitatively analyzed to assess impact in terms of i) coverage and ii) the proportion of microbiologically confirmed pediatric TB cases diagnosed. A z-proportion test was applied to test the significance of findings in SPSS ver22.

Results/Impact: 340 healthcare professionals were trained in sample collection techniques through theoretical and practical demonstrations. Sample transportation and mentoring linkages were established between 168 facilities (23 hubs, 141 spokes and 4 mentoring institutes). A total of 1880 samples were collected from presumptive children (≤18 years) and 211 (11%) samples were microbiologically diagnosed as TB. A three-year trend analysis showed a significant increase (20%) in microbiological confirmation among the identified pediatric persons with TB in the year 2023 [z score: 5.51, ($p< 0.01$)].

Conclusions: This training-cum-mentoring aided hub and spoke intervention has been effective in improving TB case detection among children and can be scaled up in similar high-burden settings to accelerate end-TB goals.

OA04-131-13 Evaluating the missing TB cases in children: A programmatic review of the implementation of a treatment decision-making algorithm

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Background: The National Tuberculosis Program (NTLP) adopted the Treatment Decision Algorithm (TDA) from Union Desk Guide as a tool to guide childhood TB diagnosis with and without bacteriological confirmation (BC). In children, a greater proportion of diagnoses are expected to be clinically diagnosed (CD) and chest radiography is critical in making this diagnosis. We aimed to evaluate the proportion of BC and CD cases diagnosed in children with TB.

Design/Methods: We analyzed programmatic TB treatment data collected from children <15 years old diagnosed between October 2022 to December 2023 across 8 provinces in Zambia. BC and CD diagnoses were defined as per WHO TB guideline definitions. We compared the relative frequency of BC against CD cases.

Results: A total of 6748 children <15 years were reviewed of which 49% were female, 56% were aged 0-4 years, 34 % were CD while 66% were BC ($P<0.001$). Of a total of 3761 children aged 0-4 years, 27% were CD while 73% were BC ($p < 0.001$). Diagnosis with LF-LAM contributed 53%, diagnosis by Xpert MTB/Rif contributed 46% and microscopy contributed 1% of the BC cases in this age group. Among the 2987 children aged 5-14 years, 43% were CD and 57% were BC ($p <0.001$). Of the BC cases in this age group 35% were diagnosed using LF-LAM, 63% diagnosed with Xpert MTB/Rif and 3% by microscopy.

Conclusions: Despite availability of TDAs, health-care workers (HCWs) remain reliant on bacteriological confirmation to diagnose TB in children. This is likely due to limited access to chest radiography in this setting. TDAs should be developed to account for accessibility factors

in resource limited settings. Additionally, strategies must be implemented to strengthen HCW aptitude with use of TDAs in diagnosis childhood TB as we await results from the validation of other WHO recommended TDAs.

OA05 From stigma to support: Addressing mental health for better outcomes

OA05-132-13 Mental health condition (MHC) among Diagnosed TB (DTB): Cross-sectional study 2018 Indonesian National Health Survey (NHS)

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Background: Mental health conditions (MHCs) are frequently observed as comorbidities in tuberculosis (TB) patients, with a global prevalence rate ranging from 10% to 52%, significantly higher than that in the general population. These conditions can profoundly impact patients' treatment outcomes and quality of life, leading to poor adherence to TB medication, increased risk of relapse, higher mortality rates, and diminished quality of life.
This study aims to evaluate the prevalence of MHCs in 3,391 Indonesians diagnosed with TB (DTB) and identify potential risk factors associated with MHCs in this population.
Design/Methods: Methods: We conducted a cross-sectional study using secondary data from the National Health Survey (NHS) 2018. The study population included Indonesians aged 15-75 years or older who participated in the NHS 2018 and were diagnosed with TB. We use Self Report Questionnaire (SRQ) to identify MHC. We define TB as ever diagnosed TB within one year prior the 2018 Riskesdas. Participants with incomplete data were excluded. Data analysis was performed using logistic regression.
Results: Of the 3,391 DTB individuals, 19.6% (95% CI 17.7 – 21.6) were found to have MHCs. Logistic regression analysis indicated that unemployment was independently associated with a higher risk for MHCs (AOR 1.6, 95% CI 1.3 – 1.9). In contrast, DTB individuals aged 15 – 34 were less likely to experience MHCs (AOR 0.1, 95%CI 0.5 – 0.6), as were those who were currently married (AOR 0.8, 95% CI 0.7 – 1.0), resided in urban areas (AOR 0.7, 95% CI 0.6 – 0.8), and were male (AOR 0.8 95%CI 0.7 – 1). No significant differences in MHC prevalence were observed among DTB individuals based on education level.
Conclusions: DTB individuals who are unemployed, older than 34, not currently married, female, and residing in rural areas were more likely to experience MHCs. Healthcare providers should be aware of these potential risk factors when treating TB patients.

OA05-133-13 Prevalence and predictors of depression among people with TB in Ghana: Implications for integrated care and stigma reduction

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Background: Tuberculosis (TB) is a significant public health concern and a leading cause of death globally, with individuals with mood disorders such as anxiety and depression being particularly vulnerable.
This study aimed to determine the prevalence of depression and associated factors among TB patients seeking healthcare in Ghana.
Design/Methods: A facility-based cross-sectional study utilizing systematic random sampling was used to select 1103 consenting persons with TB . A structured questionnaire with closed-ended questions was administered face-to-face. Binary logistic regression analysis was used to identify key predictors at 5% statistical significance.
Results: This study revealed a high prevalence of depression among persons with TB (41%). Female persons with TB (AOR = 1.9, 95% CI = 1.22–2.98), living in a single-family home (AOR = 11.38, 95% CI = 1.04–124.55), moderate (AOR = 1.9, 95% CI = 1.22–2.98) or poor health (AOR = 10.09, 95% CI = 3.74–27.22), and having treatment supporters such as family members other than spouses (AOR = 3.44, 95% CI = 1.65–7.17), friends (AOR = 21.47, 95% CI = 7.02–65.64), or spouses (AOR = 3.61, 95% CI = 1.57–8.30) significantly increased the likelihood of depression. Being a trader reduced the odds of depression by 54% (AOR = 0.46, 95% CI = 0.24–0.91). High levels of general (AOR = 2.35, 95% CI = 1.10–5.04) and internalized stigma (AOR = 7.51, 95% CI = 1.51–37.44) were strongly associated with elevated odds of depression.
Conclusions: This study's findings highlight the critical need for targeted interventions and support systems tailored to address gender disparities, housing conditions, health status, support networks, and stigma among persons with TB in Ghana. By addressing these factors, healthcare providers and policymakers can enhance mental well-being, promote treatment adherence, and ultimately improve health outcomes in this vulnerable population.

OA05-134-13 Mental health support for people with TB during wartime: Experience of Ukraine

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Background and challenges to implementation: The problem of the emotional state of people during the war, including those with tuberculosis (TB), is worsening. In the current situation, most Ukrainian do not seek help from specialists. Because of this, efforts should focus on a person-centered model of psychological support for people with TB to ensure continuation of their anti-tuberculosis treatment.

Intervention or response: With this in mind, the Alliance for Public Health provides medical and psychosocial services (MPSS) to TB patients as part of the comprehensive patients-centered programmatic approach. People with TB are screened for anxiety and depression using the Patient Health Questionnaire (PHQ) and Hospital anxiety and depression scale (HADS); based on the results of the assessment they are provided with psychological counseling

Results/Impact:

Year	The number of people with TB at the MPSS	Of which are covered by the services of a psychologist	%	The number of people with TB who have interrupted treatment	Of which are covered by the services of a psychologist	%
2022	8426	832	9.8	507	29	5.7
2023	7686	1593	20.7	258	29	11.2

The total number of people with TB at the MPSS was 16,112 in 2022-2023. Of them, 9.8% and 20.7%, respectively, received the services of a psychologist according to the results of the screening questionnaire conducted on the PHQ and HADS scales. Out of the 765 individuals who had TB and interrupted their treatment during the war, 92.5% of them did not display symptoms of anxiety or depression that met the criteria for receiving psychological support based on the screening questionnaire results. As a result, they did not receive any psychological support.

Conclusions: The screening questionnaires based on the PHQ and HADS scales are not effective enough to identify psychological problems that may hinder treatment. As such, the role of the psychologist remains critical.

OA05-135-13 Evaluating depression intensity with the PHQ-9 scale among people with drug-resistant TB in Vietnam

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Background: Depression significantly impacts global health, notably affecting those with multidrug-resistant tuberculosis (MDR-TB), a major health concern. The interaction between depression and MDR-TB can hinder treatment adherence, increase complications, and worsen outcomes. Studies reveal varied depression rates among MDR-TB patients, highlighting an urgent need for care models that include mental health support.

Such integrated approaches are crucial to improve treatment compliance and the success of MDR-TB management, addressing both the psychological and physical aspects of this challenging disease.

Design/Methods: This quantitative study, part of the VSMART clinical trial, assessed depression in drug-resistant TB patients across six Vietnamese provinces using the PHQ-9 scale. Data from 250 participants were collected through questionnaires and analyzed with descriptive statistics, focusing on depression levels and their correlation with treatment adherence and patient knowledge.

Results: In this study involving 250 MDR-TB Vietnamese patients, the demographic breakdown revealed an average age of 42.25 years, with the majority (51.6%, 129 patients) between 30 and 50 years old.

Occupation-wise, 63.6% (159 patients) were unemployed or self-employed. Regarding treatment history, 74.4% (186 patients) had undergone TB treatment once.

The depression assessment using the PHQ-9 scale showed no depression in 34.4% of patients, mild depression in 36.8%, and moderate depression in 14%. Notably, those who forgot their TB medication reported higher depression levels (OR = 0.5; p = 0.032), and patients with lower TB knowledge scores had a depression rate of 70.2%.

Conclusions: This study reveals a high prevalence of depression among drug-resistant TB patients in Vietnam, significantly linked to treatment adherence and patient education. It underscores the necessity of incorporating mental health support into TB treatment plans to improve patient outcomes and reduce the public health burden of TB.

OA05-136-13 Co-design for peer-led mental health and TB services integration in Pune, India: A qualitative study

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Background: Approximately one in seven people in India are affected by mental health (MH) conditions. The prevalence of MH conditions like depression and anxiety is elevated among people with tuberculosis (TB). Integrating MH care into TB treatment has the potential to improve outcomes for both conditions. Engaging people with lived experience in the co-design and delivery of integrated MH-TB treatment would promote the acceptability and sustainability of the integrated care model.
This study aimed to co-design a peer-led TB-MH integration model, including tailored implementation strategies, with people with lived experience of MH conditions and TB treatment.
Design/Methods: This study in Pune, India was nested within TB Aftermath, an ongoing post-TB active case finding study among people who have recently completed TB treatment. Data collection involved 25 in-depth interviews and 4 focus group discussions with TB survivors with lived experience of MH, their family members, and TB and MH providers.
We used the Consolidated Framework for Implementation Research and implementation mapping to co-design a peer-led integrated care model.
Results: TB survivors (n=6) expressed the importance of family and social support; and its impact on their treatment journey. Providers (n=6) shared that stigmatization of such conditions can act as a barrier to seeking care. Gaps in seeking MH services included lack of awareness about MH, and community perspectives about MH treatment which were limited to consuming medication.
Suggestions for integrated interventions included raising awareness about MH conditions and existing MH services among TB providers, regular MH screening and counseling for TB patients at the time of diagnosis with regular follow-ups, and engaging TB survivors to share their experiences with current patients in group settings.
Conclusions: Working with people with lived experiences provides unique perspectives into MH and TB integration. Understanding patient journeys and current health systems may provide valuable insights for intervention implementation and sustainability.

OA05-137-13 Breaking barriers: Combining DOTS integration and TB screening for improved case detection in mental health settings

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Background and challenges to implementation: Mental health disorders like smoking and alcohol use disorder are major contributors to the TB epidemic. The End TB strategy recognizes the management of comorbidities as a crucial approach to ending TB.
Intervention or response: Over a decade ago, Neuropsychiatric hospital Aro expanded its services to provide comprehensive medical care including general and specialized care, to destigmatize mental health services. Ogun State Tuberculosis, Leprosy, and Buruli Ulcer Control Program established Directly Observed Treatment Short course (DOTS) services in the hospital in the second quarter of 2021.
Health workers were trained to screen, diagnose, and treat TB. A Cough Officer screened patients for TB at various service delivery points. Collected samples were transported to a GeneXpert site by a designated specimen rider and TB commodities were supplied. The laboratory team was empowered on sputum smear microscopy for follow-up investigations. Supportive supervisions were conducted to improve TB services.
Results/Impact: Before the intervention, TB services were limited, and patients were referred to other health facilities. From 2021 to 2023, a total of 1,662 individuals with presumptive TB were identified, and 104 TB patients were initiated on treatment. In 2023, 10,200 (85%) Outpatient Department (OPD) attendees were screened for TB. Out of these, 546 (5.3%) were presumed to have TB, 545 (99.8%) were evaluated, 32 (5.9%) were diagnosed and 30 (93.8%) started TB treatment. Among 41 notified TB cases in 2023, five (12.2%) had TB/mental health disorder comorbidity. The Treatment Success rate for patients who initiated treatment in 2022 was 73.9%. Although the inadequate number of screening officers was challenging, healthcare workers were also trained to screen for TB.

Conclusions: The results accentuate the potential benefits of integrated service delivery models in addressing the dual burden of TB and mental health conditions. Continued efforts to strengthen integrated TB/mental health services are essential to improving health outcomes.

OA05-138-13 Integrated mental health and TB services in Montserrado County, Liberia

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Background: Montserrado County faces high tuberculosis (TB) stigma and burden (333 per 100,000), with a treatment success rate of only 58% (3,686 out of 6,316 cases). The Carter Center, in collaboration with the National Leprosy and Tuberculosis Control Program and other partners, cross-trained mental health (MH) and TB staff while increasing awareness and access to peer support networks to address these challenges.
Design/Methods: The project supported training of 247 community health volunteers on TB screening and referral, 128 clinicians in integrated TB and MH service delivery, and 13 nurses and physician assistants on basic TB screening, referral, treatment, and reporting across 46 TB and MH facilities.
By partnering with civil society organizations such as Cultivation for Users Hope and Mental Health Reporters' Network, TB case detection was enhanced through peer support and public broadcasting.
Results: By the end of Q2, 10,711 individuals were screened, representing about 40% of the targeted population. Moreover, 5,496 [n=6,559 (83%)] people were tested for TB, 2,395 (36%) received a diagnosis of TB, and 2,229 (93%) were initiated on treatment. During the intervention period, the average TB case detection reported per quarter for Bac+ TB increased by 17% from baseline (697 to 814 cases) and All Forms TB increased by 5% (1,145 to 1,197 cases).
Overall, the treatment success rate increased by 16% (58% to 74%). Of those diagnosed with TB, 174 people (7%) had comorbid MH or substance use conditions. The project observed an 83% (5,496) testing rate (n= 6,599) for suspected TB cases and improved linkage to TB and MH care.
Conclusions: TB case detection and the treatment success rate has improved in Montserrado Country for the last two successive treatment cohorts, demonstrating the efficacy of integrating MH services into TB care.

OA05-139-13 Prevalence of mental health issues at different stages of TB treatment: Insight from rural India

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Background and challenges to implementation: Although tuberculosis (TB) is a major burden, it is important to consider the psychological effects of the disease on an individual. Physical symptoms of TB, combined with the difficulties of adhering to treatment regimens and comorbidities can lead to increased mental health issues. Socio-economic factors and limited healthcare access exacerbate these problems. Due to the close association between mental health issues and tuberculosis, treating both conditions may lead to better outcome.
Intervention or response: WHO Self-Reporting Questionnaire (SRQ) was used to screen individuals aged 18 or above person with drug-sensitive TB (PwDSTB) and person with drug-resistant TB (PwDRTB). For PwDSTB, assessments were conducted in three phases: Initial, after 2 months, and after treatment completion; for PwDRTB, quarterly. Those scoring 15 or above or reporting suicidal tendencies were considered screened positive and linked to psychologists for counseling.
Results/Impact: 1441 PwDSTB were screened at the start of treatment, where 16% were screened positive. 67% of them were connected to professional counselors. During the 2-month follow-up, 507 people were screened, of which 9% were screened positive. At treatment completion, 81 were screened and only 2% were found to be positive. For PwDRTB, out of 165 people screened, 27% were found to be positive.
After 3 months of treatment, 27 were screened, and 8 were positive (30%). The overall prevalence of mental health issues at any stage of treatment among PwTB was 14%, and among PwDRTB, was 28%. 42% of total females were screened and over 50% were positive, compared to only 15% of males who screened positive.

	Overall SRQ Screening	Overall SRQ Screening Positive
PwDSTB	2029	249 (14%)
PwDRTB	192	53 (28%)
Total (PwTB)	2221	302 (14%)

Conclusions: The study signifies the prevalence of mental health issues among PwTB. As treatment advances, the prevalence of mental health issues declines among PwDSTB while no change was observed among PwDRTB.
The issues were more pronounced among females. There is a need to integrate mental health into the TB care cascade.

OA05-140-13 Integrated harm reduction strategies for TB in conflict-affected regions of Myanmar

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Background and challenges to implementation: Drug use persists a major public health challenge in Myanmar particularly in Kachin, Shan state, and Sagaing region. Injection drug use is prevalent in these areas, exposing people who use or inject drugs (PWID/PWUD) at significant risk of contracting blood-borne viruses, opportunistic infections especially TB, and developing drug use disorders.
In addition, the limited availability of Methadone Maintenance Therapy (MMT) and TB screening and treatment services further exacerbates this situation since the beginning of political instability in 2021.
Intervention or response: Asian Harm Reduction Network (AHRN) provides harm reduction services, including provision of MMT in these three regions to address high TB/HIV transmission among PWID/PWUD.
Into MMT programs, AHRN integrated TB screening and treatment services where clients receiving MMT undergo regular TB screening at the respective clinics or service centers and are offered treatment accordingly.
Moreover, AHRN mobilizes digital X-ray machine from mobile team to MMT clinics, enabling a screen-for-all approach.
Results/Impact: Programmatic data from 2021 to 2023 reveals that 8,844, 9,837, and 9,231 clients accessed AHRN's MMT services respectively. Remarkably, there was a significant increase in the proportion of clients screened for TB from 31% (2,723 out of 8,844) in 2021 to 63% (6,207 out of 9,837) in 2022, which further rose to 73% (6,733 out of 9,231) in 2023 despite ongoing challenges. People diagnosed with TB also increased from 132 in 2021 to 248 in 2022, and 276 in 2023.
Conclusions: AHRN efforts in Myanmar have shown promising results in tackling drug use and TB challenges. By integrating TB screening and treatment into MMT programs, more people are getting screened for TB, and the number of TB case notification is going up.
These findings highlight the importance of comprehensive harm reduction strategies in combating public health crises and emphasize the need for continued support and expansion of integrated services in affected communities.

OA06 Transmission dynamics of M. tuberculosis: Insights and challenges

OA06-116-13 Transmission networks with whole-genome sequencing data

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Background: Characterizing transmission dynamics in tuberculosis outbreaks is highly relevant for TB control. The increasing availability of next-generation sequencing has improved our ability to analyze transmission dynamics at high resolution. The 'TransPhylo' method, for example, has helped to identify risk factors for transmission, and transmission timing and location.
However, it requires a fixed, phylogenetic tree, and can handle a limited amount of data. Other tools have similarly serious limitations.
Design/Methods: We present a Bayesian method to simultaneously estimate the transmission network and timed phylogenetic trees using whole-genome sequence (WGS) data. It estimates individuals' times of infection and the time to infecting others or to sampling. It infers where individuals were likely missed, and the size and duration of cryptic chains of transmission.
We validated our method on simulated data, and analyse an outbreak with 86 tuberculosis isolates in Germany (Roetzer et al, 2013).
Results: In the outbreak data, timed phylogenetic trees are estimated to have an earlier and more certain most recent common ancestor (14.6-17.7 years before the last sample) than in a coalescent model (16.2-28.9 years). We estimate a mean of 19 unsampled individuals contributing to transmission. The average maximum length of cryptic chains of transmission was 2.74 individuals.
Transmission events are uncertain, but there are 44 pairs of known individuals with posterior probability of transmission > 0.25 between them.
Conclusions: Whole-genome sequencing data has the potential to reveal quantitative information about the timing and dynamics of TB transmission, but inference of transmission is challenging and leaves considerable uncertainty.
Our method overcomes serious limitations of previous methods, identifies transmission chains that were likely missed and estimates who infected whom and when, accounting for uncertainty.

OA06-117-13 Predictive factors for co-membership in a transmission network among individuals with TB in Blantyre, Malawi

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Background: Understanding factors associated with tuberculosis (TB) transmission can improve strategies for ending TB. We use data from Blantyre, Malawi to infer recent TB transmission events and investigate factors associated with transmission.

Design/Methods: We used the R package TransPhylo to reconstruct putative transmission networks using whole genome sequencing data from individuals diagnosed with TB in Blantyre. We used the R package GenePair to fit dyadic (paired) regression models to estimate the association between membership in the same transmission network and several individual- and pair-level factors (age, sex, HIV status, HIV clinic, TB diagnosing clinic, home distance).

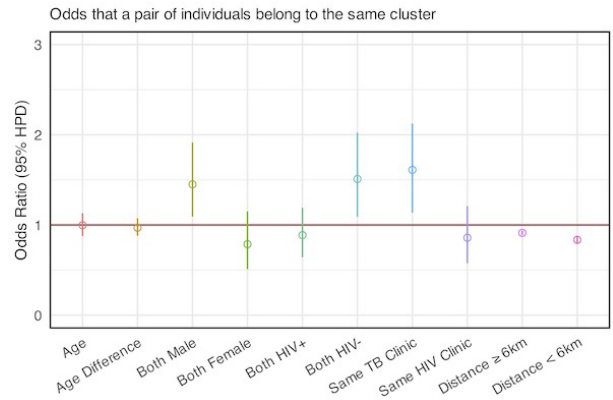
Within the largest transmission networks, we investigated associations between the number of small nucleotide polymorphism (SNP) by which pairs of sequences differ and these same factors.

Results: There were 3,856 individuals with culture positive TB between 2015 and 2019, and we successfully sequenced 717 diagnostic isolates.

Overall, 393 (56%) of individuals with sequenced isolates belonged to one of 130 transmission networks. Two individuals had a higher adjusted odds of belonging to the same transmission network if they were diagnosed in the same clinic, were both HIV negative, and were both male.

In addition, the distance between home locations was associated with a lower adjusted odds of belonging to the same transmission network, with a larger effect for distances under 6 km.

Within the largest transmission network, diagnosis at the same clinic was associated with smaller SNP distances and geographic distance was associated with larger SNP distances on average.



Conclusions: We identified several factors independently associated with an increased odds that two individuals belong to the same transmission network in Blantyre, Malawi. These findings improve understanding of how transmission occurs in a high TB and high HIV prevalence setting.

OA06-118-13 Longitudinal transmission of multi-drug-resistant TB in China: A population-based genomic epidemiology analysis

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Background: MDR-TB is a formidable barrier to its prevention and management. Understanding its transmission dynamics is essential for effective containment. Utilizing genomic epidemiology, our study investigated the latest trends in MDR-TB transmission and explored potential risk factors facilitating its spread in Shanghai, the most populous city in China.

Design/Methods: This study included all patients with bacteriologically confirmed tuberculosis and MDR in Shanghai from January 1, 2005 to December 31, 2018. Genomic DNA was extracted from these isolates for WGS analysis. Putative transmission clusters were identified in the resulting M–L tree using TreeCluster, testing 2 distance thresholds of 0.0003 and 0.0006 substitutions/site, corresponding to approximate SNP thresholds of 20 and 40, respectively. Timed phylogenetic trees for each large cluster were built with BEAST2 v2.6.3.

Results: Our analysis of 1,100 MDR-TB strains in Shanghai revealed that 1,007 belonged to Lineage 2 and 93 to Lineage 4, with 593 strains (53.91%) showing high-confidence compensatory mutations. By applying thresholds of 0.0003 and 0.0006, we identified cluster formation rates of

48.36% and 55.36%, respectively, and observed MDR-TB samples diagnosed 13 and 12 years apart. We discovered a significant link between compensatory mutations and the rpoB S450L mutation (p<0.0001).
Our findings highlighted two divergent patterns of MDR-TB spread, characterized by the distinct genomic and transmission dynamics of clusters C1 (n=35) and C2 (n=27). C1 exhibited a more complex, scattered distribution, while C2 was characterized by a centralized pattern with each strain carrying compensatory mutations (Fig 1).
Fig 1. (A) Characterization of genomic epidemics and spatial distribution of C1. (B) Characterization of genomic epidemics and spatial distribution of C2.
Conclusions: The persistent long-term diffusion of MDR-TB continues without diminution even within the urban regions of China, areas typically characterized by an abundance of healthcare resources.

OA06-119-13 Quantifying subclinical transmission of TB using whole genome sequencing and Bayesian inference: A population-based study in Taiwan

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Background: The prevalence of tuberculosis disease without recognizable symptoms (subclinical tuberculosis) has shown to be high in high-burden settings. Recent modeling studies suggested that the contribution of subclinical tuberculosis to disease transmission could be substantial. Using a population-based whole genome sequencing (WGS) study, we quantified the proportion of subclinical transmission among case pairs of putative direct transmission.
Design/Methods: We used WGS to analyze a total of 3,787 TB cases, accounting for 82% of all notified cases between January 2019 and November 2023 in Kaohsiung City, Taiwan. Putative large transmission clusters (n>=10) were identified based on a SNP distance of 12. Transmission trees were further inferred by implementing the *TransPhylo* package which integrated the information of tuberculosis sampling date and genetic relatedness under a Bayesian statistical framework. Symptom onset was based on self-report from the patients.
Results: We identified 12 large clusters, with case numbers ranging from 10 to 50 per cluster. Using a cut-off of 0.4 for the inferred transmission probability, we found 65 direct transmission pairs within these large clusters. Out of the 24 transmission pairs for which the infectors reported symptom information, the putative timing of transmission occurred before the onset of symptoms for the infectors in a median of 16 transmission pairs (67%, 95% CrI:46%-75% based on 10,000 sampling of the posterior distribution of the transmission time).
Conclusions: The analysis of whole genome sequencing data, combined with Bayesian transmission inference considering the natural history of the disease, provided quantitative evidence of the contribution of subclinical tuberculosis to transmission.

OA06-120-13 Implementing a community transmission study in a TB-endemic setting: Lessons learned from TARGET-TB (Targeting TB transmission hotspots to find undiagnosed TB in South Africa)

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Background: Community transmission remains a primary driver of TB incidence, yet studying it, especially in TB-endemic settings, poses significant challenges. Obstacles include identifying all individuals with infectious TB within a community, collecting high-quality respiratory samples, and obtaining comprehensive mobility data to approximate the spatial scale of transmission.
This preliminary analysis quantifies losses along the TB diagnostic cascade to understand the implications for community TB transmission.
Design/Methods: Between July 2022 – March 2024, we conducted a cross-sectional study within primary healthcare clinics responsible for TB treatment initiation (N=2) in Tongaat, KwaZulu-Natal, South Africa. TB registry data identified individuals recently diagnosed with pulmonary TB by GeneXpert Ultra for enrollment into the TARGET-TB study.
Participants provided sputum for genomic analysis and underwent structured interviews to capture/geocode frequently visited locations in the past year.
We quantified losses at each step, from initial TB symptom screening to obtaining genomic and spatial data, necessary for studying community transmission.
Results: A total of 20,928 clinic attendees reported at least two TB symptoms and underwent TB testing via GeneXpert, X-ray, or LAM. Among these, 1,376 (6.6%) were deemed inconclusive due to sputum jars leaking during transportation (N=743), failure to meet lab standards (N=166), or producing an unsuccessful result (N=467).
Of the successful results, 691 (3.5%) were diagnosed with TB, with 478/691 (69.0%) confirmed bacteriologically.
Study staff successfully traced 460/478 (96.2%) TB patients, enrolled 410/460 (89.1%) eligible participants, and geolocated a total of 1,371 locations (~4 locations/partici-

pant) within Tongaat. Among the 372 sputum specimens processed, 273/372 (73.4%) were culture positive, and 220/273 (80.6%) underwent WGS, representing 46.0% (220/478) of all bacteriologically confirmed TB (Figure).

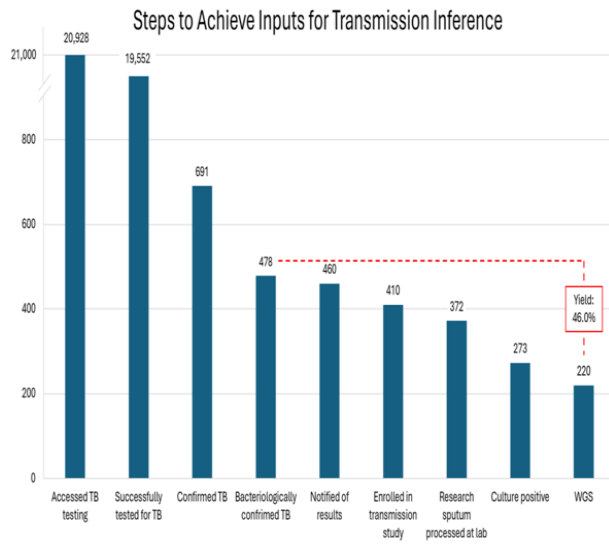

Figure.

Conclusions: Losses along the diagnostic path, from identifying, confirming, culturing, and sequencing TB, to capture the dynamics of community TB transmission were not insignificant. These challenges underscore the complexity of studying community transmission in TB-endemic settings.

OA06-121-13 Comparison of the transmissibility of isoniazid-resistant TB and drug-susceptible TB

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Background: Prior epidemiological studies revealed that isoniazid-resistant (INH-R) tuberculosis (TB) was associated with a reduced risk of transmission compared to drug-susceptible TB, but the results were inconsistent and affected by the limited sample size and suboptimal study design. We assessed the relative transmissibility of INH-R TB compared with that of pan-susceptible (DS-TB) in a population-based whole-genome sequencing study in Taiwan.

Design/Methods: We conducted a prospective, population-based study from January 2019 to July 2023 in Kaohsiung, Taiwan. Whole-genome sequencing was completed in 3,796 of 4,565 (83%) culture-positive TB cases. We defined INH-R TB as isolates carrying any INH resistant conferring mutations, identified by the *TBprofiler* tool. We assessed the transmissibility by defining genomic clusters with a single-nucleotide-polymorphisms (SNP) distance of 5. Logistic regression was used to analyze the risk of clustering for INH-R TB compared to DS-TB within clusters.

Furthermore, we performed sensitivity analysis on different SNP cutoffs to define genomic clustering and different definitions of INH-R TB, including genotypic mono INH-R TB, genotypic resistance to INH but susceptible to rifampicin (HrTB), and phenotypic resistance to INH (DST INH), to assess the consistency of the results regarding transmissibility between INH-R TB and DS-TB.

Results: Among 3,796 isolates with sequencing results, 336 were INH-R TB and 3,085 were DS-TB. The clustering rate of INH-R TB and DS-TB were 11% (36/336) and 17% (523/3085), respectively. INH-R TB was associated with reduced odds of genomic clustering compared to DS-TB after adjusting age, TB lineage, and region (adjusted odds ratio (aOR): 0.53; 95% confidence interval (CI): 0.37—0.78). Similar results were observed using different definitions of INH-R TB (Figure).

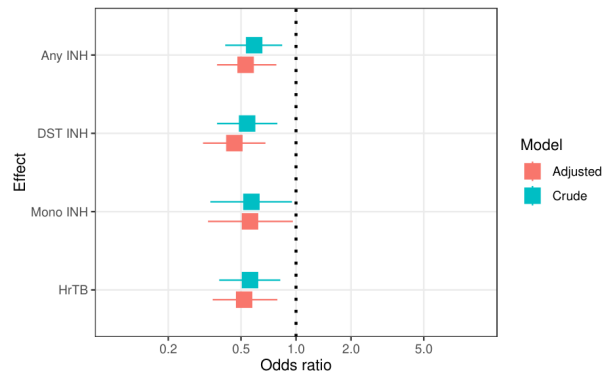

Figure. Sensitivity analysis on different definitions of isoniazid (INH) resistance on the relative transmissibility of INH resistance.

Conclusions: Our findings indicated that INH-R TB exhibited lower transmissibility than DS-TB, suggesting the potential fitness cost associated with isoniazid resistance mutations.

OA06-122-13 The impact of diabetes mellitus on transmission dynamics of TB

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Background: Diabetes mellitus (DM) increases the risk of Tuberculosis (TB) progression, posing a challenge to TB control efforts. The escalating global DM prevalence presents an emerging threat to TB control, but it is not clear whether DM affects TB transmissibility.
Design/Methods: Between 2009 and 2012, we enrolled 3,109 microbiologically-confirmed index patients with pulmonary TB and their 12,767 household contacts (HHCs) whom we followed for one year. Index patients were classified as having DM if they self-reported DM or were under DM treatment.
We assessed the association between index patients' DM status and the occurrence of TB infection and disease in their HHCs. Considering that chest radiographical abnormalities may vary between patients with and without DM, we repeated the analysis stratified by the presence of cavitary disease in the index patients.
Results: Of 12,767 contacts, 1,256 (9.8%) were exposed to TB patients with DM. DM status of index patients was not associated with altered risk of TB infection as measured by a tuberculin skin test in HHCs (aRR [95% CI] 1.07 [0.96-1.19]).
Furthermore, index patient DM was associated with a reduced incidence of TB disease in HHCs (aHR=0.33 [0.13-0.86]). Both of these associations were further reduced when we restricted the analyses to HHCs exposed to a TB patient with cavitary disease (risk of infection: 0.77 [0.46-1.29]; risk of incident TB: 0.18 [0.03-1.30].
Conclusions: In this large cohort study, DM did not increase the transmission of TB from index patients to their HHCs.
This finding likely stems from differential chest radiographic features between DM and non-DM patients. Our results suggest a more intricate impact of DM on the TB epidemic trajectory than previously understood.

OA06-123-13 Risk of within-household M. tuberculosis transmission by HIV/ART and symptom status of people starting treatment for pulmonary TB in rural KwaZulu-Natal, South Africa

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Background: Understanding relative infectiousness is key to guiding effective tuberculosis case-finding. We aimed to compare relative infectiousness among people with pulmonary tuberculosis (PWTB) starting tuberculosis treatment by:
i. HIV/ART and;
ii. Symptom status (in PLHIV on ART) by assessing the risk of within-household *Mycobacterium tuberculosis* transmission using the prevalence of QuantiFERON-TB Gold Plus (QFT) positivity among child household contacts (2-14 years).
Design/Methods: We recruited programmatic sputum-positive index PWTB (≥15 years) starting treatment at 12 health facilities in uMkhanyakude district, KwaZulu-Natal. A multivariable mixed-effects logistic regression with marginal standardization was used to derive predicted probabilities of QFT-positivity and relative risk (RR) of intra-household transmission by index PWTB characteristic of interest.
Symptom status analysis was restricted to PLHIV on ART, who received symptom-agnostic screening in clinic as part of HIV care. The minimal adjustment set was informed by directed acyclic graphs. We repeated analyses restricting to index PWTB who were sputum-positive on repeat (research) testing with Xpert MTB/RIF Ultra and culture.
Results: Between February 2022-December 2023, 819 child household contacts (of 306 index PWTB) were enrolled, of whom 755 (92%) had a valid QFT result.
Overall QFT-positivity was 18%. Table shows the no. of index PWTB, no. of child contacts, predicted probability of QFT-positivity and the RR of each index PWTB characteristics.

		(a) Child contacts of all PWTB				(b) Child contacts of PWTB sputum-positive on repeated testing as part of study			
		Unadjusted analysis		Adjusted analyses		Unadjusted analysis		Adjusted analyses	
		Proportion QFT-positive (n/N)	Unadjusted RR (95% CI)[a] (i) N=755; (ii) N=361	Marginal predicted probability of QFT-positivity [b]	Adjusted RR (95% CI) [b] (i) N=732; (ii) N=356	Proportion QFT-positive (n/N)	Unadjusted RR (95% CI)[a] (i) N=496; (ii) N=187	Marginal predicted probability of QFT-positivity [b]	Adjusted RR (95% CI) [b] (i) N=477; (ii) N=184
(i) HIV/ART status (no. of index PWTB; N=293)	HIV- (n=102)	0.24 (60/253)	Ref	0.25	Ref	0.29 (56/192)	Ref	0.31	Ref
	HIV+ on effective ART (n=138)	0.16 (59/361)	0.6 (0.4 – 0.9)	0.14	0.6 (0.3 – 0.8)	0.25 (47/187)	0.8 (0.5 – 1.1)	0.21	0.7 (0.4 – 1.0)
	HIV+ not on effective ART (n=54)	0.14 (19/141)	0.7 (0.3 – 1.0)	0.18	0.7 (0.4 – 1.1)	0.15 (18/117)	0.6 (0.3 – 1.0)	0.21	0.7 (0.3 – 1.0)
(ii) Symptom status (Restricted to PWTB on effective ART; N=138)	No symptoms reported (n=17)	0.17 (9/52)	Ref	0.15	Ref	0.26 (8/31)	Ref	0.24	Ref
	At least one symptom reported (n=121)	0.16 (50/309)	0.7 (0 – 1.5)	0.19	1.2 (0.2 – 2.3)	0.25 (39/156)	0.7 (0 – 1.5)	0.24	1.0 (0 – 2.1)

[a] Adjusted for household clustering

[b] Adjusted for adjusted for household clustering by country and a priori covariates informed by directed acylic graph (age of index, sex of index, treatment clinic, household socioeconomic score, age of child contact)

Table. Unadjusted and adjusted analyses of risk of intra-household transmission by index PWTB characteristic of interest.

Contacts of PWTB on effective ART had a 40% lower risk of being QFT-positive compared to contacts of HIV-negative PWTB (aRR 0.6: 95% CI: 0.3 – 0.8). There was no evidence for a difference in risk of intra-household transmission by symptom status of PWTB on effective ART (aRR 1.2: 95% CI: 0.2 – 2.3).

Conclusions: We found no evidence that effective ART (among people with HIV) or symptoms in those on effective ART increased the infectiousness of sputum-positive PWTB. TB case-finding strategies need to encompass people taking ART and those that are asymptomatic.

OA07 Identifying and managing TB infection

OA07-151-13 Can preceding symptoms predict the occurrence of hypersensitivity reaction with 3HP?

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Background: Treating TB infection (TBI) with 12 once-weekly directly observed doses of rifapentine and isoniazid (3HP) is non-inferior to 9-months daily isoniazid (9H) in preventing progression to active TB.

However, 3.8% of participants in the largest study of 3HP experienced hypersensitivity reaction (HR), a serious adverse event. Identifying individuals at risk of HR could enhance the safety and uptake of 3HP.

Design/Methods: We conducted a case-control study nested within the intervention arm of a cluster-randomised controlled trial of mass community TBI treatment in CaMau, Vietnam. Eligible participants were diagnosed using tuberculin skin test. Active TB was excluded with normal CXR and negative Xpert test or abnormal CXR with two negative M.tuberculosis cultures.

The study population received ≥3 doses of 3HP. HR was defined as:

1. Systolic blood pressure <90 mmHg, urticaria, angioedema, acute bronchospasm, or conjunctivitis or;
2. Concurrently ≥four of weakness, fatigue, nausea, vomiting, headache, fever, aches, sweats, dizziness, shortness of breath, flushing, or chills. Controls started treatment concurrently but did not develop hypersensitivity.

We analysed symptoms in the two weeks preceding HR in cases and the same two weeks in controls.

Results: From June-September 2023, 399 hypersensitivity reactions occurred from 5969 started on 3HP(6.68%), with the majority(320) after three doses. Female participants comprised 58.8% of cases compared to 36.7% of controls, with no other significant baseline differences. Symptoms preceding HR were reported by 63.3% of cases versus 31.2% of controls (OR 3.81 95%CI = 2.72–5.33 P<0.0001). Fever, dizziness, aches and stomach discomfort were strongly associated with subsequent HR.

Loss of Appetite	-	327 (96.0%)	327 (99.1%)	OR = 4.00	P = 0.0216
	+	12 (3.7%)	3 (0.9%)	95%CI = 1.06-22.25	
Nausea	-	289 (87.8%)	306 (92.7%)	OR = 1.76	P = 0.0342
	+	40 (12.3%)	24 (7.3%)	95%CI = 1.01-3.14	
Rash	-	295 (90.2%)	317 (96.1%)	OR = 2.65	P = 0.0030
	+	32 (9.8%)	13 (3.9%)	95%CI = 1.32-5.60	
Eye Symptoms	-	325 (99.4%)	325 (98.5%)	OR = 0.4	P = 0.2594
	+	2 (0.6%)	5 (1.5%)	95%CI = 0.04 – 2.47	
Fever	-	245 (74.9%)	308 (93.3%)	OR = 4.69	P < 0.0001
	+	82 (25.1%)	22 (6.7%)	95% CI = 2.79 – 8.10	
Numb	-	324 (99.4%)	329 (99.7%)	OR = 2.03	P = 0.5557
	+	2 (0.6%)	1 (0.3%)	95%CI = 0.11 – 120.16	
Stomach Discomfort	-	312 (95.4%)	325 (98.5%)	OR = 3.13	P = 0.0292
	+	15 (4.6%)	5 (1.5%)	95 % CI = 1.12 – 8.70	
Sick	-	242 (74.0%)	307 (93.0%)	OR = 4.69	P < 0.0001
	+	85 (26.0)	23 (7.0%)	95% CI = 2.82-8.11	
Aches	-	210 (64.2%)	283 (85.8%)	OR = 3.35	P < 0.0001
	+	117 (36.7%)	47 (14.2%)	95% CI = 2.25 -5.03	
Dizzy	-	265 (80.5%)	309 (93.6%)	OR = 3.55	P < 0.0001
	+	64 (19.5%)	21 (6.4%)	95%CI = 2.07-6.29	

Table: Symptoms in the two weeks preceding HR Symptoms Y/N Cases n=330(%) Controls n=330(%) Unadjusted OddsRatio p-value

Conclusions: We found that fever, dizziness, aches and stomach discomfort while taking 3HP to be the most discriminating for subsequent HR. Developing a predictive model for clinicians to halt treatment pre-emptively is our next step in enhancing 3HP safety.

OA07-152-13 Treatment adherence to an adult levofloxacin formulation in children on multi-drug-resistant TB preventive treatment within the TB-CHAMP trial

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Background: WHO recently recommended levofloxacin as tuberculosis (TB) preventive treatment (TPT) for contacts of multidrug-resistant (MDR)-TB. Although formulations designed for children are a priority, adult levofloxacin formulations are affordable and still used widely.

Design/Methods: TB-CHAMP was a double-blind multi-site randomised trial in South Africa assessing levofloxacin MDR-TPT. Initially children aged 0-4 years, and later also those 5-17 years who were *Mycobacterium tuberculosis*-infected or HIV-positive, with household exposure to an adult with bacteriologically-confirmed MDR-TB, were enrolled. Households were randomized 1:1 to 24-weeks daily levofloxacin (adult 250mg tablets) vs placebo. Competing risk methods were used to assess factors associated with premature treatment discontinuation. Factors associated with poor adherence, defined as taking <80% of overall prescribed doses based on pill counts and treatment cards, were assessed using modified Poisson regression.

Results: Overall, 922 children were randomised, 452 to levofloxacin and 470 to placebo. Median age was 2.8 (IQR 1.3-4.2) years.

155 (17%) children discontinued treatment prematurely; 70 stopped for clinical reasons (including 7 for adverse events), and 85 for non-clinical reasons (Table). The likelihood of stopping treatment for non-clinical reasons was similar between treatment groups. In adjusted analyses, baseline factors associated with premature treatment discontinuation for non-clinical reasons were previous receipt of herbal/traditional medicine and having ≥2 typical symptoms of TB (TB already excluded). Children who slept in the same room as the index patient were less likely to discontinue treatment for non-clinical reasons than those who did not.

Among 818 children with information on treatment adherence who had not stopped treatment prematurely for clinical reasons, 61 (7%) had poor adherence. The pro-

portion of children with poor adherence was similar between treatment groups. Younger age was associated with poor adherence.

Outcomes	Levofloxacin	Placebo
1. Discontinued treatment prematurely	75/452 (17%)	80/470 (17%)
1a. Discontinued treatment for clinical reason	31 Reason: late screening failures (n=17*), presumed/diagnosed TB disease (n=1), adverse event (n=6), new exposure to drug-susceptible TB (n=7)	39 Reason: late screening failures (n=12*), presumed/diagnosed TB disease (n=11), adverse event (n=1), new exposure to drug-susceptible TB (n=13), other (n=2)
Sub-hazard ratio (95% CI) of treatment discontinuation for clinical reason, levofloxacin vs. placebo	0.79 (0.42-1.49), P=0.47	
1b. Discontinued treatment for non-clinical reason	44 Reason: moved away/ lost to follow-up (n=14), withdrew consent (n=18), non-adherent (n=10), other (n=2)	41 Reason: moved away/ lost to follow-up (n=18), withdrew consent (n=16), non-adherent (n=7)
Sub-hazard ratio (95% CI) of treatment discontinuation for non-clinical reason, levofloxacin vs. placebo^	1.10 (0.66-1.82), P=0.72	
2. Poor treatment adherence (<80% of allocated doses taken)^	34/405 (8%)	27/413 (7%)
Risk ratio (95% CI) of poor adherence, levofloxacin vs. placebo	1.27 (0.73-2.22), P=0.40	

* Reason for screening failure: TB disease at baseline (n=6), index case with isoniazid-sensitive (n=18) or fluoroquinolone-resistant TB (n=4), other (n=1).
^ Excluded children without information on treatment adherence and those who had stopped treatment for clinical reasons.

Premature treatment discontinuation and poor adherence of levofloxacin MDR-TB preventive therapy among child and adolescent household contacts in TB-CHAMP.

Conclusions: Adherence to levofloxacin MDR-TPT was good overall among paediatric household contacts. It is important to identify approaches to improve adherence, including counselling and support for caregivers.

OA07-153-13 High prevalence of fluoroquinolone resistance and *katG* mutations in adult index patients in a multinational multi-drug-resistant TB prevention trial

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Background: Fluoroquinolones have recently been recommended as preventive treatment for contacts of adults with multidrug-resistant tuberculosis (MDR-TB).
We aimed to describe drug susceptibility testing (DST) patterns in adults with pulmonary MDR-TB whose household members were approached to participate in ACTG A5300B/IMPAACT 2003B/PHOENIx, an ongoing clinical trial evaluating efficacy and safety of TB preventive treatment with delamanid versus isoniazid.
Design/Methods: DST results from respiratory specimens from local TB programs were obtained for the adult MDR-TB index patients. If resistance to both isoniazid and rifampicin was not adequately documented by phenotypic and/or molecular tests (e.g., Xpert® MTB/RIF Ultra, GenoType® MTBDR*plus*), a screening sputum was tested using GenoType® MTBDR*plus* to confirm MDR-TB. We tested for homogeneity of prevalence of fluoroquinolone resistance by country and provide a Monte Carlo estimate of Fisher's Exact Test p-value.
Results: From June 2019 to October 2023, 1347 adults with documented MDR-TB from 28 sites (13 countries) in Africa, Asia, Central and South America were enrolled. Median age was 37 years (interquartile range 27–48); 37% were female; 27% were living with HIV.
Of these, 801 (59%) had fluoroquinolone DST results reported by molecular and/or phenotypic methods, and 164 (20% of 801) had fluoroquinolone resistance. Documented fluoroquinolone resistance prevalence varied from 0% in Haiti (0/47) and Zimbabwe (0/6) to 86% (38/44) in Vietnam (p<0.001).

GenoType®MTBDR*plus* isoniazid mutation results were reported in 876 patients, with *inhA* mutations alone in 226 (26%) and *katG* mutations (with or without *inhA* mutations) in 650 (74%), indicating high-level resistance.

Drug susceptibility pattern (any test) (N=1347)	INH-r, RIF-r, FLQ-s, Inj-s	633 (47%)
	INH-r, RIF-r, either FLQ-r or Inj-r but not both	122 (9%)
	INH-r, RIF-r, FLQ-r, Inj-r	35 (3%)
	INH-r, RIF-r, FLQ-u or Inj-u	557 (41%)
FLQ susceptibility (any test) (N=801)	Resistant	164 (20%)
	Susceptible	637 (80%)
INH resistance mutations (GenoType® MTBDRplus) (N=876)	inhA only	226 (26%)
	katG only	123 (14%)
	inhA and katG	527 (60%)

Abbreviations: INH, isoniazid; RIF, rifampicin; FLQ, fluoroquinolone; Inj, second-line injectable drugs (aminoglycosides/cyclic peptides); -r, resistant, -s, susceptible; -u, unknown.
Drug susceptibility pattern was provided by the clinical research site staff based on results from local tuberculosis programs; if resistance to both isoniazid and rifampicin was not adequately documented by phenotypic and/or molecular tests (e.g., Xpert® MTB/RIF Ultra, GenoType® MTBDRplus), a screening sputum was tested using GenoType® MTBDRplus to confirm MDR-TB. FLQ resistance was based on drug susceptibility results provided by local tuberculosis programs using phenotypic and/or molecular methods. While all participants had INH resistance, not all had GenoType® MTBDRplus testing or had details on specific mutations reported by the lab.

Conclusions: Of 801 adults with MDR-TB fluoroquinolone DST available, fluoroquinolone resistance was estimated to be 20% overall, varying by country. Of 876 with INH mutation results, 74% had high-level isoniazid resistance. Drug susceptibility patterns in MDR-TB index patients support the need for efficacious TB preventive treatment for household contacts based on individualized risk assessment.

OA07-154-13 Safety profile of levofloxacin preventive treatment for multi-drug-resistant TB: A meta-analysis of the VQUIN and TB-CHAMP trials

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Background: WHO recently recommended tuberculosis preventive treatment (TPT) with levofloxacin for individuals exposed to multidrug-resistant (MDR)-TB. Better understanding of the risk of adverse events (AEs), and how that varies with age, is important.
Design/Methods: VQUIN and TB-CHAMP were independent phase 3 trials evaluating levofloxacin MDR-TPT. Following MDR-TB household exposure, V-QUIN enrolled mainly adults in Vietnam; TB-CHAMP enrolled mainly young children in South Africa. Randomization in both trials was 1:1 at household-level to daily levofloxacin or placebo for 6-months. Individual participant data were pooled across trials. For each pre-defined safety endpoint, the risk ratio comparing the proportion of participants experiencing the relevant endpoint between treatment groups was estimated using modified Poisson regression.
Results: Overall, 2843 (96%) of 2963 participants who commenced study treatment were included; 1922 from VQUIN and 921 TB-CHAMP. Median age was 40 years (IQR 28-52) in VQUIN and 2.8 years (1.3-4.2) in TB-CHAMP.
No association was observed between levofloxacin and grade≥3 AEs, risk ratio (RR) 1.07 (95%CI 0.70-1.65); see Table. Grade≥3 AEs at least possibly related to study drug occurred in more participants in the levofloxacin-group than placebo-group in VQUIN (10 (1.0%) versus 2 (0.2%), respectively), but not in TB-CHAMP.
Levofloxacin was associated with musculoskeletal events (RR 6.36, 4.30-9.42), although not among children <10 years; severe events were rare. Three levofloxacin-receiv-

ing participants developed tendonitis, all grade 1/2. Participants in the levofloxacin-groups were more likely to discontinue treatment early due to AEs in both studies (RR 6.32, 3.43-11.63), mostly due to low-grade events. The likelihood of stopping treatment early for AEs increased with age. Five deaths occurred in the levofloxacin-group and 4 in placebo-group; none related to treatment.

Endpoints	Trial	Levofloxacin	Placebo	Estimated risk ratio (95% confidence interval)	P-value for overall treatment effect	P-value for test of heterogeneity between studies
Grade ≥3 adverse event (AE)	VQUIN	29/960 (3.0%)	19/962 (2.0%)	1.55 (0.87–2.76)		
	TB-CHAMP	14/452 (3.1%)	23/469 (4.9%)	0.67 (0.34–1.31)		
	Overall	43/1412	42/1431	1.07 (0.70–1.65)	0.75	0.06
Grade ≥3 AE at least possibly related to study drug	VQUIN	10/960 (1.0%)	2/962 (0.2%)	5.26 (1.16–23.95)		
	TB-CHAMP	4/452 (0.9%)	8/469 (1.7%)	0.53 (0.16–1.70)		
	Overall	14/1412	10/1431	1.46 (0.65–3.26)	0.36	0.02
Discontinuation of study treatment due to AE	VQUIN	71/960 (7.4%)	11/962 (1.1%)	6.43 (3.42–12.09)		
	TB-CHAMP	6/452 (1.3%)	1/469 (0.2%)	5.25 (0.64–43.13)		
	Overall	77/1412	12/1431	6.32 (3.43–11.63)	<0.001	0.86
Musculoskeletal AE of any grade	VQUIN	220/960 (22.9%)	32/962 (3.3%)	7.02 (4.67–10.56)		
	TB-CHAMP	6/452 (1.3%)	4/469 (0.9%)	1.35 (0.36–5.06)		
	Overall	226	36	6.36 (4.30–9.42)	<0.001	0.01

Combined safety analyses of the VQUIN and TB-CHAMP trials.

Conclusions: There was no evidence observed of serious safety concerns with levofloxacin MDR-TPT in either adults or children. However, low grade AEs affected treatment tolerability, resulting in treatment discontinuation, particularly in adults.

OA07-155-13 Bedaquiline or linezolid resistance without co-occurring fluoroquinolone resistance in the Western Cape, South Africa

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Background: New treatment recommendations for multidrug resistant tuberculosis (MDR-TB: TB resistant to isoniazid and rifampicin) and rifampicin-resistant TB (RR-TB) were released in 2021, prompting a revision of the definitions of TB resistance categories. Since then, pre-extensively drug-resistant TB (pre-XDR-TB) is defined as TB caused by Mycobacterium tuberculosis (Mtb) strains that fulfil the definition of MDR/RR-TB and are resistant to moxifloxacin or levofloxacin. XDR-TB is defined as TB caused by pre-XDR Mtb strains that are also resistant to bedaquiline and/or linezolid.
The goal of the new WHO definitions was to define groups of TB patients who require complex treatment regimens.
Design/Methods: We performed the Deeplex Myc-TB assay on 260 of 490 consecutive Xpert Ultra RR-TB early positive cultures collected from April 2023 to September 2023 from the Western Cape, South Africa, within TS-Eliot, a cluster RCT (NCT05553236) assessing the effect of next-generation sequencing on RR-TB patient outcomes.
Results: Of the 260 isolates, 255 passed quality control. Based on genomic DST results generated by the automated Deeplex Myc-TB report, 14 (5.5%) isolates were categorized as rifampicin susceptible, 67 (26.3%) as rifampicin mono-resistant TB, 131 (51.4%) as MDR-TB, 34 (13.3%) as pre-XDR-TB due to resistance to fluoroquinolones and 9 (3.5%) as XDR-TB given the presence of resistance to rifampicin, fluoroquinolone, and bedaquiline. Despite harboring mutations in the linezolid resistance-conferring rrl gene (n=2, both unclassified) or bedaquiline resistance-conferring Rv0678 gene (n=23 of which 7 unclassified), 25 (9.8%) isolates were categorized as RR-TB (n=7) or MDR-TB (n=18) as they were genotypically susceptible to fluoroquinolones on the Deeplex assay.
Conclusions: The WHO definitions currently do not allow specific classification of patients with fluoroquinolone susceptible isolates that are resistant to bedaquiline and/or linezolid.
However, awareness of second-line drug resistance is crucial to prescribing effective regimens, to prevent transmission of difficult-to-treat forms of TB, and to assess the ongoing effectiveness of standardized regimens.

OA07-156-13 Treatment discontinuation patterns and reasons in individuals receiving TB preventive treatment with standard and high-dose rifampin: Post hoc analysis of the 2R2 randomised controlled trial

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Background: Treatment completion is needed to benefit from tuberculosis preventive treatment (TPT). A shorter duration of TPT may result in improved treatment completion.

We assessed the treatment discontinuation patterns and reasons among individuals receiving TPT.

Design/Methods: We performed a post-hoc analysis using data from a multicenter, phase 2b, randomized trial of two months of high doses of rifampin (20 mg/kg and 30 mg/kg groups) versus four months of standard (10 mg/kg) rifampin for TPT. We included participants in the modified intention-to-treat (MITT) population.

Participants had three routine treatment follow-up visits: at 4, 8, and 16 weeks in the standard-dose group and 2, 4, and 8 weeks in the 20 mg/kg and 30 mg/kg groups.

We assessed the treatment discontinuation into three patterns: discontinuing before the first follow-up visit, before the second visit, and after the second visit.

Results: Of the 1368 participants in the MITT analysis, 942 (68.9%) completed treatment per protocol, 52 (3.8%) completed treatment but not per protocol, 135 (9.9%) discontinued before the first visit, 212 (15.5%) discontinued before, and 27 (1.9%) discontinued after the second visit.

Similar trends were observed in the standard and two high doses of rifampin, where a higher proportion of individuals (9.9%, 16.3%, and 20.3%) discontinued before the second visit compared to 7.1%, 9.9%, and 12.6% before the first visit and 1.1%, 2.4%, and 2.4% after the second visit.

Of the participants who decided to stop TPT, either by themselves or due to adverse events, they were most likely to do so after the first and before the second visit (138 [62.2%] and 69 [86.3%], respectively).

Characteristic		All Participants	Participants discontinuing before the first follow-up visit	Participants discontinuing before the second follow-up visit	Participants discontinuing after the second follow-up visit	Participants completing treatment but not per protocol	Participants completing treatment per protocol
Number of participants		1368 (100%)	135 (9.9%)	212 (15.5%)	27 (1.9%)	52 (3.8%)	942 (68.9%)
Treatment received	Standard dose rifampin (10mg/kg)	454 (100%)	32 (7.1%)	45 (9.9%)	5 (1.1%)	16 (3.5%)	356 (78.1%)
	High dose rifampin (20mg/kg)	461 (100%)	46 (9.9%)	75 (16.3%)	11 (2.4%)	19 (4.1%)	310 (67.3%)
	High dose rifampin (30mg/kg)	453 (100%)	57 (12.6%)	92 (20.3%)	11 (2.4%)	17 (3.8%)	276 (60.9%)
Reasons for discontinuation	Did not start	65 (100%)	65 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Participant's decision	222 (100%)	63 (28.4%)	138 (62.2%)	21 (9.5%)	0 (0%)	0 (0%)
	Adverse event	80 (100%)	6 (7.5%)	69 (86.3%)	5 (6.3%)	0 (0%)	0 (0%)
	Others (pregnancy, died, and investigated for TB disease)	7 (100%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	0 (0%)	0 (0%)

Conclusions: Over one-fourth of participants discontinued TPT regimens with rifampin, mainly in the middle of the treatment period, due to participant decisions or adverse events. The shorter duration of TPT does not improve the treatment completion, which needs more evaluation.

OA07-157-13 Managing TB infection among household contacts of people with TB under JEET project, India, 2021-2024

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Background and challenges to implementation: TB Infection (TBI) management and provision of TB preventive treatment (TPT) is essential to meet the global TB elimination goals. In line with India's guidelines on Programmatic Management of TPT, Joint Effort for Elimination of Tuberculosis (JEET)- under FIND, implemented TBI project in collaboration with National TB programme (NTEP) during 2021-2024. To add to limited on-ground experiences of TBI initiatives in India, this document describes three-year project achievements of the project.

Intervention or response: FIND implemented the JEET project in 28 districts in five states of India. The activities included door-step TB screening, linkage for diagnosis of TBI or active TB and TPT initiation and adherence support for household contacts of pulmonary TB patients. End to end IGRA testing was offered in 02 districts for TBI

detection. Routine project data was captured in project MIS and shared for inclusion in national TB programme databases (Ni-kshay). Dissemination and handover meetings were organised for knowledge sharing with project team and NTEP team.

Results/Impact: A total of 396,180 HHCs were screened during the project duration, of whom 6% aged <05 years, and 52% were females. 15,892 HHCs underwent IGRA tests, of whom ~38% were positive.

Further, 252,039 HHCs were put on TPT in project geographies (97% received 6H, 3%-3HP and <1%-3HR respectively). The proportion of HHC put on TPT, of those screened increased from 42% (36,464/87,668) in Year-1 (Apr21-Mar22) to 72% (103,324/143,972) in Year-3 (Apr23-Mar24) (Figure 1).

Of 103,380 HHCs who received TPT, 89,415 (86%) completed TPT. At the country level, the national programme has planned to scale up TPT through community health officers and domestically funded patient provider support agencies, thus making the efforts sustainable post project closure.

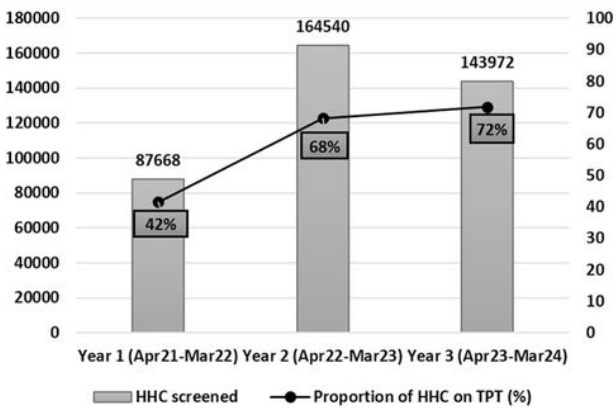

Figure 1. Household contacts of TB patients screened and put on TB preventive treatment (TPT) under JEET project, India, 2021-2024.

Conclusions: The JEET project achievements contribute towards evidence generation for community based TBI management in India. Similar sustainable efforts will help in strengthening global TB prevention strategies.

OA07-158-13 TB Vaccine Readiness Repository: An interactive inventory of past, present, and future work to share the state of vaccine readiness

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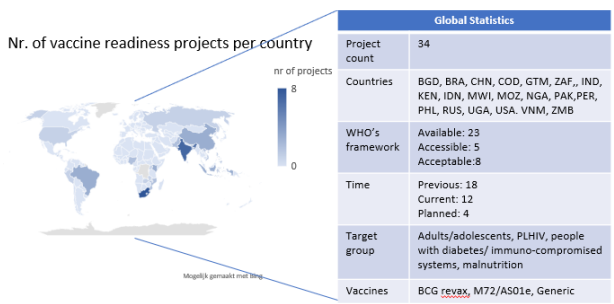
Background and challenges to implementation: Ensuring the availability of a new TB vaccine for adults and adolescents is one of the key strategies to end tuberculosis (TB). A new TB vaccine could be available by 2028. To ensure effective preparation for implementation, there is a need for intensified collaboration among key stakeholders. Moreover, because of the growing interest of many players in this field, effective communication and information sharing platforms are needed. Our aim was to create an online interactive platform to share the state of initiatives on vaccine readiness to guide strategic project direction, highlight potential gaps, and foster collaboration, with the intention to update semi-annually.

Intervention or response: In April 2023, a survey inquiring initiatives/studies that have been conducted, are ongoing, or planned on TB vaccine readiness was shared among stakeholders working in the field of TB and TB vaccine readiness. Furthermore, existing knowledge gaps were inquired. Data was visualized guided by the World Health Organization's (WHO) *Global Framework to prepare for Country Introduction of New TB Vaccines for Adults and Adolescents* and included availability, accessibility, acceptability and characteristics such as country, vaccine target group, and vaccine candidate.

Results/Impact: 34 projects were identified by 14 stakeholders. Most projects were completed (18), next ongoing (12), and planned (4). According to WHO's framework, 23 projects included aspects on Availability, 5 on Accessibility, and 8 on Acceptability. 20 countries were included in country-specific projects with South Africa (8), India (7), and China (3) being most represented. Identified gaps were broad, ranging from identifying country decision-makers, to developing educational materials, to benchmarking vaccination costs against alternative strategies.



Conclusions: This data forms the basis of a publicly accessible and interactive repository This repository showcases ongoing and planned work. It can inform activities by highlighting gaps, contribute to streamlining of (research) efforts, and stimulate synergies between stakeholders and across projects.

OA08 Digital Chest X-Ray + AI for TB Detection

OA08-159-13 Community TB screening using artificial intelligence (AI) software-assisted lung X-ray improves detection of TB in health zones in Grand Kasai, DR Congo

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Background: The National Tuberculosis Control Program in the DRC reported only 65% of the estimated number of tuberculosis (TB) cases were diagnosed in 2018, leaving a gap of almost 35% of cases. Tuberculosis kills at least 1.5 million people each year according to the World Health Organization. It was the deadliest infectious disease in the world before COVID-19 hit, which does not mean that tuberculosis is on the decline, quite the contrary. During the COVID-19 pandemic, the number of tuberculosis-related deaths has increased again.
Design/Methods: In June 2018, oriented a team of health workers (1 clinical manager, 1 nurse and 1 data clerk) on the use of CXR artificial intelligence. With the help of trained staff, TB hotspots were mapped and awareness activities were organized accordingly. This was supported by community resource persons who conducted door-to-door mobilization a week before the scheduled sensitization.
Results: From June 2018 to September 2021, 1,064 people were screened with CXR for TB in the facility and 3,328 in the community. Among them, 11% (482) had a positive CAD4TB score ≥50, and 154 of them were confirmed to have tuberculosis by GeneXpert. This contributed to 25% (154/611) of the total TB cases identified, 75% were identified using previously established methods. Screening tools including four symptom screening tests, chest x-rays and molecular tests recommended by WHO rapid diagnostic tests alone or in combination. CXR AI screening identified 57% (88/154) of TB cases from community hotspots and 43% (68/154) from the facility.
Conclusions: The use of routine TB screening by community-based artificial intelligence CXR significantly improved TB case identification. Ending the TB epidemic requires large-scale implementation of new interventions like artificial intelligence CXR in addition to traditional approaches to finding the missing TB.

OA08-160-13 Experiences with chest X-ray screening and artificial intelligence software in TB screening and diagnosis at health facility level in Malawi

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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 Malawi, CXR-AI has been extensively used in community TB screening, however, limited data exist on its use at health facility level. We present our experiences with integrating CXR-AI in selected facilities utilizing routine program data.
Intervention or response: With funding from USAID, Partners in Hope, a local medical Non – Governmental Organization, collaborated with Ministry of Health (MOH) to introduce CXR-AI from Qure.ai at three health facilities (HFs) with digital X-ray equipment. We conducted software installation, trainings, review meetings and supportive supervision with additional remote support from Qure.ai.
Adult clients with TB symptoms were referred for CXR-AI. Images were imported to qXR/qTrack (v3) software for interpretation, with CXR-AI reports and CXR images sent back for viewing at service points. Clients above threshold score of 0.5 were deemed presumptive for TB, submitted sputum samples for microscopy and Xpert testing and were reviewed by clinicians, according to MOH guidelines.
Results/Impact: 1,318 images were analyzed from June 2023 to January 2024, with 287 being presumptive for TB, yielding 104 TB cases with 61% (63/104) clinically diagnosed. Overall, 166 pulmonary TB cases were notified

during the implementation period, being 37.1% higher than those reported from June 2022 to January 2023 (121 TB cases). Strong coordination with MOH teams was key to successful implementation.
Challenges included inconsistent decision making by providers for clinically diagnosed cases and frequent breakdown of X-ray machines.
Conclusions: Use of CXR-AI was well integrated in routine clinical settings and seemed to have contributed to improved TB notification. Further interventions should consider introducing quality assurance for clinically diagnosed cases.

OA08-161-13 Enhancing TB detection through the integration of computer-aided detection (CAD) software in chest radiography: Findings from targeted outreach programs in Kenya

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Background: Integration of Chest radiography (CXR) with computer-aided detection (CAD) software has been endorsed by the World Health Organization (WHO) as a pivotal screening tool for tuberculosis (TB) detection. 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 high burden countries like Kenya.
Design/Methods: Kenya implemented the use of 8 digital chest X-ray machines equipped with CAD software as part of the Introducing New Tools USAID funded project (iNTP). These machines were seamlessly integrated into Kenya's TB targeted outreach program, with screening algorithms devised to incorporate CXR alongside symptom screening for all outreach attendees. Quarterly outreaches were conducted across eight designated sites.
Results: A total of 15,916 individuals were reached through the screening outreach initiative in 2022 and 2023, with 55% (8,680) being male and 56% (8,957) presenting with TB symptoms. Analysis of CAD-generated scores revealed that 5% (793) scored above 60, while an additional 5% fell within the 40-59 score range. Among those with a CAD score above 60, 72% (572) underwent laboratory investigations for TB confirmation, compared to 57% (476) for the 40-60 score range. Notably, 28% (163) of individuals with a CAD score above 60 tested positive for TB through laboratory investigation, including 47 patients who were asymptomatic. The TB positivity rate among individuals with a CAD-score of 40-60 was 6%.
Conclusions: The implementation of CXR with CAD facilitated a streamlined process for identifying individuals requiring further laboratory investigation, thereby reducing unnecessary Gene-Xpert testing during outreaches. Moreover, the study found a high TB positivity rate among individuals with elevated CAD scores, underscoring the efficacy of community-based screening efforts augmented by AI-enabled X-rays in early disease detection. Scaling up the deployment of this technology holds promise for significantly enhancing TB detection rates in Kenya.

OA08-162-13 Automated interpretation of chest X-rays predicts incident TB risk in a prospective cohort in prisons

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Background: Previous studies demonstrated that chest X-ray (CXR) automated interpretation had high accuracy in screening for prevalent tuberculosis (TB). However, whether CXR automated interpretation predicts later development of TB disease is unknown.
Design/Methods: We enrolled a prospective cohort of incarcerated individuals in two Brazilian prisons from February 2023. Eligible participants included adults (≤18 years) with at least 12-months remaining sentence.
We performed baseline screening using CXR, two sputum samples for Xpert Ultra and one for culture; individuals found to have active TB through this screening were treated and excluded. Cohort participants were followed-up every four months with CXR and sputum sample collection for Xpert Ultra and culture.
We used LunitTB to score CXR images and categorized them into "low" (scores ≤50) or "high" (scores >50). TB incidence was defined as a positive result on either Xpert or sputum culture tests during follow-up. Incidence rates (IR) and 95% confidence intervals (CI) were reported per 100 person-years.
Results: Among 2469 individuals who were TB-negative at baseline, 1715 with ≥1 follow-up visit information available were included. We identified incident TB among 4.1% of participants (70/1711) during 974 person-years

(IR=7.2 per 100 person-years, 95%CI 5.6 – 9.0). Baseline LunitTB scores were significantly higher among individuals with incident TB (median=83.7, interquartile range [IQR] 27.9, 97.9) compared to those without incident TB (median=34.8, IQR 18.4, 56.9) (p<0.01).
TB incidence was significantly higher among individuals with high LunitTB scores (IR=13.8, 95%CI 10.0 – 18.6) compared to those with low LunitTB scores (IR=4.1, 95%CI 2.7 – 5.9; IR ratio=3.4, 95%CI 2.1 – 5.6).
Conclusions: Through intensive longitudinal screening, we identified extremely high rates of incident TB in a cohort of incarcerated individuals who screened negative at baseline. High baseline LunitTB scores were highly predictive of incident tuberculosis. The use of automated CXR interpretations in carceral settings may help identify individuals at risk of incident TB.

OA08-163-13 Triage or no triage: Use of CXR-CAD in community-wide TB-screening in an urban community in Zambia

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Background and challenges to implementation: CXR-CAD can be used as a first line screening test for TB or as a triage test in TB-symptomatic clients. We investigate performance of CXR-CAD as an additional screening tool or as a triage test in a Zambian urban community (~60,000 population).
Intervention or response: Ubumi Bwandi ("my health, my choice") is a TB screening study aiming to screen all community members aged ≥15 for TB. All community members are encouraged to access TB-screening at the community health facility (HF) or at a community hub. Both HF and hub have a chest Xray machine using CAD (CAD4TB v7). Those with either symptoms or a CAD-score of >50 are eligible for GenXpert testing.
We present the TB-screening cascade as observed, and for hypothetical scenarios where analysis is restricted to those with symptoms alone or using CXR-CAD as triage following a positive symptom screen.
Results/Impact: To date of 3,970 people screened at the HF, 134 (3.4%) were identified with TB versus 33/3,600 (0.9%) at the hub.
At the HF, compared to screening on symptoms alone, the addition of CXR-CAD resulted in a 42% increase in Xpert (from 180 to 256) and an additional 34 TB diagnoses (34% increase). Triage would result in a 34% reduction in tests needed (from 180 to 119), and 12 TB diagnoses being missed (12% decrease). At the hub, the addition of CXR-CAD resulted in a 32% increase in tests needed and an additional 11 (50% increase) TB diagnoses. Triage would result in a 72% reduction in Xperts needed, and 5 TB diagnoses being missed (23% decrease).

	Health Facility			Community hub		
	Symptom screen only	Symptom screen with CXR-CAD (% change of those under symptom screen only)	Symptom screen followed by CXR-CAD (% change of those under symptom screen only)	Symptom screen only	Symptom screen with CXR-CAD (% change of those under symptom screen only)	Symptom screen followed by CXR-CAD (% change of those under symptom screen only)
# Screened	3,970	3,970	3,970	3,612	3,612	3,612
# Presumptive	366	480	169	197	266	49
# Sputum Submitted	214	300	134	150	201	43
# Tested (GenXpert)	180	256 (+42%)	119 (-34%)	149	197 (+32%)	42 (-72%)
# Bacteriologically confirmed	40	53 (+33%)	38 (-5%)	19	27 (+42%)	14 (-27%)
# TB Treatment	100	134 (+34%)	88 (-12%)	22	33 (+50%)	17 (-23%)

Conclusions: In our implementation research setting, systematic TB screening including CXR-CAD increased the number of people diagnosed with TB compared to using symptom screening alone or using a triage model in those with symptoms.

OA08-164-13 Bridging the gap: Enhanced TB detection using mobile digital X-ray and AI as screening tool surpasses W4S-based screening in community-based intervention - Insights from Malawi

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Background and challenges to implementation: Malawi faces challenges in TB case notification, with nearly one-third of cases missed. Roughly 35% of those with active TB did not seek care at health facilities for their symptoms (Malawi prevalence survey). There is a need for community-based case-finding strategies to address the missing cases.
Intervention or response: Malawi launched a community-based active TB case-finding initiative focusing on key populations. Twelve mobile vans were deployed for this purpose, with seven employing digital X-rays with CAD (parallel screening algorithms), while five relied solely on symptom-based screening. Genexpert was used to evaluate active TB. Field staff underwent training on TB screening and diagnostic algorithms. CAD score of >60 was set as the threshold for presumptive. Regular onsite support and data analysis were provided.

Results/Impact: Of 128,535 persons screened in 2023, 8,070 (6.3%) were presumptive TB. Of 6,353 presumptive cases identified through parallel screening, 22.5% were negative on symptom screening but had a CAD score > 60, 52.2% were positive on symptom screening with CAD scores < 60, 25.3% had positive on symptom screening and CAD > 60. Higher Xpert uptake (94%) and positivity rate (9.3%) were observed among those presumptive identified through parallel screening compared to symptom screening only.
A total 1,164 TB cases were diagnosed with 52% bacteriologically confirmed, yield of 906 cases per 100,000 person screened for all forms and 467 cases per 100,000 person screened for bacteriological confirmed. The yield for parallel screening was 4.4 times and 3.4 higher for all form, and bacteriological confirmed respectively compared to symptom based screening.

Screening algorithm	Number Screened	Number of presumptive	Xpert test	Bac+ PTB	Xpert positivity rate	Clinically Dx PTB	All TB cases	All TB forms yield per 100K	Bact+PTB yield per 100k
W4S with X-ray and CAD (parallel)	100,555	6,358 (6.3%)	5985(94%)	555	9.3%	536	1,095	1,089	552
W4S screening only	27,980	1,712 (6.1%)	1282(75%)	45	3.5%	23	69	247	161
Total	128,535	8,070	7267(90%)	600	8.2%	559	1,164	906	467

Figure 1. Active TB screening outcomes by type for screening algorithm used, 2023.

Conclusions: X-rays with CAD (AI) for TB screening have significantly contributed to case notification among key populations in community-based screening. Scaling up this screening approach, along with continuous quality improvement and capacity-building for field staff, can effectively bridge the gap in missing TB cases, particularly through proper targeting of key populations.

OA08-165-13 Upscaling diagnosis of pulmonary TB through routine GeneXpert testing of stool from hospitalised children with severe acute malnutrition: Experience from Sokoto State, Nigeria

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Background and challenges to implementation: Nigeria has the 5th highest burden of childhood Tuberculosis (TB) in the world, with malnutrition having the highest attributable fraction (22%) of TB cases in 2022. Despite available evidence linking high TB prevalence among children with severe acute malnutrition (SAM), efforts to intensify TB case-finding among them has been largely passive.

Intervention or response: The intervention focus was to improve pulmonary TB (PTB) detection through routine collection of stool from hospitalized malnourished children for GeneXpert testing. The maiden edition of the National Childhood TB testing week was conducted across the 36 states and the Federal Capital Territory from 22nd - 26th May, 2023. During the testing week, the Sokoto State TB Programme innovatively targeted children with SAM. Stool samples were routinely collected from 28 hospitalized children with SAM and without prior TB diagnosis at the inpatient therapeutic feeding centre (ITFC) of State Specialist Hospital, Sokoto. The samples were sent for GeneXpert testing.
Results/Impact: Out of the 28 children with SAM tested with GeneXpert, 10 (36%) had PTB. Out of the 10 children diagnosed with PTB, 6 and 4 were infants and children greater than 1 year old respectively. Similarly, out of the PTB diagnosed cases, 6 of them had malaria while none was HIV positive. (See table 1). Nine out of the 10 patients were commenced on TB treatment and later discharged while the remaining one was referred to the Teaching Hospital due to massive right sided pleural effusion.

	Children with Severe Acute Malnutrition who had GeneXpert testing		TB cases among children with Severe Acute Malnutrition		Children with Severe Acute Malnutrition, TB and Malaria	
	Male	Female	Male	Female	Male	Female
	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Infant	7 (25%)	10 (36%)	3 (30%)	3 (30%)	1 (17%)	2 (33%)
Children greater than 1 year	6 (21%)	5 (18%)	2 (20%)	2 (20%)	2 (33%)	1 (17%)

Table 1. Profile of hospitalized children with severe acute malnutrition.

Conclusions: The finding of high proportion of PTB among the hospitalized under-5 children with SAM argues the need for routine TB evaluation in these children. We therefore recommend routine stool testing with GeneXpert be incorporated into the protocol/guidelines for management of children with SAM to improve detection of PTB and ultimately enhanced treatment outcomes.

OA08-166-13 Can AI-driven computer-aided detection optimise Xpert-orientated community-based active case finding for TB? An interim trial progress report

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Background: Approximately one-third of persons newly ill with TB are undiagnosed or unreported. Detecting individuals in endemic communities has been restricted by the lack of sensitive, point-of-care (POC) diagnostic tools. Computer-aided detection (CAD) has been recommended by the WHO for TB screening, however, there are no controlled data about its impact during community-based active case-finding (ACF).

Design/Methods: In an ongoing multicentre open-labelled randomised controlled trial (XACT-19), individuals at risk for TB (symptomatic and/or HIV-positive/contact history/diabetics/history of previous TB) were recruited from TB/HIV-endemic communities in South Africa, Zambia, and Zimbabwe. Using a low-cost mobile van staffed by three healthcare workers and equipped with an ultra-portable x-ray and GeneXpert® system, participants were randomised into either POC 'CAD+Xpert' (CAD followed by Xpert in CAD-positive participants using pre-calibrated thresholds), or POC 'Xpert only' (Xpert in all). The reference standard was microbiologically proven TB (Xpert MTB/RIF Ultra and/or sputum culture positivity).

Results: As of March 2024, 1,667 participants were randomised (South Africa, 544 [33.2%]; Zambia, 756 [44.4%]; Zimbabwe, 367 [22.0%]). There were 714/1,667 (42.8%) people living with HIV, of which 108/714 (15.1%) were newly diagnosed. A total of 56/1,667 (3.4%) participants tested positive for TB (South Africa, 37/544 [6.8%]; Zambia, 18/756 [2.4%]; Zimbabwe, 1/367 [0.3%]), of which 27/56 (48.2%) were sub-clinical (i.e., asymptomatic), and 17/56 (30.4%) were smear-positive. Of the 826 participants randomised into the CAD+Xpert arm, CAD detected 17/21 (81.0%) persons with TB. There were 337/826 (40.8%) CAD false-positives. However, CAD was truly negative in 468/826 (56.7%) participants who did not undergo Xpert testing.

Conclusions: Community-based ACF detected a high burden of TB, TB-HIV, and undiagnosed HIV. ~50% had asymptomatic TB. CAD missed ~20% of TB and false-positivity rates in those without TB were high (WHO target profiles not achieved). Nevertheless, Xpert testing was halved. These data inform ACF strategies in TB/HIV endemic settings. Cost-effective studies are warranted.

OA09 Resisting resistance: Challenge of drug-resistant TB

OA09-167-13 Bedaquiline resistance and treatment outcomes among people with TB previously exposed to bedaquiline in India

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Background: Bedaquiline (BDQ), introduced in India in 2016, plays a pivotal role in managing DR-TB patients under the National Tuberculosis Elimination Programme. However, among BDQ exposed tuberculosis patients with suspected or confirmed treatment failure there is risk of development of BDQ resistance posing a significant challenge in TB control. This study aimed to assess BDQ resistance among such patients and associated factors.

Design/Methods: National Institute of Tuberculosis and Respiratory Diseases in Delhi and Médecins Sans Frontières clinic in Mumbai, the study provided BDQ, Delamanid, and carbapenem-based regimens to BDQ-exposed suspected or confirmed treatment failure cases. Phenotypic drug-susceptibility testing (DST) for BDQ was performed on all patients.

Individualized regimens, considering exposure history, co-morbidities and previous adverse reactions, were initiated based on DST results.

Results: From December 2020 to December 2022, 117 patients were enrolled (Table 1). Median (IQR) age was 24 (22-32) years, 54% were females, and 94% had pulmonary tuberculosis. Thirty six percent showed BDQ-resistance. Patients with BDQ resistance were older (median age 27

vs. 23; p=0.04), more likely to have lung cavities (Risk Ratio =1.8; 95%:CI:1.1-3.1; p=0.02) and be resistant to clofazimine (RR=2.3; 95% CI:1.5-3.6; p=0.001) compared to BDQ sensitive patients. Treatment, tailored to each patient, was initiated for 102 patients. Those with BDQ resistance had significantly worse treatment outcomes compared to susceptible patients (RR=4.4; 95% CI:1.9-10.3; p < 0.001.

Overall, 87% of patients with BDQ resistance experienced unfavorable treatment outcomes. Older age (p=0.016) and involvement of both lungs (p=0.035) were associated with higher risk of unfavorable outcomes in univariable analysis.

Characteristics	Variable	Overall, N = 117 N (%)	BDQ resistance, n= 42 n (%)	BDQ sensitive, n= 75 n (%)	p- value
Age	Median (IQR) age	24 (22 - 32)	27 (22 - 37)	23 (21 -29)	0.043
Gender distribution	Female	63 (54)	18 (43)	45 (60)	0.077
Lung involvement	Bilateral	89 (78)	34 (81)	55 (76)	0.6
Lung cavity	Present	61 (52)	28 (67)	33 (44)	0.059
Resistance profile	Clofazimine resistant	28 (25)	18 (44)	10 (14)	<0.001
	Fluoroquinolones resistant	100 (90)	38 (93)	62 (89)	0.7
Treatment outcome (102/117)*	Favorable outcomes	40/102 (40)	5/38 (13)	35/62 (56)	<0.001
	Unfavorable outcomes	60/102 (60)	33/38 (87)	27/62 (44)	

*102 patients started on treatment among 117 patients. 2 patient still on treatment is BDQ susceptible patient

Table 1: Baseline patient characteristics and treatment outcome among 117 enrolled patients

Conclusions: The study reveals a troubling rate of BDQ resistance among previously treated DR-TB patients, leading to unfavorable treatment outcomes. To prevent treatment failure, we recommend implementing BDQ-DST and intensifying research and development efforts for newer TB drugs.

OA09-168-13 Comparative effectiveness of bedaquiline in reducing mortality in MDR/RR-TB: A target trial emulation

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Background: Studies have reported a reduced risk of death in patients receiving bedaquiline (BDQ)-containing regimens compared to non-bedaquiline-containing regimens for multidrug or rifampicin-resistant (MDR/RR) tuberculosis. However, patients in the bedaquiline group often have different risk profiles. While several studies have adjusted for these differences, no studies have used causal inference methods to determine whether bedaquiline causes a reduction in mortality.

Design/Methods: To emulate a trial to perform a comparative effectiveness analysis of bedaquiline and quantify its causal effect on one-year mortality in MDR/RR-TB patients, we leveraged data from two South African studies, one performed before the introduction of bedaquiline (2012-2013) and one after its introduction (2020-2021). The theoretical trial randomizes MDR/RR-TB patients to a regimen containing bedaquiline or not.

We employed multiple imputation to address missing data and constructed inverse probability weights (IPW) for marginal structural models to estimate the average treatment effect.

Results: Of the 620 patients who met the inclusion criteria, 193 were treated with a bedaquiline-containing regimen. Patients receiving bedaquiline were more likely to be male (70% versus 51%), older (42 versus 38 years), HIV-negative (40% versus 22%), and received a more effective regimen (mean regimen efficacy score in the BDQ group was 55.1 versus 44.9 in the non-BDQ group).

The unadjusted odds of mortality was 0.68 (95%CI:0.28-1.08). Using IPWs, we balanced the two groups by age, sex, HIV status, history of tuberculosis treatment, resistance pattern, smear status, weight, diabetes mellitus, hemoglobin, and regimen efficacy score. Had all patients been treated with a bedaquiline-containing regimen, the odds of mortality would have been 0.57 (95%CI:0.31-1.05) compared to if no patient received bedaquiline.

Conclusions: By emulating the design of randomized trials while using real-life observational data, duly considering missing data and appropriately combining IPWs, we found that the use of bedaquiline causes a reduction in mortality of 43%.

OA09-169-13 Overcoming barriers to access: Strategies for improving drug-resistant TB care delivery in underserved communities

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Background and challenges to implementation: Delivering effective care for drug-resistant tuberculosis (DR-TB) in under-served communities presents multifaceted challenges, including limited access to follow up diagnostic services, inadequate healthcare infrastructure, and socioeconomic barriers. KNCV Nigeria under the USAID LON Regions 1 & 2 Project, has a key deliverable of ensuring improved access to high-quality, person-centered DR-TB services in implementing states. Thus the need to overcome these barriers is paramount to ensure equitable access to quality DR-TB care in under-served communities. We present our key strategies that helped to improve DR TB services to underserved communities.
Intervention or response: To achieve this core programmatic deliverable, innovative strategies were incorporated alongside the DR-TB implementation component. The strategies comprised of a further decentralized DRTB OPD clinics setup, DR-TB consilium meetings, a comprehensive and fast-paced baseline investigation process, community-based treatment initiation, patient-centered care model, treatment supporter capacity building and incentivized support for DRTB OPD clinic staff.
Additionally, capacity-building initiatives were conducted to empower DOTS providers in DR-TB presumptive identification, diagnosis and contact investigation.
Results/Impact: Analysis of DR-TB diagnosis data from October 2023 to February 2024 in Katsina state under the USAID LON Regions 1 & 2 Project revealed that 20 DR-TB diagnoses was recorded during this period which is a 63% increase from case finding within similar time periods in the state as shown in Figure 1.
The strategies provided easier access to care for patients in under-served communities, facilitated collaborative decision-making among clinicians ensuring comprehensive and timely treatment plans, reduced barriers to access and enhances patient treatment adherence.

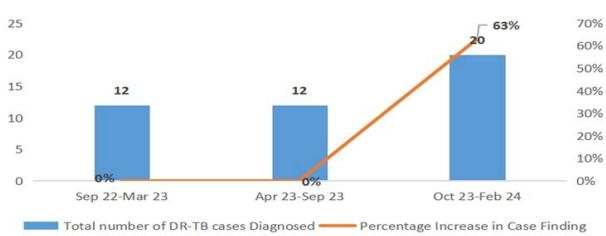

Figure 1: DR-TB Case Notification Increase due to improved Care delivery strategies in Katsina

Conclusions: The strategies deployed for improving DR-TB care delivery in under-served communities in Katsina have demonstrated promising results, continuous improvement and scaleup of these strategies will ensure the achievement of equitable access to quality DR-TB care in under-served communities.

OA09-170-13 Linezolid interruption and rechallenge in rifampicin-resistant TB: A review of South African programmatic data from 2018 to 2020

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Background: Rifampicin-resistant tuberculosis (RR-TB) remains one of the deadliest infectious diseases in the world. Linezolid (a WHO-defined group A drug) is a key drug in many RR-TB regimens. However, limited programmatic data exist about the frequency and determinants of linezolid (LZD) interruption. There are no data about frequency and predictors of successful linezolid rechallenge.
Design/Methods: We evaluated programmatic data from all nine provinces in South Africa between 2018 and 2020, using the electronic Dug Resistant TB web-application (EDRWeb). The frequency of LZD interruption and rechallenge was measured and characteristics between groups were compared. Odds ratios (ORs) for unfavourable outcome and rechallenge success were estimated using unconditional logistic regression.
Results: Clinical data from 11 495 patients were reviewed and 9516 (82,8%) patients with adequate outcome data were included in the analysis. 17,9% (1706/9516) interrupted LZD and the median time to interruption was 5.87 weeks. After adjusting for age, sex, HIV status, history of previous TB and smear status, those who interrupted LZD had 4.65 times higher likelihood of an unfavourable outcome compared to those who did not interrupt (95% CI 4.11-5.23; p= <0.001). Only 4,92% (84/1706) of those who interrupted were rechallenged with LZD; however of those rechallenged 75,4% (52/84) were able to successfully complete their prescribed LZD course. Those who successfully rechallenged had 0.24 times reduced odds of an unfavourable outcome compared to those who failed rechallenge (95% CI 0.06-0.95; p=0.04). HIV negativity, sputum smear negativity, weight >50kg and higher heamoglobin level were significantly associated with rechallenge success.

Background and challenges to implementation: Rifampicin-resistant tuberculosis (RR-TB) remains one of the deadliest infectious diseases in the world. Linezolid (a WHO-defined group A drug) is a key drug in many RR-TB regimens. However, limited programmatic data exist about the frequency and determinants of linezolid (LZD) interruption. There are no data about frequency and predictors of successful linezolid rechallenge.
Intervention or response: We evaluated programmatic data from all nine provinces in South Africa between 2018 and 2020, using the electronic Dug Resistant TB web-application (EDRWeb). The frequency of LZD interruption and rechallenge was measured and characteristics between groups were compared. Odds ratios (ORs) for unfavourable outcome and rechallenge success were estimated using unconditional logistic regression.
Conclusions: LZD interruption is common (one in five patients) and was independently associated with an unfavourable clinical outcome. LZD rechallenge, when attempted, is frequently successful and is associated with better outcomes. These findings inform clinical practice and have implications for the rollout of newer short course regimens containing LZD.

OA09-171-13 Treatment outcomes for drug-resistant TB contacts diagnosed with drug-sensitive TB

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Background and challenges to implementation: Contacts of people with tuberculosis (TB) are at increased risk of acquiring and developing active TB disease. We implemented a contact investigation program and examined the treatment outcomes for contacts of drug-resistant TB (DR-TB) index patients who were diagnosed with and treated for drug-susceptible TB (DS-TB).
Intervention or response: All household contacts of DR-TB index patients who started treatment between November 2021 to March 2024 in three provinces (Ha Noi, Ho Chi Minh City, and Can Tho) were eligible for testing with Xpert MTB/RIF Ultra assay and genotypic drug susceptibility testing (Xpert MTB/XDR, and line probe assay). DR-TB contacts diagnosed with DR-TB and DS-TB were linked to appropriate TB treatment. DS-TB treatment outcomes were extracted from treatment registers and summary statistics were compiled.
Results/Impact: A total of 2,466 DR-TB index patients were notified in the intervention provinces during the project period, resulting in the identification of 4,946 DR-TB contacts. The Xpert Ultra assay was administered to 4,676 DR-TB contacts (94.5%), resulting in the diagnosis of TB in 84 individuals (prevalence = 1,796/100,000 >10.2 times Vietnam's national incidence rate), including 40 (47.6%) with DS-TB and 44 (52.4%) with DR-TB.
Of the 40 individuals diagnosed with DS-TB, 36 (90.0%) started on DS-TB treatment and 25 (69.4%) had a treatment outcome at the time of data collection: 15 (60.0%) were cured, 8 (32.0%) completed treatment, and 2 (8.0%) were transitioned to a DR-TB regimen.

	All Provinces	Hanoi	Ho Chi Minh City	Can Tho
DR-TB contacts enumerated	4,946	2,352	2,396	194
Tested with Xpert/Ultra	4,676 (94.5%)	2,201 (93.6%)	2,286 (95.4%)	189 (97.4%)
Diagnosed with TB (rate per 100/000)	84 (1,796)	21 (954)	60 (2,625)	3 (1,587)
DS-TB	40 (47.6%)	10 (47.6%)	28 (46.7%)	2 (66.7%)
DR-TB	44 (52.4%)	11 (52.4%)	32 (53.3%)	1 (33.3%)
DS-TB treatment linkage	36 (90.0%)	10 (100%)	24 (85.7%)	2 (100%)
DS-TB with a treatment outcome	25 (69.4%)	9 (90.0%)	15 (62.5%)	1 (50.0%)
Successful treatment outcome	23 (92.0%)	8 (88.9%)	14 (93.3%)	1 (100%)
Transitioned to a DR-TB regimen	2 (8.0%)	1 (11.1%)	1 (6.7%)	0 (0%)

Conclusions: Roughly half of DR-TB contacts were diagnosed with and treated for DS-TB, and preliminary data indicate that 92% had a successful treatment outcome. Empiric DR-TB treatment tailored to match the resistance profile of an index patient should be thoughtfully deliberated when drug susceptibility testing results are pending or are not available. This consideration is essential due to the duration, cost, and side effects of DR-TB treatment regimens.

OA09-172-13 Understanding the reasons for pre-treatment lost to follow-up of people with drug-resistant TB in Bihar

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Background: Several studies have shown that pretreatment loss to follow-up (PTLFU), representing the loss of people with TB (PwTB) between TB diagnosis and treatment registration can be significant despite relatively straightforward treatment programs. Starting PwTB on drug-resistant (DR) treatment is much more complicated and in India requires additional tests, and consultations at different facilities which is complicated, confusing and costly for people to manage. Unsurprisingly, PTLFU is more common in PwDRTB as compared to people with drug sensitive TB. We aimed to ensure PwDRTB were linked to care, and determine factors contributing to PTLFU among PwDRTB who escape continued monitoring.

Design/Methods: TB Champions (PwTB who had completed treatment and undergone a training program) were assigned to follow up and support PwDRTB diagnosed across eight districts of Bihar. PwDRTB were supported to expedite the process of pre-treatment evaluation and treatment initiation. Selected PwDRTB were provided with financial support for investigations and travel to TB treatment centres.

Results: In 2022 and 2023, 3071 PwDRTB were diagnosed with DR-TB through laboratory tested. 24 TB Champions supported them and 2839 (92%) were initiated on appropriate DRTB treatment. Among the 232 (8%) PwDRTB who were not initiated on treatment, the following reasons were documented: died 102 (44%), non-traceable due to incorrect contact details 32 (14.2%), not willing 24 (10.3%), migration to other district/state 20 (8.6%), opting private treatment 20 (8.6%), alternate (DSTB/Non-TB) diagnosis 19 (8.2%), and absence of family support 14 (6%) (Refer Table).

Reasons for Pre -treatment lost to follow up	Male	Female	Total	%
Died	61	41	102	44
Untraceable	20	13	32	14.2
not willing	14	10	24	10.3
migration	10	10	20	8.6
opting private treatment	15	5	20	8.6
alternate diagnosis	10	9	19	8.2
Absence of family support	10	4	14	6
Total	140	92	232	100

Conclusions: TB Champions were able to successfully guide thousands of PwDRTB to proper treatment. However, our results highlight a large proportion of PTLFU as mortality resulting from delayed diagnosis and difficulty in tracing patients due to inaccurate contact information. Encouraging early healthcare seeking behavior, community education about TB, and capturing accurate contact information at laboratories can significantly diminish PTLFU rates.

OA09-173-13 Indonesia's journey to roll out the 6-month drug-resistant TB treatment regimen

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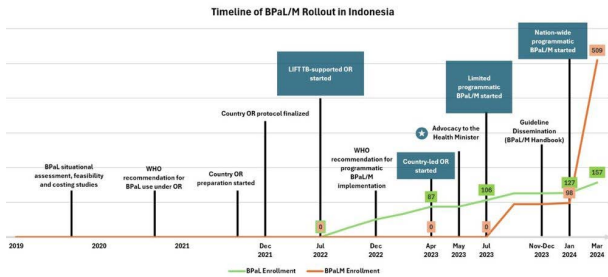
Background and challenges to implementation: In 2020, WHO recommended BPaL (bedaquiline, pretomanid, and linezolid) for DR-TB under operational research (OR), followed by the recommendation of its programmatic use (with or without moxifloxacin) in 2022. Indonesia, among the highest-DR-TB burden countries, faces challenges in implementing new regimens due to geographic barriers and healthcare worker adoption time.

This abstract outlines Indonesia's experience in rolling out BPaL/M.

Intervention or response: In 2019, Indonesia began BPaL situational evaluation, feasibility, and costing studies. BPaL OR preparation started in early 2022, supported by LIFT TB, a TB Alliance-led multicountry project to expand access to BPaL-based regimens. The OR took place from July 2022 to March 2023 in 15 sites in four provinces, followed by a country-led OR from April to June 2023. In parallel, several advocacy efforts took place: awareness-raising campaigns leveraging testimonies of BPaL OR participants and direct advocacy to the Health Minister to showcase the OR results to encourage rapid adoption of BPaL/M following the global call to action.

In parallel, country-level technical preparation ensued with guideline revision, capacity building, and logistical planning.

Results/Impact: The LIFT TB-supported OR enrolled 87 patients BPaL treatment with a 97.6% success rate (cured and completed). The political advocacy resulted in a full commitment from the Health Minister and staff to accelerate the programmatic adoption to July 2023. Limited programmatic implementation of BPaL/M was started in the four provinces from July to December 2023, followed by a nationwide scale up to all provinces in January 2024. As of March 16th, 2024, 157 individuals receiving BPaL and 509 individuals receiving BPaLM in Indonesia.



Conclusions: High-level policymakers' commitment, based on satisfactory OR findings, accelerates BPaL/M programmatic adoption in Indonesia. Continuous support from NTP and partners, along with monitoring, community engagement, supply/demand strengthening, and advocacy, are vital for rapid adoption and scale-up of new tools for TB elimination.

OA09-174-13 Home-based screening of persons exposed to drug-resistant TB, Dharavi, India, 2020-2022

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Background and challenges to implementation: Household contacts (HHCs) of drug-resistant tuberculosis (DR TB) are at high risk for infection and progression to TB disease. Dharavi, a slum in Mumbai, India, is one of the most densely populated areas in the world and has a high concentration of DR TB. We determined the programmatic feasibility of monthly screening and linkage to care for all HHCs of DR TB living in Dharavi.

Intervention or response: All HHC of persons registered for DR TB treatment in Dharavi during December 2020–September 2022 were eligible for enrolment. Field coordinators conducted monthly home visits and screened HHC using a standardized 4-symptom screening tool through March 2023. HHCs experiencing symptoms at any time during follow-up were referred for further clinical evaluation and testing as per national program guidelines.

We calculated age- and sex-stratified incidence rates. Rate ratios with 95% confidence intervals measured risk for developing TB.

Results/Impact: We approached 3,746 HHCs of 974 persons with DR TB. A total of 3,628 (97%) HHCs agreed to enrolment and 244 (7%) experienced TB-related symptoms during 12 months of follow-up. Among these, 195 (80%) HHCs received CXR and at least one of the following: cartridge-based nucleic acid amplification tests (n=178, 91%), fine-needle aspiration cytology (n=14, 7%), and computed tomography scans (n=3, 2%). In total, 45 HHCs were diagnosed with TB.

Among these, 31 (69%) HHC had drug-susceptible TB (DS TB), suggesting exogenous reactivation of post-primary TB not related to recent exposure in the home. Female HHCs and those aged <18 years had the highest TB incidence rates (Table).

Characteristic	Household contacts n = 3,746 (%)[1]	Developed TB during follow-up n = 45 (%)[1]	Number and proportion with DR TB n = 14 (%)[1]	TB incidence rate per 100,000 persons Overall: 1,201	Rate ratio (95% CL)
Sex					
Male	1,947 (52)	17 (38)	7 (50)	873	referent
Female	1,799 (48)	28 (62)	7 (50)	1,556	1.78 (0.94, 3.50)[2]
Age (in years)					
0–18	1,383 (37)	24 (53)	7 (50)	1,735	1.95 (1.04, 3.69)[3]
>18	2,363 (63)	21 (47)	7 (50)	889	referent

1. Column percent. 2. p = 0.059 3. p = 0.026 DR TB=drug-resistant tuberculosis

Table. Age- and sex-stratified tuberculosis incidence of household contacts –– Dharavi, India, 2020–2022

Conclusions: Home-based, monthly screenings uncovered early onset of TB among HHC. Regular home visits and monitoring might hasten the time to diagnosis and prevent further transmission of both DR TB and DS TB amongst HHC living in high-burden areas.

OA09-175-13 Point-of-care integration of XDR assay for enhanced drug-resistant TB management in Punjab, Pakistan

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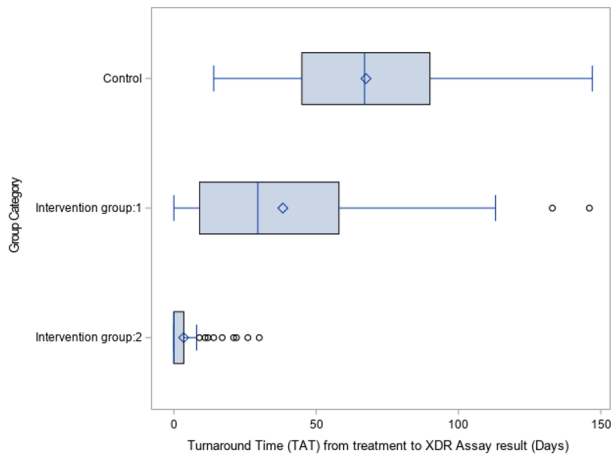
Background: Rapid on-site drug susceptibility testing (DST) is crucial for improving drug resistant tuberculosis (DR-TB) care as it can address delays, inaccurate diagnoses, treatment failures, or adverse outcomes. In Pakistan the DST methods historically took weeks or months for results. Our study assessed the impact of integrating Cepheid's XDR assay at the point of care on turnaround times (TAT) and regimen changes during treatment.

Design/Methods: We integrated the MTB XDR assay for DST in individuals with DR-TB at five TB centers in southern Punjab, Pakistan. Our study employed a pre-post design across three phases to assess the impact on TAT from sputum collection to DST results or regimen changes based on DST results. Baseline phase data was collected from 2019-2021. From January-October 2022 testing on MTB XDR Assay was introduced at central PMDT sites. Thereafter the machines were placed in decentralized DRTB Clinics. Descriptive statistics and a binomial logistic regression model were used to compare TAT and regimens changes in phases.

Results: We analyzed records of 113 people with DR-TB in the baseline phase, 106 individuals who underwent XDR testing during the introductory phase, and enrolled 64 during the decentralized phase. The median TAT was 67 (SD=50.3) days at baseline, improving to 29 (SD=34.2) days during the introductory phase, and dropped to 0 (SD=6.7) days during the within-facility testing phase (Figure 1).

Moreover, the regimen change was 34.5% at baseline, 14.5% introductory, and 5% in the decentralization phase. The model demonstrated a significant reduction in the relative risk of regimen changes, with a 67% decrease (RR: 0.33, P-value: 0.001) during introductory phase and 90% decrease (RR: 0.10, P-value: 0.001) in decentralization phase, compared to the baseline.



Conclusions: Decentralizing rapid XDR assays to the point-of-care enhances treatment precision, timeliness, and streamlines results delivery, and substantially reduces regimen changes in MDR-TB patients.

OA10 Solutions for TB elimination

OA10-177-13 Genomic and clinical evidence of M. tuberculosis strains harboring *rpoB* mutations outside the rifampicin resistance-determining region associated with misdiagnosis of rifampicin resistance in Myanmar

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Background: Detecting rifampicin (RIF) resistance is crucial in selecting tuberculosis (TB) treatment regimens. World Health Organization-recommended molecular diagnostic assays detect mutations in 81-base-pair RIF-resistance-determining region (RRDR) of *rpoB* gene in *Mycobacterium tuberculosis* which are associated with 95-97% of RIF resistance. Previous studies reported borderline *rpoB* mutations including I491F and V170F which located outside RRDR with 0.5-56% prevalence among RIF-resistant TB worldwide and this led to inappropriate management, treatment failures and increased transmission.

Design/Methods: Sputum samples were collected from treatment failure patients who were initially diagnosed as RIF-susceptible by routine GeneXpert MTB/RIF and treated with drug-susceptible TB (DSTB) treatment regimen in TB Centers, Yangon during 2022-2023. Culture and phenotypic drug susceptibility testing were conducted. Whole genome sequencing (WGS) was carried out using Illumina Miseq. Mutation analysis was done by PhyResSE version 1.0 and SAM-TB platforms. RIF resistant cases detected by WGS were switched to appropriate drug-resistant TB (DRTB) treatment regimens and observed clinical, radiological and bacteriological parameters prospectively to assess treatment response and end-of-treatment outcomes.

Results: Among 52 culture-positive cases, RIF-resistance conferring mutations were found in 24/52 (46.2%); 21 (40.4%) were I491F (n=14) and V170F (n=7), two (3.8%) were S450L and one (1.9%) was double mutation (S428T and S441A). Associated isoniazid (INH) resistance (23/24, 96%) and fluoroquinolone resistance (6/24, 25%) were detected. RIF-resistant cases treated with switched multidrug- or pre-extensively drug-resistant TB regimens showed improved treatment response and favorable outcomes in 13/17 (77%) cases.

Conclusions: This study showed missed RIF-resistance cases and majority were due to I491F and V170F mutations which were missed by current diagnostic methods. We suggested a strategy to detect I491F/V170F mutations

in DSTB treatment failure and INH-resistant TB patients in our setting. Our study highlighted improved treatment responses achieved by switching to correct DRTB regimens and provided the evidence-based information on the significance of detecting RIF-resistance conferring *rpoB* mutations outside RRDR.

OA10-178-13 Prevalence of bedaquiline-resistant TB in three provinces of South Africa

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Background: Bedaquiline (BDQ) has been used in South Africa since 2013. In March 2023, South Africa amended the drug-resistant TB (DR-TB) reflex testing guidelines to include BDQ and linezolid (LZD) phenotypic drug susceptibility tests (pDST) for all people with rifampicin-resistant TB (RR-TB).
Design/Methods: We conducted a retrospective study of people with RR-TB who had their first BDQ pDST test conducted through the National Health Laboratory Service (NHLS) between March and November 2023. We assessed provincial implementation of DR-TB reflex guidelines, restricting analysis to provinces with coverage of >50%. BDQ, Fluoroquinolone (FQ), and LZD susceptibility results were extracted from routine NHLS data. Laboratory data were linked to EDR Web (electronic drug resistant TB register), and previous exposure to BDQ and clofazimine (CFZ), defined as ≥14 days, was ascertained.
Results: Three provinces, Eastern Cape (EC), KwaZulu-Natal (KZN) and Western Cape (WC), met the BDQ pDST coverage criterion. Of the 2,308 people included 149 (6.5%) had BDQ resistant TB. The prevalence of BDQ resistance was higher in the WC (10.2%) compared to the EC (3.6%) and KZN (4.8%) provinces. Nearly two thirds (64%) of those with BDQ resistance had FQ–susceptible TB. Prior BDQ/CFZ exposure was available for 115 (77%) people with BDQ resistance. Of these, 64(56%) had no prior BDQ or CFZ exposure. People previously exposed to BDQ /CFZ, however, still had substantially increased risk of BDQ resistance (OR 5.7, 95%CI: 3.8 – 8.7).
After adjusting for relevant confounders, patients in the Western Cape had three-fold higher risk of BDQ-R (AOR 3.0; 95%CI: 1.8 – 4.9). Prevalence of LZD resistance was 0.2%.
Conclusions: Overall prevalence of BDQ resistance was 6.5%, and higher in the Western Cape (10.2%). More than half of those with BDQ resistant TB had not been exposed to BDQ/CFZ indicating likely transmitted resistance. Nearly two thirds of people with BDQ resistant TB were FQ-susceptible.

OA10-179-13 Facility-based screening for TB in pregnant and post-partum women in Papua New Guinea

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Background: Papua New Guinea has both a high burden of tuberculosis (TB) (432/100,000 population) and a high fertility rate (4.2 children/woman). Women have an increased risk of TB during pregnancy and in the postpartum period. The Port Moresby General Hospital (PMGH) is the only public maternity care provider in the National Capital District (NCD), which has an estimated TB incidence of 1,117/100,000 population. PMGH oversees 15,000 deliveries annually.
Design/Methods: Active TB screening of women in the peri-partum period at PMGH over 9 months has been recorded through an implementation project funded by the TB REACH initiative. Screening officers verbally screen for TB symptoms at the following entry points: antenatal clinic, labor and delivery ward, and postpartum ward. Women with a positive symptom screen receive a chest radiography and provide sputum for GeneXpert testing in the antenatal clinic.
Results: During the initial nine months of project implementation, 4205 women have completed screening in the antenatal clinic (2386/4205, 56.7%), labor and delivery ward (520/4205, 12.3%), and postpartum clinic (1299/4205, 30.9%). A total of 4205/11,250 (37%) pregnant or post-partum women were screened. Among screened women, 175/4205 (4.2%) reported symptoms consistent with TB, 826/4205 (19.6%) had contact with a person treated for TB in the past year, and ~3% (119/4205) are living with HIV. Among symptomatic women, 114/175 (65.1%) benefited from GenXpert testing or chest radiography. The TB incidence is estimated to be 1.3% (53/4205) and primarily consists of pulmonary TB (67.9%; 36/53) and drug-susceptible TB (98.1%; 52/53). All women have been linked to care and initiated TB treatment.
Conclusions: The estimated TB incidence among pregnant and post-partum women at PMGH is alarmingly high. Integration of routine TB screening in antenatal

clinics, delivery wards, and postpartum clinics is crucial for timely linkage to care and treatment while reducing potential adverse outcomes for women and their families.

OA10-181-13 Report on oral second-line drug resistance rate of MDR/RR pulmonary TB in South Korea from 2018 to 2023

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Background: The WHO guidelines revised in 2019 significantly changed the classification of second-line drugs into three main groups, placing highly effective oral drugs in Group A. Identifying resistance to these drugs is crucial to treating MDR/RR-TB.
This study aims to present the minimal inhibitory concentration (MIC) results and resistance rates for oral second-line drugs, including 3 Group A drugs, delamanid, and clofazimine, among MDR/RR-TB patients and isoniazid-resistant patients in Korea from 2018 to 2023.
Design/Methods: Subjects: Mycobacterium tuberculosis clinical isolates identified as Rifampicin and/or isoniazid-resistant strains in phenotypic or genotypic DST. MIC test drugs are as follows: Bedaquiline, Delamanid, Moxifloxacin, Levofloxacin, Linezolid, and Clofazimine. MIC test methods are broth microdilution methods with Middlebrook 7H9 media in 96 well plates.
The MIC test concentration range is 0.03125 to 4 mg/L for Bdq, 0.00625 to 0.8 mg/L for Delamanid, and 0.0625 to 8 mg/L for the rest of drugs.
Results: MIC test for bedaquiline and delamanid began in 2018. The resistance rates for bedaquiline and delamanid were found to be 3.7% and 7.9%, respectively, with 117 and 254 resistant strains out of 3205 strains. MIC values were analyzed for 1,311 strains against moxifloxacin, levofloxacin, and linezolid from 2021. Moxifloxacin showed a 17.5% resistant rate (230/1311), while Levofloxacin showed an 18.7% (245/1311). The linezolid-resistant rate was 1.3% (17/1311).
For clofazimine, MIC values were analyzed for 776 strains from 2022, with 28 resistant strains resulting in a resistance rate of approximately 3.6%. The shared resistance mechanisms of clofazimine and bedaquiline resulted in similar resistance rates.
Conclusions: The high fluoroquinolone resistance rate among MDR/RR-TB strains and the non-negligible resistance to bedaquiline highlight the increasing importance of DST for key second-line drugs. Especially as short-course treatment regimens for MDR TB patients were introduced, the need for rapid DST for new oral anti-TB drugs will become more critical.

OA10-182-13 TB and associated factors in refugee camps in Ethiopia

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Background: Although Ethiopia is the third largest refugee-hosting country in Africa, there is limited data on the prevalence and associated factors of tuberculosis (TB) in refugees. The objective of this study was to estimate the prevalence of bacteriologically confirmed pulmonary TB (PTB) and explore associated factors in refugees residing in refugee camps in Ethiopia.
Design/Methods: A cross-sectional study was conducted between February and August 2021 on 610 presumptive TB refugees in selected 12 refugee camps in Ethiopia. The Xpert *Mycobacterium tuberculosis* (MTB)/Rifampicin (RIF) assay was performed on direct spot sputum samples, whereas morning sputum samples were processed and inoculated for bacteriological culture using Mycobacterium Growth Indicator Tube (MGIT) and Lowsteen Jensen (LJ) methods. A logistic regression model was used for the evaluation of the association between bacteriologically confirmed TB cases and the associated factors. Descriptive statistics were used for the expression of the results, and statistical significance was assumed at $p< 0.05$.
Results: Out of 610 study participants, more than half were female (54.9%), and the mean age was 37.9 years (SD, 16.64). The countries of origin of the study participants were South Sudan (324, 53.1%), Somalia (147, 24.1%), Eritrea (107, 17.5%), and Sudan (32, 5.3%).
The prevalence of bacteriologically confirmed PTB cases among refugees residing in refugee camps in Ethiopia was 13.3% (95% CI, 10.7-16.2%) using the Xpert MTB/RIF assay and/or culture.
The multivariable logistic regression model showed South Sudan origins (adjusted odds ratio, AOR=7.74; 95% CI, 3.05-19.64), age group, 19-38 years old (AOR=5.66; 95% CI, 1.86-17.28), and male sex (AOR=2.69; 95% CI, 1.58-4.56) were significantly associated with the bacteriologically confirmed TB among refugees residing in refugee camps in Ethiopia.
Conclusions: The prevalence of bacteriologically confirmed PTB refugees residing in refugee camps in Ethiopia was high. The national TB program should strengthen TB prevention and control activities in the refugee camps of Ethiopia.

OA10-183-13 Enhancing TB case detection in Malawi: Non-monetary public-private mix engagement yields promising results

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Background and challenges to implementation: The WHO End Tuberculosis strategy advocates for involving all relevant healthcare providers in Tuberculosis (TB) care and prevention through Public Private Mix (PPMx) approaches. In Malawi, the National Tuberculosis and Leprosy Elimination Program (NTLEP) has engaged various care providers to improve TB case notification and access to TB services, aiming to reduce patients' financial burden. There is huge potential for private sector involvement in TB care and prevention.

This work was made possible through the U.S. Agency for International Development under the Tuberculosis Implementation Framework Agreement project implemented by JSI Research & Training Institute, Inc.

Intervention or response: In 2021, NTLEP launched an initiative to improve TB notification by engaging 30 PPM sites. Before implementation, NTELP undertook facility assessments, stakeholder orientation, training of healthcare workers in systematic TB screening, and provision logistics for specimen storage and transportation. TB screening was done by trained volunteers using four Symptom Screening (W4S) criteria, and all presumptive were evaluated for active TB using GeneXpert. Sites without the GeneXpert platform collected and transported samples for testing, and results were relayed back for further action. Performance was monitored through reports, on-site mentorship, and review meetings.

Results/Impact: The number of presumptive TB cases increased from 4,727 (pre-intervention period, July 2021-September 2022) to 7,796 during the intervention period (July 2022-September 2023), marking a 65% increase.

Concurrently, the number of persons diagnosed with TB rose by 48% from 459 to 680. Samples referred to gene GeneXpert sites increased by 132%, from 127 to 272, with results feedback improving from 87% to 94%.

Conclusions: Active involvement of all care providers through the PPMx initiative significantly enhanced TB case notification in Malawi. NTLEP, with support from development partners, must take major steps in rolling out engagement with other providers in TB care and prevention.

OA10-184-13 UNMASK-TB: Face mask sampling for M. tuberculosis detection in children with pulmonary TB

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Background: Approximately 1.3 million children developed tuberculosis (TB) in 2022. Bacteriological confirmation of TB is challenging in children. Recently, face mask sampling (FMS) confirmed detection of *Mycobacterium tuberculosis (M. tuberculosis)* DNA from exhaled breath in adults with pulmonary TB. To date, no study has evaluated the use of FMS to detect pulmonary TB in children. We developed a method for FMS of *M. tuberculosis*-specific DNA in children and performed a clinical exploration to assess feasibility in children.

Design/Methods: The previously described method of detecting *M. tuberculosis* DNA in face masks was modified for paediatric sampling. Face masks were spiked, analysed on GeneXpert-Ultra, qPCR, and targeted Next-Generation-Sequencing; a limit of 95% detection on GeneXpert-Ultra was calculated. Ten children with pulmonary TB were asked to wear three modified FFP2 masks for 30 minutes as part of an exploratory clinical study.

Results: Experiments with H37Ra *M. tuberculosis* strain showed a limit of 95% detection of 3.75 CFU (4.85-3.11; 95%CI) on GeneXpert-Ultra. TB was confirmed in 3/10 children by positive cultures, seven children received a clinical diagnosis. However *M. tuberculosis*-specific DNA was detected on none of the face masks, either on GeneXpert-Ultra or qPCR.

Conclusions: Paediatric FMS has a low limit of detection for *M. tuberculosis*-specific DNA *in vitro*. However, *M. tuberculosis* DNA was not detected in any of the thirty masks worn by children with pulmonary TB, including

nine masks worn by children with culture confirmed TB. This suggests that FMS in the form applied here may not be more effective for detecting *M. tuberculosis* in children with pulmonary TB than existing methods.

OA11 Innovative strategies for TB care: Co-creation, community engagement, closing the treatment

OA11-186-13 Learning and innovation can adapt care to population needs: A decentralised model of TB prevention and care in highly populated urban areas of Manila, Philippines

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Background and challenges to implementation: Populations living in densely populated areas are disproportionally vulnerable to tuberculosis (TB). To strengthen TB management in this population, a decentralized, comprehensive strategy including screening, diagnosis, linkage to care and prevention is needed. We describe the activities, challenges and results of this TB care model implemented in Manila, Philippines.
Intervention or response: This is retrospective and prospective analysis of step wise improvements in Médecins Sans Frontières (MSF) activities in Tondo, Manila from July 2022 – December 2023 (Figure 1).

Figure 1.

Starting with systematic active case finding (ACF), adults and contact persons of confirmed TB cases were screened three days per week paired with contact investigation (CI) in one health center (HC) catchment area.
After a month, on-site medical evaluation was added for adults with highly presumptive TB and paediatric contacts, followed by on-site tuberculin skin test and TB preventive treatment (TPT) initiation. By October, chest x-ray (CXR) with computer-aided detection (CAD) was employed. In 2023, ACF became mobile through HC rotation every two weeks, and community volunteers were involved in mobilization. MSF provided 16-module GeneXpert machine and dedicated laboratory technician to one laboratory, followed by household medical evaluation among children contacts.
Results/Impact: Screening rate among Tondo population increased from 0.49% during systematic ACF to 2.31% when ACF became mobile and with strengthened community engagement. Turnaround time during screening decreased from 47 minutes to 27 minutes using CXR with CAD while release of GeneXpert results decreased from 6 days to 3 days with improved diagnostics.
Clinically diagnosed TB cases increased by 81% because of medical evaluation. CI rate minimally increased from 35% to 36% however, paediatric contacts started on TPT increased by 135%.
Conclusions: Screening and community engagement, paired with advanced diagnostics and decentralized care, constitutes comprehensive approach to TB prevention and care. While challenges persist, adaptability, and innovative but practical interventions underscore the commitment to ending TB.

OA11-187-13 Co-creating an innovation intervention through a people-centered design process for re-imagining TB care: Reflections from Uganda

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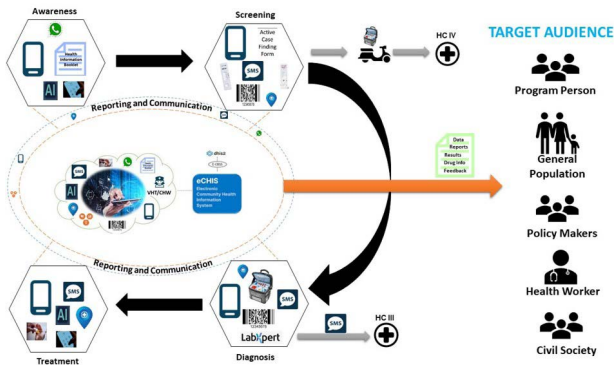
Background: Addressing Tuberculosis (TB) in Uganda requires innovative solutions that truly understand and meet the needs of affected people. This study describes the journey of empowering local capacity through a People-Centered Design (PCD) approach to co-create and co-develop transformative TB care innovation.
Design/Methods: The journey began with identifying a multidisciplinary team, trained by PCD experts, to understand the needs and wants of TB-affected people in Uganda. Civil Society Organizations (CSOs) were engaged as community representatives to support in mobilization and data collection. This participatory approach aimed at increasing ownership of innovations and creating transparency in decision-making. These interviews would inform the final selection of an intervention.
Results: 2000+ statements were collected, analyzed and categorized into 15 opportunity areas. Through several Workshops, those 15 were narrowed into 4 priority areas.

From 458 initially identified innovations, 15 were selected to address these opportunities. Three concept notes were developed, outlining the top three interventions, leading to the selection of a single innovation during the final workshop for development and implementation (Figure 1).

To help our diverse group of stakeholders - TB-affected people, health workers, and NTP representatives - co-select the final innovation, we created innovation posters and fostered open discussion to evaluate their desirability, fit, and impact.

We developed three final concepts around developing digital tools for:

1. For TB-affected people,
2. For community health workers (CHWs/VHTs), and
3. For policy-makers and managers. During the final workshop, the group selected the concept to develop digital tools to empower CHWs. Throughout, individual decisions were the basis for anonymous voting, with group discussions preceding.



Conclusions: This participatory process highlights the significance of a people-centered design approach in driving localized innovation. By empowering community members with PCD skills, we ensured that resulting innovations genuinely reflected community needs, fostering sustainable innovation driven by community needs and priorities.

OA11-188-13 Project 'PAR CARIOCA': Aligning quality TB care into extremely vulnerable population

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Background and challenges to implementation: The **MINISTRY OF HUMAN RIGHTS AND CITIZENSHIP - MDHC/BRAZIL** published (August/2023) a report showing 62% of the registered homeless population (PSR) in the country is in the Southeast Region. Among the states, São Paulo has the largest population, with 95,195 people (40% of the total). The 10 municipalities with the highest number of homeless people together account for 48% of the country's homeless population. In sequence: Rio de Janeiro, Belo Horizonte, Brasília, Salvador, Fortaleza, Curitiba, Porto Alegre, Campinas, and Florianópolis

Intervention or response: The Municipality of Rio de Janeiro launched the **Programa Seguir em Frente** (Move Forward Program) in December/2023. The plan establishes various measures of shelter, social assistance, and health care and diagnosis of this more vulnerable population. The goal is to create conditions for resocialization, promote reintegration into the labor market, and rescue citizenship.

Results/Impact: PAR Carioca (Street Support Point) - to attract and give the first shelter to the homeless population. From December/2023 to March/2024, 1,014 people were assisted by the Municipal Social Assistance Secretariat (SMSA), of which 886 were sent to shelters and 350 were sent to the Ivone Lara Care Center (chemical dependency). Within the 1,050 clinical attendances, 92 TB suspects underwent the rapid TB test (TRM) in which 68 results were positive, and from them, 20 were classified as restarting treatment for TB. Serologies requested: 132 tests for HIV and Syphilis, with 42 and 62 positives, respectively; and 128 tests for Hepatitis B, of which 2 were positive.

Conclusions: This strategy has been working very well, giving directly person-centered care to extremely vulnerable people and providing diagnosis and treatment, especially for TB and HIV cases. In addition, veterinary care was also included for the animals that live with these people, with the placement of microchipping and vaccination updates, contextualizing, in practice, the principles of ONE HEALTH.

OA11-189-13 Closing the gap of finding the missing people with TB through intensified community-based intervention: Experience from Ogun state, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a significant health concern in Nigeria, posing a considerable burden on both health outcomes and mortality rates, reaching epidemic proportions. Nigeria ranks first in Africa and sixth globally among the 30 high burden TB countries. Despite this ranking, Nigeria continues to grapple with a substantial portion of missing TB cases globally. In 2021, Ogun state reported a total of 4,783 tuberculosis patients. However, this number only represents 38% of the estimated TB cases in the state, leaving a concerning gap of 62% of undetected TB patients. This aim of this study is to demonstrate the potential in active case finding through the community channels.

Intervention or response: Collaborating with implementing partners, the state initiated a multifaceted community-based intervention strategy. This approach involved the identification and engagement of Community Volunteers tasked with conducting house-to-house TB case searches in slum areas. Monthly community outreaches were organized, covering 50% of the total Local Government Areas in the state, based on hotspot mapping. Additionally, contact investigators were identified, trained, and deployed to all local government areas to trace diagnosed TB index cases.

Results/Impact: Over the past four years of implementation, community contribution to TB case notification have seen a significant increase, from 8% in 2020 to 26% by 2023, indicating a remarkable 300% improvement compared to 2020 levels. During this period, the state's TB detection rate surged from 26% in 2020 to 47% in 2023, showcasing substantial progress in the fight against TB within the state.

Conclusions: The state has made significant strides towards realizing the National Strategic Plan (NSP) goal of enhancing community involvement in delivering high-quality TB care, evidenced by the community's increased contribution to TB case notification, reaching 35% by 2025. As such, prioritizing intensified community-based interventions remains imperative for sustaining and further advancing these gains.

OA11-190-13 Systematic triaging of severely ill: Addressing the predictors of early deaths among persons with TB in Delhi, India

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Background and challenges to implementation: Understanding predictors of early tuberculosis (TB) deaths is essential to prevent avoidable deaths. Government of Delhi undertook a series of efforts to study the risk factors of early deaths in persons with TB (PwTB) and devise a strategy to avert early deaths through systematic triaging of severely ill PwTB in 2023.

This study aims to assess the effectiveness of this intervention.

Intervention or response: A retrospective analysis of data from national TB database (Ni-kshay) was conducted to identify the risk factors of early deaths among all notified PwTB in Delhi from 2021-22. Operational definition of early deaths and severely ill PwTB was defined.

The evidence generated from multivariate logistic regression informed the state's initiative to avert early TB deaths through systematic triaging and appropriate clinical management of severely ill PwTB. Systematic triaging was done at peripheral health centers.

Triaging parameters were:

i. Severe undernutrition or,

ii. Respiratory insufficiency or,

iii. Ppoor clinical performance status.

Those triaged positive were referred to respective tertiary care facilities where medical officer admitted them for inpatient care followed by ambulatory treatment on discharge. Process indicators of triaging were used to assess the effectiveness of this intervention.

Results/Impact: Among the 5332 deaths reported in 2021-22, more than a quarter (37.8%) were early deaths. Regression model matrix with significant risk factors for early deaths is attached (Table1).

Following the launch of systematic triaging, between December 2023 – February 2024, 31%(1868) of notified TB patients were triaged using the screening parameters and 4% (69) turned triage-positive.

Of these, 44% (21) were confirmed to be severely ill by the medical officer at the referral center and were admitted for further management. Mean duration to admission was 2 days.

Independent variable	Dependent variable	Adjusted Odd's ratio (95% CI)	Adjusted* p-value
Early TB Deaths	Male Gender	1.06 (0.92-1.22)	0.363
	HIV -TB co-infected	2.5 (1.99-3.12)	<0.001
	Microbiologically confirmed	1.34 (1.26-1.42)	<0.001
	Low body weight	2.02 (1.9-2.16)	<0.001
	Diagnosis to treatment initiation > 7 days	2.1 (1.6-2.8)	<0.001
	Drug resistant TB	3.8 (2.7-5.2)	<0.001

Table 1. Logistic regression to determine the predictors of early deaths (2021-22) in Delhi.

Conclusions: Systematic triaging in Delhi enabled severely ill patients to undergo comprehensive clinical assessment and timely admission for treatment thereby reducing chances for early TB deaths.

OA11-191-13 Addressing high rates of loss to follow-up: Implementation of the person-centered care model for people with TB at Kalingalinga clinic in Lusaka, Zambia

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Background and challenges to implementation: Between 2017 and 2021, Kalingalinga Clinic servicing a high-density community in Lusaka, Zambia, reported a treatment success rate of 68% - 82%; the national treatment success rate for the corresponding period ranged between 89%-91%.
For the October 2020 to September 2021 cohort, loss to follow-up (LTFU) accounted for 14% of the treatment outcomes and 70% of these were initial loss LTFU. In April 2023, the Ministry of Health, in collaboration with the USAID TBLON project, supported the clinic to initiate a quality improvement project aimed at addressing the high LTFU rate.
Intervention or response: We conducted a root cause analysis which identified the following key barriers to treatment completion: knowledge gaps among patients, insufficient post-diagnosis counseling, stigma, lack of support, and poor staff attitude towards patients.
To tackle the above barriers, a five-component "person-first" model was implemented; it included:
1. Strengthening post-diagnosis counseling allowing information on TB, treatment, and potential side effects to be tailored to an individual's understanding and preference,
2. Peer-patient-pairing where TB patients were paired with community health workers sharing similar backgrounds for psychosocial support,
3. Training staff on patient-centered principles to transform attitude,
4. Strengthening the appointment management system and;
5. Extended Service Hours through introducing weekend TB services and provision of afterwork TB services at the OPD.
Results/Impact: From April to December 2023, the clinic diagnosed and linked 263 TB patients to treatment (achieving 100% linkage to treatment). The treatment success rate for the April-June 2023 cohort was 95%. The loss to follow-up rate decreased from 14% to 0%.
Conclusions: Focusing on patient-centered care and staff attitude led to a significant reduction in the loss to follow-up rate at the Kalingalinga clinic. Achieving zero loss to follow-up is possible in highly populated urban areas where the population is considered difficult.

OA11-192-13 Closing the gap in TB treatment success rates (TSR) in the Ankole region, Uganda: The role of the TB/HIV Root Cause Analysis (RCA) tool

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Background and challenges to implementation: TB is the leading cause of death among people living with HIV (PLHIV) in Uganda. Despite high HIV testing and ART coverage (>95%) among TB and TB-HIV co-infected clients, TB treatment success rates (TSR) were lower (84%) for TB-HIV co-infected clients compared to the general TB cohort (88%) in 2022, with lost-to-follow-up and TB/HIV mortality as key challenges in achieving the 90% TSR target in Ankole.
Intervention or response: The lack of understanding of key reasons behind the interruption in treatment necessitated the adaptation and application of the HIV Root Cause Analysis (RCA) tool on TB/HIV co-infected clients. The Excel-based RCA tool was piloted between April-September 2023 across 20 Ankole sites with TB TSR below the 90% target for 2+ years. The tool facilitated uploading TB client lists with interruptions from the electronic case-based surveillance systems, capturing clinical, sociodemographic data, and TB/HIV co-infection status. Qualitative interviews identified client reasons for interruptions. Findings from RCA and the Plan-Do-Study-

Act (PDSA) model guided collaboration between district quality improvement (QI) coaches and facility teams to address cost, travel, forgetfulness, and stigma, utilizing initiatives like home medicine delivery, reminder calls, lower-level healthcare facility medicine refills, and social support connections.

Results/Impact: The TB TSR target achievement in Ankole region stagnated at 84.5% - 87.5% between October 2021 - March 2023, and increased to 92.4% in September 2023 (Fig. 1), surpassing the 90% target. The RCA activity improved TB TSR in Ankole, and engagement of QI personnel facilitated timely implementation of QI activities.

Conclusions: The pilot highlighted enhanced person-centered TB care and improved client-provider communication and trust. Scaling up this RCA tool nationally could strengthen TB/HIV continuity of care via data-driven QI activities.

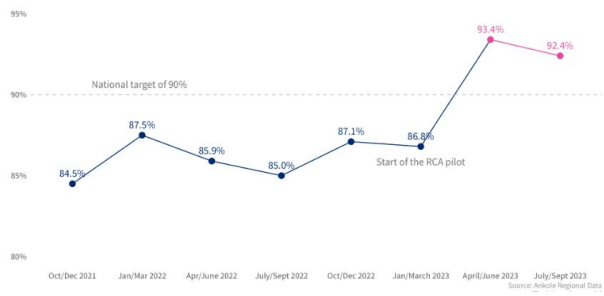

Figure 1: TB Treatment Success Rate (TSR) in Ankole improve above 90% after the start of the RCA Pilot

OA11-193-13 Contribution of alternative courier specimen referral to enhance access to TB diagnostic in Ethiopia

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Background and challenges to implementation: Despite the advantages of GeneXpert for rapid and accurate tuberculosis (TB) diagnosis, access to GeneXpert testing through specimen referral continues to be a challenge due to the limited capacity of postal courier. The intervention aimed to describe the contribution of both postal and alternative specimen referral modalities to access GeneXpert service and improve its performance.

Intervention or response: The specimen referral process was facilitated through stakeholders‘ sensitization, supportive supervision, monitoring and evaluation, and data collection, analysis, and reporting. In addition to routine postal courier, alternative specimen referral modalities such as the engagement of non-health professional couriers and outsourcing to private couriers were introduced in areas where postal couriers cannot operate. . Lab X-pert connectivity solution used as a primary result delivery. A dedicated Telegram messaging group was also created for results delivery. We analyzed data collected from January to December 2023 from Amhara, Oromia, Sidama, South Ethiopia region (SER), and South-West Ethiopia (SWER) regions.

Results/Impact: A total of 323,251 sputum specimens were tested by GeneXpert sites, with 94,463 (29.2%) specimens originating from referring health facilities. The trend of specimen referral has increased by 9.4% in Amhara, by 21.4% in Oromia, by 11.1% in Sidama, by 13.1% SER, and by 7.7% in SWER. Overall, the contribution of specimen referral by alternative couriers was 45.5%.

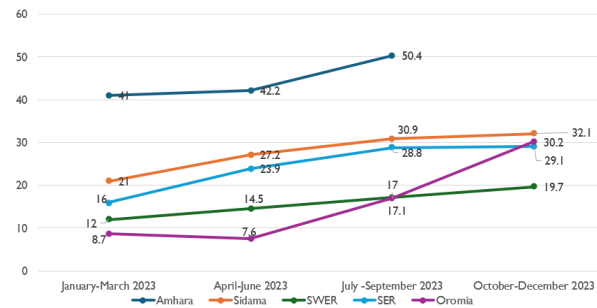

Figure 1. Trend of sample referral contribution in optimization of GeneXpert services in 5 regions of Ethiopia (January - December 2023).

Conclusions: Utilizing integrated specimen courier service in coordinated manner demonstrated continuous improvement to access GeneXpert service in all regions. It is very important to decentralize the courier service coordination and monitoring at the district level to further enhance efficiency, ensure access and sustainability of the service at peripheral health facilities.

SHORT ORAL ABSTRACT SESSION (OA)

SOA01 Active case finding: Experiences from different countries

SOA01-600-13 Analysing the impact of active TB screening on health systems enhancement: Insights from KNCV Nigeria's experience

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Background and challenges to implementation: Globally, Tuberculosis (TB) is a known public health concern. Nigeria is currently ranked 7th among the top 30 countries with a high TB burden in the world (WHO Global TB Report, 2022). In 2022, TB incidence in Plateau State Nigeria was estimated at 10,330, but only 3,669 were diagnosed and notified leaving a gap of 6,661 undetected TB cases. Active TB screening of hospital attendees is pivotal in finding missing TB cases. KNCV Nigeria through USAID funded TB LON project institutionalized active TB screening across all implemented interventions (public, private, contact investigation, and community outreaches) in Plateau State.
Intervention or response: Ad-hoc staff were recruited, trained, and deployed to selected public health facilities for program implementation conducting active TB screening among all hospital attendees and relations in various service delivery points within the hospital. Visitations to index TB households for contact investigation was routinized. Hub and spoke mapping facilitated presumptive TB client referrals at facilities without diagnostic capacity. Data reporting and analysis were carried out weekly and validation was done from the facility's recording and reporting tools against submitted data.
Results/Impact: Between April 2020 and December 2021, KNCV's efforts in State TB data indicated a consistent rise in clients screened and TB cases diagnosed at 72% and 76% respectively. However, from October 2021 to December 2022, reduced ad-hoc staff (by 60%), CI, and outreaches to only high-burden LGAs, led to a decline in TB screening and diagnosis. Overall, there was a 29% decrease in presumptive cases and an 18% decrease in TB cases diagnosed during the period with reduced staffing and outreach efforts. Following staff re-engagement and full CI and community outreach implementation by January 2023, screening and diagnosis rates began to rise again.
Conclusions: Active TB screening in Plateau State enhances case detection, urging nationwide adoption in Nigerian healthcare facilities for optimal impact.

SOA01-601-13 TB Club as a tool for improving TB detection in Niger State, North Central Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a significant global health challenge, ranking as the second leading cause of death from a single infectious agent. Nigeria bears the sixth-highest burden of TB worldwide and have the highest burden in Africa. Despite efforts, 285,581 (60%) cases of TB were reported in Nigeria in 2022 out of an estimated 479,182 cases, indicating a concerning 40% gap that perpetuates ongoing transmission. In Niger State specifically, TB treatment coverage stood at 53% in 2023.
Intervention or response: To address the dual challenges of low TB treatment coverage and underutilization of specimen transport stipends, the TB Club initiative was implemented across five underserved Local Government Areas (LGAs) in Niger State. The TB Club comprised unemployed graduates from tertiary institutions with interest in Public health deployed strategically to conduct community-based outreaches, contact tracing and community sensitization with generated specimens transported to TB diagnostic laboratories for processing, and transportation costs were reimbursed alongside additional incentives for positively diagnosed cases following National TB Program (NTP) performance-based incentivization guidelines.
Results/Impact: The TB Club members operating in the five selected LGAs successfully sensitized 21 communities, delivering TB-specific messages to over 50,663 individuals. They identified 2,663 persons with presumptive TB, collected 2,560 specimens for testing and facilitated the diagnosis of TB in 114 individuals.
Moreover, contact tracing efforts resulted in the identification of 447 contacts linked to 114 index cases that were screened and 66 eligible contacts receiving TB Preventive

Therapy (TPT). The intervention contributed 4.7% of TB cases reported in the state during the reviewed quarter (Q4, 2023).

Conclusions: This intervention has demonstrated tangible improvements in TB diagnostics access through the effective utilization of specimen transport and contact tracing incentives, empowering youth participants to educate communities about TB. Scaling up this initiative in similar settings is recommended to further enhance TB control efforts.

SOA01-602-13 Enhancing TB detection in correctional settings: A comprehensive screening approach

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Background and challenges to implementation: Tuberculosis screening is a crucial public health effort to mitigate the transmission of TB. Factors such as overcrowding, substandard infrastructures, inadequate health care and undernutrition exacerbate the spread of tuberculosis in correctional centres, especially in resource-limited regions. A sustained active TB case-finding initiative was launched in correctional centres across Ogun State, Nigeria.

Intervention or response: Ogun state has six correctional centres with an inmate population of over 1900. Ogun State Tuberculosis, Leprosy and Buruli Ulcer Control Program commenced routine TB screening in correctional centres in 2021 and has designated Directly Observed Treatment Short Course (DOTS) sites in these facilities for TB management.

Advocacy visits were made to the heads of the correctional centres. DOTS Officers in all correctional centres in the state were orientated on TB screening. Monthly sensitization and TB screening of inmates was conducted. Cell provosts (leaders) were trained to identify and refer persons with presumed TB. Sputum samples were moved to GeneXpert sites by Specimen Riders and diagnosed patients were commenced on TB treatment. Monthly review meetings of the intervention were carried out. Routine TB screening of new inmates was also done.

Results/Impact: The findings showed a significant increase in TB case notifications with a 123% surge from 2020 to 2021 and a further 10% rise from 2021 to 2022. Although there was a 22% decline in 2023 attributed to increased awareness and prompt management of detected TB cases, the general pattern highlights the positive impact of the intervention on enhancing TB detection in correctional centres. The main obstacle is a high loss to follow-up, especially with the release of inmates from correctional centres while on TB treatment.

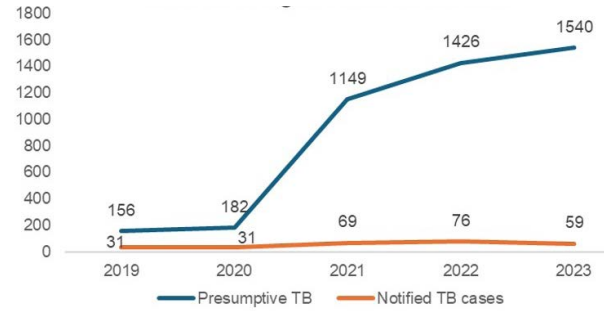

Figure. Trend of TB case finding in correctional centres in Ogun State 2019-2023.

Conclusions: This intervention has demonstrated promising results in the detection and management of Tuberculosis. Sustaining and expanding on this effort will further mitigate the transmission of TB and improve health outcomes in correctional centres.

SOA01-603-13 Improving childhood TB diagnosis through community-based approach: Engaging Traditional Child Clinic in Nigeria

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Background and challenges to implementation: WHO estimates that 12% of the total global TB burden is among children 0-14 years old. In 2021, only 3% of TB notifications in Ebonyi State in Nigeria were children. A root cause analysis revealed several barriers affecting the low yield but a leading cause was that caregivers patronized traditional child clinics (TCCs) when children manifest cardinal signs of childhood TB because of the cultural belief.

Caritas Nigeria implemented a TB REACH project to engage TCC providers for childhood TB screening. Here, we review the strategies deployed, the lessons learned, and the results.

Intervention or response: the project started in January 2023 targeting 3 remote LGAs in Ebonyi State. The engagement of community leaders to secure their support was followed by a joint meeting with community leaders and TCC owners to discuss collaboration. All the TCCs were mapped to TB treatment facilities.

Capacity building was conducted, and incentives for case finding were provided by the Global fund public-private mix(GFPPM) project. Pediatric screening officers were

placed at the TCCs to assist in TB screening, sample transport logistics, treatment initiation, and to ensure continuity of care.
Results/Impact: The engagement of community stakeholders led to increased trust and collaboration, their concerns of losing their clients were addressed by making them TB treatment supporters.
From June to December 2023, A total of 2,044 children were screened, 342 had presumptive TB, and 52 cases of childhood TB were diagnosed and notified. This achievement contributed to the overall state childhood TB notification which increased from 3% to 8% by the end of 2023.
Conclusions: Engaging TCCs has proven effective in improving childhood TB diagnostic rates. This community-based approach, enhanced collaboration between traditional and modern healthcare systems, demonstrates the potential that TCCS can be engaged in other disease surveillance.

SOA01-604-13 Strengthening active case finding in Indonesia: Investigating non-compliance among referred contact persons

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Background: The challenge of Active Case Finding (ACF) for TB in Indonesia is highlighted by the Penabulu-STPI Consortium's experience, where many community-screened and referred contacts fail to present at health services. This study explored the factors influencing the decision of referred contact persons to undergo testing, crucial for the success of the ACF strategy and the broader objective of ending TB in Indonesia.
Design/Methods: Through a qualitative phenomenological approach, the study probes the experiences of contact persons, family members, healthcare workers, and community leaders from three high TB burden provinces. Data from in-depth interviews and focus group discussions were analysed to identify enablers and barriers affecting compliance with testing referrals.
Results: Results underscore the vital role of individual knowledge and motivation in encouraging TB testing, significantly enhanced by family and community support. Contrarily, economic challenges, stigma, fear of discrimination, and healthcare system gaps are key barriers. Emphasis is placed on community cadres' pivotal role in referring contacts, highlighting an area needing reinforcement.
Conclusions: The findings call for an integrated approach to overcoming the identified barriers, with strategies aimed at boosting public health literacy, fostering supportive social networks, and enhancing healthcare system efficiency. Such measures are critical for improving compliance with testing among referred contacts and are integral to Indonesia's drive towards ending TB.

SOA01-605-13 Are neighbourhoods of TB cases a high-risk population for active intervention?

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Background: Current tuberculosis (TB) prevention and control efforts primarily focus on the individual with TB and their households. In high TB burden countries, considerable transmission of *Mycobacterium tuberculosis (Mtb)* likely occurs in neighbourhoods, and outside of households. We estimated the TB prevalence and incidence in neighbourhoods around known TB cases compared to household contacts.
Design/Methods: Our prospective study screened household contacts (HCs) (aged 10+) of newly diagnosed pulmonary TB patients (Index case) in selected areas of Bandung City, Indonesia. Neighbourhood contacts (NCs) living within an approximate 50 metre radius from the Index case were also screened for TB symptoms and by chest X-ray (CXR). Sputum was collected from anyone coughing/CXR suggestive of TB for smear, *Mtb* culture and Xpert MTB/RIF. Those with no evidence of TB disease at baseline were followed up by phone at 4 and 8 months, and repeat in-person 12-month screen. TB prevalence at baseline, and incidence rate per 100,000 person-days, were analysed and presented with 95% confidence intervals (CI).
Results: Between April 2021 to October 2022, from 213 TB index cases, a total of 514 HCs and 4141 NCs underwent TB screening, representing 87% and 72%, respectively, of all those eligible. TB was diagnosed in 17

HCs (3.3%; 95% CI 1.9-5.2) and 47 NCs (1.1%; 95% CI 0.8-1.5). The follow-up 12-month screen was completed for 98% of eligible participants and a further 11 HCs and 14 NCs with TB were diagnosed, giving an incidence per 100,000 person-years of 2,260 (95% CI 1,250-4,090) and 350 (95% CI 210-590), respectively.

Conclusions: For every secondary case in a TB household, there are, on average, another two cases in the neighbourhood households thereby indicating the importance of a more general community approach to TB control to reduce the burden of TB.

SOA01-606-13 Development of TB active case-finding approach for general hospital settings to improve detection of TB

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Background and challenges to implementation: In the Kyrgyz Republic, around 24% of TB cases are diagnosed within eight days, on average, after admission to a general hospital, thus creating a serious risk of infection to other patients and medical staff. To improve the detection of active TB cases, the Under USAID Cure TB Project URC revised and adopted a TB active case-finding approach for general hospital settings based on the WHO FAST strategy.

Intervention or response: Under the USAID Cure TB Project, URC developed a TB symptom questionnaire and TB diagnostic algorithm for general hospitals. Between January and December 2022, TB screening was conducted among in-patients in 12 district-level general hospitals in three regions and the capital, Bishkek. All who had one or more TB symptoms were evaluated and tested for active TB and put on treatment.

Results/Impact: Among 96,855 hospitalized patients, 11,445 patients with respiratory symptoms were screened for TB symptoms. 1,086 (9.5%) were identified as presumptive cases, and all were tested by X-ray and GeneXpert. Of the evaluated patients, 79 (7.3%) were diagnosed with TB and all initiated treatment. Presumptive TB cases increased from 3% to 9.5% among hospitalized patients following increased awareness of TB among the medical staff. On average, TB patients were diagnosed within two days, and treatment was initiated within four days.

Conclusions: Using a simple TB diagnostic algorithm increased presumptive patients among the in-patients. The tool provides earlier diagnosis and treatment of TB patients seeking medical help in hospitals. The tool can be institutionalized to scale up TB active case-finding in general hospitals nationwide.

SOA01-608-13 Reaching the unreached: Active TB case finding in police stations in Nairobi City County, Kenya

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Background and challenges to implementation: Kenya 2016 prevalence survey showed that about 65% of people with TB are in the community with non-severe symptoms. In informal settlements in Nairobi County where there are high TB cases, detainees held in six police stations per week are usually 630, reportees 1,290, police officers and their families being 600. There was no TB screening in police stations before the project. This population is eligible for TB screening and was therefore targeted for TB screening and testing by RODI Kenya with support of GF through AMREF.

Intervention or response: Mapping was done in Nairobi County and 6 stations were selected. 23 police officers and 14 community health promoters were trained with support from the National Police Service. Station liaison officers were selected as TB ambassadors in each station. TB screening desk was established in each station where reportees, detainees and police officers and their families were screened for TB by Community health promoters. Sputum samples were taken for presumptive TB cases and transported to gene-expert sites by trained riders.

Patients who required further clinical evaluation were referred to health facilities. Clients were immediately informed of their results. Joint support supervision, review meetings and data quality audits were done with stakeholders.

Results/Impact: From December 2022 to December 2023 a total of 26,012 people were screened for TB. 3,231 (12.7%) were presumptive, 85% (2,745) were investigated and 239 people diagnosed with TB (138 bacteriologically confirmed and 101 clinically diagnosed). 90% (216) were initiated on TB treatment. Among the groups diagnosed with TB, Reportees accounted for 88% (211) of TB cases while detainees were 10% (25) and police staff 1% (3) cases respectively.

Conclusions: Multi sectoral engagement of sectors can contribute to finding TB cases in areas not routinely used. There's need to incorporate health policies and guidelines to mainstream TB screening in police stations.

SOA01-609-13 Strategising case-finding approaches to reach targets with limited resources: Community volunteer engagement in Eswatini

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Background: Eswatini engaged 369 TB community volunteers known as TB Champions to conduct a door-to-door strategy. By 2019, due to financial constraints, the number of TB Champions reduced to 100, prompting a refined focus on high-risk populations. The country introduced eight models of care, each tailored to meet the unique needs of high-risk population. These models encompass proactive and reactive screening, cluster screening, mobile clinics, outreach programs, community TB preventive therapy (TPT), awareness campaigns, and mass screening for children.
This study aims to explore the efficacy of utilizing minimal resources in TB case detection and to share insights on achieving strategic objectives amidst resource constraints.
Design/Methods: Data were collected from the National TB Surveillance system and community registers, comparing the outcomes of the door-to-door strategy initiated in 2016 with 369 community TB Champions, against the results from 2019 to 2023, when targeted approaches with 100 community volunteers were implemented. This analysis focuses on the effectiveness of these strategies in enhancing TB case detection.
Results: Analysis reveals that community contribution to TB detection ranged between 8 % to 13% from 2016 to 2018, utilizing 369 TB Champions. While from 2019 to 2023, despite the reduction of TB Champions to 100, community contributions significantly upward trend ranging between 13% to 34% from 2019 to 2023. Notably, the streamlined team of 100 TB Champions not only achieved but exceeded the initial target, achieving a remarkable 34% contribution in 2023.
Conclusions: The study findings indicate strategic innovation and targeted interventions are pivotal in enhancing TB case detection within resource-limited settings. The successful reallocation of resources and tailored approach to community engagement serve as testament to the potential of strategic planning and adaptability in public health endeavors. This experience offers invaluable lessons for similar public health challenges, underscoring the capacity to achieve and surpass objectives with optimized resource utilization.

SOA02 Burden of smoking and impact of tobacco control measures

SOA02-610-13 Invisible threats: Unveiling the secondhand smoke exposure at home among children in India through the Lens of GATS Survey (2009-2017)

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Background: Children are susceptible to early life inequalities stemming from their limited control over their environment and their physical incapability to handle the health and developmental consequences of smoke exposure.
Additionally, their lack of awareness regarding the detrimental effects of secondhand smoke (SHS) exposure on their well-being emphasizes the crucial need to comprehend the extent of secondhand smoke exposure among the younger population.
The study aims to analyze the trend and factors influencing SHS exposure among children under 15 years, along with the shifts in SHS exposure in India and its states.
Design/Methods: GATS 1 (2009-10) and GATS 2 (2016-17) India, data are utilized to conduct the secondary data analyses. The total number of children included in the study were 1,08,814 and 10,00,167 for GATS1 and GATS2, respectively.
The outcome variables for the study were SHS exposure in households with children (below 15 years old). The exposure variables were the socio-economic and demographic characteristics. Descriptive statistics using bivariate analysis and Multivariate logistic regression were utilized.
Results: Despite a significant decrease, 45% of children under 15 still face SHS exposure at home. While most states witnessed a decline, Jammu and Kashmir, Punjab, and Tamil Nadu showed an increase.
Over eight years, SHS exposure remains unchanged in rural, impoverished households with limited awareness, adult smokers, especially in the Northeast, North, and Central regions.
Alarming is the connection between SHS exposure at home and adolescent tobacco use, highlighting the need for targeted interventions to safeguard the health of children and prevent future smoking habits.
Conclusions: India has made strides in reducing child SHS exposure, yet challenges persist in rural and impoverished homes. To tackle this, prioritizing awareness, focusing on disadvantaged families, and implementing smoke-free initiatives are crucial. Comprehensive tobacco control measures can break the cycle of poverty driven by smoking-related expenses, fostering a tobacco-free generation.

SOA02-611-13 Electronic cigarette and heated tobacco product use and their association with tobacco control factors among adults in Indonesia, Kazakhstan, and the Philippines

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Background: Data on e-cigarette (EC) and heated tobacco product (HTP) use and reasons for their use is useful in policy making. We report comparable nationally representative estimates of EC and HTP use and awareness, and socio-economic and tobacco control factors associated with their use in three middle-income countries.
Design/Methods: Global Adult Tobacco Survey (GATS) data from Indonesia (2021), Kazakhstan (2019), and the Philippines (2021) were analysed. The weighted prevalence of EC and HTP awareness, current use, and ever use, and their distribution by cigarette smoking status were calculated. Socio-economic, and tobacco control factors associated with EC and HTP use were assessed using binary logistic regression analyses.
Results: For EC, awareness was 55.7%, 48.7%, and 69.4%; ever use was 8.8%, 5.0%, and 3.6%; current use was 3.0%, 1.9%, and 2.1% in Indonesia, Kazakhstan, and the Philippines respectively. For HTP, awareness was 2.7%, 21.7%, and 11.1%; ever use was 0.2%, 2.1%, and 0.2%; current use was 0.1%, 1.2%, and 0.1% in Indonesia, Kazakhstan, and the Philippines respectively. Major reasons for EC and HTP use were attractive flavours, hedonistic values, and policy circumvention. EC and HTP use was associated with younger age, higher education level, higher wealth, tobacco smoking, exposure to information about tobacco-use dangers (AOR 1.50, 95% CI 1.08, 2.09) and advertisements about tobacco products (AOR 1.58, 95% CI 1.14, 2.19). Smoke-free policies at home were associated with lower EC and HTP use.
Conclusions: The higher prevalence of EC and HTP use among younger men with higher education levels and wealth, and those who smoke tobacco cigarettes makes these subgroups suitable for targeted surveillance and interventions in the three countries. Policies should be formulated and implemented to regulate the use of EC and HTP.

SOA02-612-13 Tobacco smoking-attributable mortality in Kenya: 2012–2021

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Background: Tobacco smoking is a significant contributor to mortality worldwide, with profound implications for public health. This study aimed to assess the impact of tobacco smoking on mortality in Kenya between 2012 and 2021.
Design/Methods: We utilized a prevalence-based analysis model to estimate smoking-attributable mortality, employing the Population Attributable Fraction to quantify the proportion of deaths attributed to smoking.
Data on smoking prevalence, causes of death, and mortality rates were obtained from national surveys, health facility records, and population estimates. Joinpoint regression analysis was applied to identify trends in mortality rates.
Results: Between 2012 and 2021, tobacco smoking contributed to 16.5% of deaths among adults aged 35 and older in Kenya. Respiratory diseases, particularly pneumonia and influenza, emerged as the leading contributors to smoking-attributable deaths, followed by cancers, chronic respiratory diseases, cardiovascular diseases, diabetes, and tuberculosis.
Notable causes of mortality associated with smoking included oesophageal cancer and cerebrovascular diseases. Trends in mortality mirrored patterns observed in similar studies, although disparities were noted in comparison with findings from other countries.
Conclusions: Urgent efforts are needed to prevent tobacco use and address the associated disease burden in Kenya. Comprehensive tobacco control strategies, including smoking cessation interventions and public awareness campaigns, are essential for reducing the impact of smoking-attributable deaths.
The study underscores the importance of continued monitoring and surveillance efforts to inform evidence-based tobacco control policies and interventions.

SOA02-613-13 How the tobacco industry normalise its CSR activities to bypass TAPS ban in Vietnam: A media narrative analysis

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Background: Despite TAPS ban, tobacco CSR-related news increases in frequency in Vietnam, reflecting global trend and low domestic laws enforcement. This provides opportunities for the industry to normalize public image, brands or meddle in policy-making.

This study used a narrative analysis to provide evidence on how the industry bypass the TAPS ban with different tactics, to increase awareness and enforcement.

Design/Methods: The study started with a core narrative frame using the commercial determinants of health approach in international literature includes findings on how tobacco companies used CSR to influence stakeholders' views (Fooks et al., 2013), used philanthropy strategically in the PM21 campaign (Tesler & Malone, 2008), and similar tactics in other harmful industries (Martino et al., 2017).

This frame was used to code the content of CSR-related news collected in Vietnam throughout 2023. Subsequent narratives were added through an exploratory approach, with verifications of legal expert and tobacco control experts to reflect the TAPS regulation and state-owned monoply typical in Vietnam.

Results: The result shows that, state-owned and joint-ventures with Big Tobacco employ multi-facet CSR-normalizing narratives.

For the state, they position as organizations complying with regulations, voluntarily supporting anti-smuggling, being patriotic or in line with government innovative initiatives.

For public health, they portray responsible image by transformation, supporting cessation, smoke-free, and voluntary measures to prevent youth smoking, while advocating for new products. (Table 1).

For community, they show caring for employees, stockholders, farmers, unions, locals, environment, sustainable development, while trying to delay tax policy.

They show caring for vulnerable children, woman, and cultural activities (arts, sports) to get more visibility to the public.

Frames	Source	Frames	Source	Frames	Source
Tobacco company being innovative	TC experts	Tobacco company has responsibility to gender equity	TC experts	Tobacco company complies with obligations to the government	TC experts
Tobacco company is transforming	Fooks et al., (2013)	Tobacco company support spiritual life, art, and sports	TC experts	Tobacco company supports anti-smuggling	TC experts
Tobacco company implements sustainable development	Fooks et al., (2013)	Tobacco company has responsibility to the environment	Fooks et al., (2013)	Tobacco company supports, collaborates with public health	Fooks et al., (2013)
Tobacco company take care of their supply chain managment	Fooks et al., (2013)	Tobacco company has responsibility to consumers	Fooks et al., (2013)	Tobacco company supports tax policy but with inteference	Fooks et al., (2013)
Tobacco company has good work environment	Tesler & Malone (2009)	Tobacco company has responsibility to the unions	Fooks et al., (2013)	Tobacco company supports cessation program to advocate for new tobacco products	Fooks et al., (2013)
Tobacco company has responsibility to famers	Fooks et al., (2013)	Tobacco company has responsibility to community	Fooks et al., (2013)	Tobacco company support smoke-free programs to advocate for new tobacco products	Fooks et al., (2013)
Tobacco company has responsibility to stockholders	Fooks et al., (2013)	Tobacco company has responsibility to children	TC experts	Tobacco company voluntarily restricts youth smoking to advocate for new tobacco products	Martino et al., (2017)
Tobacco company shows patriotism	TC experts				

Table 1 - Narratives

Conclusions: The study provided evidence on how tobacco companies attempted making-up a comprehensive responsible image to execute their framing strategy. Tobacco control needs to establish forward-looking, sustained strategies to reduce industry influence and denormalize CSR activities.

SOA02-614-13 Increase in anti-tobacco media campaigns over last 5 years: Case study of West Bengal, India

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Background and challenges to implementation: Earned media campaigns play a crucial role in tobacco control efforts. But before 2019, the impact of earned media on anti-tobacco campaigns in West Bengal, India, was minimal. Notably, West Bengal is home to India's largest cigarette manufacturing company and has the highest number of *bidi* rollers in the country. This background made it challenging to bring anti-tobacco narratives to the forefront of media attention, coupled with strong tobacco industry lobby and lack of coordinated government efforts.

Intervention or response: Change occurred over past five years, particularly with advent of COVID-19. The pandemic highlighted tobacco use as a co-morbidity factor, propelling media coverage on topics that could mitigate COVID-19 infections and their severe outcomes.

Consequently, both central and state governments amplified efforts through various media platforms, resulting in a significant 30–50% increase in media coverage by 2023-24.

During this period, government ramped efforts to strengthen the National Tobacco Control Programme by implementing various measures, including introduction of a Management Information System. This underscored the inextricable link between effective tobacco control and the battle against Non-communicable Diseases and eradication of tuberculosis. Comprehensive tobacco control measures to protect public health was emphasised through increased media attention.

Results/Impact: This study examines six media organizations—four in South and two in North Bengal—from January 2019 to January 2024. They include print and electronic media, and their associated SM platforms (X, Facebook, Instagram). Preliminary findings show substantial rise in space and time for anti-tobacco news and paid campaigns, largely motivated by pandemic's implications and associated risks on lung health.

Conclusions: Success of a sustainable campaign extends beyond funding and good intentions. Events significantly impacting public perception, like the COVID-19 pandemic, can dramatically shift attitudes, behaviours. Along with a renewed Government focus on tobacco control, they foster heightened awareness and commitment towards health, motivating public towards a tobacco-free world.

SOA02-615-13 Programme evaluation of tobacco-free secondary municipal schools in Pimpri-Chinchwad, Pune district, Maharashtra, India: Quasi-experimental study

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Background: The Government of India had released the "Guidelines for tobacco-free educational institutions (ToFEI)" in 2019. However, adherence to ToFEI ranged from 0-37.8% among studies conducted in Maharashtra, Karnataka, Haryana, and Pondicherry. Earlier, in the pilot survey carried out in 2019-20 among 3 out of 19 Madhyamik Vidyalayas (MVs; secondary schools) in Pimpri-Chinchwad Municipal Corporation (PCMC) it was found that the ToFEI objectives were not achieved .The present study assessed Madhyamik Vidyalayas at baseline and compared and evaluated at the end of 3rd year using Self-Evaluation Scorecard(SES) for ToFEI.

Design/Methods: The MVs had nearly 7500 adolescents and around 250 staff. After obtaining ethical clearance, training of 2 interns by explaining and discussing the criteria and weightage points of SES for ToFEI was conducted by principal investigator. In March 2021, schools were visited for collecting baseline data using the instructions given in the manual. ToFEI program was implemented for the next 3 years in these MVs through their trained staff and students for their active participation in tobacco control activities. A program evaluation was caried out in August-November 2023.

The data was analyzed using descriptive statistics represented as number and percentage with 95% CI using WinPepi PORTAL. An association between pre-post study ToFEI criteria was analyzed using 2 tailed Wilcoxon signed-ranks test and inter quartile range is presented.

Results:

Criteria(Weightage Points)	Pre study(%,CI)	Post study(%,CI)
1."tobacco free area" signage inside(10)	42(0.21-0.64)	100
updated(10)	0	100
2."tobacco free area" at the entrance(10)	16(0.04-0.37)	100
signage(10)	0	100
3. No evidence of use of products (Mandatory 10)	26(0.10-0.49)	100(0.85-1.00)
4. Poster displayed (9)	42(0.21-0.64)	95(0.76-0.99)
5. Organization of tobacco control activity (9)	0	100(0.85-1.00)
6. Designation of tobacco monitors on signage (9)	0	100(0.85-1.00)
7.'no tobacco use' in code of conduct guidelines(9)	0	100(0.85-1.00)
8. Marking of 100 yards from the fence of EI(7)	0	74(0.50-0.89)
9.No shops selling tobacco within 100 yards(7)	5(0.00-0.23)	100(0.85-1.00)
Adherence to ToFEI	0	74(0.50-0.89)

Conclusions: While at the baseline, no MV had achieved the 9 ToFEI criteria, during the program evaluation, all criteria were achieved by 74% schools with the highest weightage point of 100, 8 and 7 criteria by 21% and 5% schools at weightage of 93 and 84 respectively. 95% of MVs achieved score of 90 and above and were eligible for ToFEI certificate. This study suggests that a coordinated effort of FDA and Police, Education and Health Department, civil society, and NGO led to the adherence to ToFEI.

SOA02-616-13 Comparative analysis of e-cigarette regulation impact on retail marketing strategies: An observational study in China

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Background and challenges to implementation: China has implemented the E-cigarette Regulation since May 2022 which prohibits the sale of flavored products and online sales.

To analyze the impact of E-cigarette Regulation in China on marketing activities of e-cigarette shops and provide insights for the improving enforcement of the regulation.

Intervention or response: An on-site observational pre-post design (pre-observation: January to May 2021; post-observation: November 2023 to March 2024) was applied in Chengdu and Shanghai. Dianping, was used to identify 9 business districts in Shanghai and 5 in Chengdu as observation sites in the baseline and follow-up observation. Data were collected using a checklist including basic information, marketing behaviours, age restrictions and health warnings.
Results/Impact: The post observation highlights a dramatic decrease in the total number of e-cigarette shops from 161 to 70. After the regulation came into force, e-cigarette retail stores are mainly composed of multi-brand retail stores (n=66, 94.3%), in contrast to 2021, when single-brand stores dominated the retail market (96.9%). The availability of flavored e-cigarettes in shops decreased significantly from 100% to 32.9% while the percentage of non-nicotine e-cigarettes offered dropped from 11.2% to 5.7%. Promotional activities remaining prevalent including discounts (n=61, 87.1%) and free vaping points (n=49, 70.0%).
However, although prohibited, covert online sales were still available across majority of retailers (n=64, 91.4%). Compliance with minor protections still need improvement, with only 21 shops (30.0%) displaying signage prohibiting sales and use by minors, and only 12 shops (17.1%) displaying health warnings.
Conclusions: The implementation of e-cigarette regulations led to a decrease in the number of e-cigarette shops and standardized product offerings. However, illegal flavored e-cigarettes and online sales were still prevalent in the market. Enforcement of sales restrictions to minors and health warnings were inadequate.
This study highlights the necessity for policymakers to review and enhance e-cigarette regulations to improve the effectiveness of the regulation.

SOA02-618-13 Assessing impact of tobacco control measures on tobacco-related diseases in the state of Himachal Pradesh in India

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Background: The State of Himachal Pradesh in India has achieved a substantial reduction in tobacco use from 2010 to 2022. As per the Global Adult Tobacco Survey-2, tobacco use and passive smoking at home has reduced from 22.1 % to 16.1% and from 82.5% to 33.9% respectively. The current prevalence of tobacco use is 11.6 % and passive smoking exposure is 19.5% as per the State surveillance system. The State has achieved the lowest prevalence of tobacco use (1.1%) among youth in all Indian states as per Global Youth Tobacco Survey 2021.There is a need to assess the impact of tobacco control measures so as to take appropriate actions accordingly.
Design/Methods: The comparative analysis of tobacco use and tobacco related diseases have been done to see the trends from 2008 to 2022. The rates of tobacco related diseases has been calculated based on the number of persons diagnosed out of the total persons screened in that year .The data has been retrieved from population based registry from 2019 to 2022 and from hospital based registry from 2008 to 2011 because the population based data was not available. The exposure to other risk factors associated with these diseases is assumed to be constant during the study period.
Results: The results of this study shows that there is an association between reduction in tobacco use and declining rate of lung cancers, oral cancers, stroke and respiratory diseases from 2008 to 2022. However no reduction has been reported in cardiovascular diseases (CVDs).

Year		2008	2009	2010	2011	2019	2020	2021	2022
Tobacco use		NA	NA	22.1	NA	13.6	14.7	12	11.6
Total number of person screened *		78959	79174	79407	79427	70294	187650	303582	499162
Patients diagnosed (%)	Lung cancers	NA	1.25	1.25	1.25	0.2	0.1	0.1	0.1
	Oral cancers	NA	0.4	0.4	0.4	1	1	0.8	0.6
	Stroke	0.1	0.06	0.12	0.2	1.2	0.7	0.7	0.6
	CVD cases	1.2	1.3	1.4	1.5	1	1	1	2.8
	Respiratory diseases	NA	NA	NA	NA	4.4	3.6	3.3	2.8

NA – data not available, * Number of persons aged 18 and above screened. This number has been used as denominator for calculation of rates of common tobacco related diseases

Table -1 Tobacco use prevalence and rate (%) of tobacco related diseases from 2008 to 2022 in the State of Himachal Pradesh, India.

Conclusions: This study shows that the rates of tobacco related diseases are declining with reduction in tobacco use in the State of Himachal Pradesh. However detailed analysis is required to be done over a longer period of time by taking into account the associated risk factors also.

SOA02-619-13 Outcome of brief tobacco smoking cessation intervention among people with TB in Myanmar

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Background: The Union is integrating tobacco cessation interventions, the ABC (Ask, Brief advice, Cessation support) smoking cessation approach, for TB patients in Myanmar. This study assessed outcome at the end of intervention and factors associated with quitters who relapse smoking.
Design/Methods: A mixed-method study was conducted in TB infected individuals, currently smokers, aged 15 and above from project areas by the Union between 2020 to 2023, December. Record review and logistic regression analysis was used to assess TB treatment outcome based on quitters and non-quitters while controlling age, sex and treatment regimens. 3 FGDs were conducted among the quitters to explore reasons for staying quit or relapse. Thematic analysis was used.
Results: There were 316 TB cases who received ABC approach, of which male (291,63%) and average age of 40 years. After the intervention, 217 (69%) quitter, 48 (15%) smokers, 29 (9%) relapse, 5 (2%) death and 16 (5%) loss to follow-up. Good TB outcome was 189 (60%) and bad outcome was 126 (40%). Quitters and relapse group had 3 odds (AOR 3.1, 95% CI: 1.6–6.0), (AOR 3.2, 95% CI: 1.2–8.6) respectively to have good TB treatment outcome while compared to smoking group.
The qualitative results revealed four themes:
(1) relapse smoking to cope for depression and to get pleasure
(2) relapse is encouraged by the presence of smokers in one's social group and easy access to tobacco
(3) misperception that Cheroot is safer than cigarette
(4) lack of continuous integrated smoking cessation intervention support after TB treatment completion leads to relapse.
Conclusions: This study showed that tobacco cessation intervention significantly improved TB treatment outcomes. Coping mechanisms, social influences, misperceptions, and lack of ongoing support were identified as reasons for relapse into smoking post-TB treatment. It is recommended that these continuous brief cessation interventions to routinely conduct even after achieving cessation.

SOA03 Mapping TB: Integrating molecular and spatial approaches

SOA03-620-13 Phylogeography and transmission of M. tuberculosis in an emerging city, China: A 9-year prospective population-based genomic epidemiological study

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Background: With China's rapid urbanization and extensive internal population movement, tuberculosis (TB) control encounters new challenges. Our study integrates genomic, spatial, and epidemiological analyses to delineate the dynamics of TB transmission in urban settings characterized by high migrant populations, aiming to inform more targeted interventions.
Design/Methods: We conducted a genomic epidemiological study of all culture-positive pulmonary TB patients diagnosed in Baoan, a district of Shenzhen, during 2014–2022. After whole genome sequencing, genomic clusters were defined with a threshold distance of 12-single-nucleotide-polymorphisms. Risk factors for clustering were identified by logistic regression. The distances between patients' residences were compared to their isolates' genomic distances. We conducted a GWAS to find transmissibility-associated mutations using *treeWAS*. Spatial patient hotspots were defined with Getis-Ord *Gi** statistics.

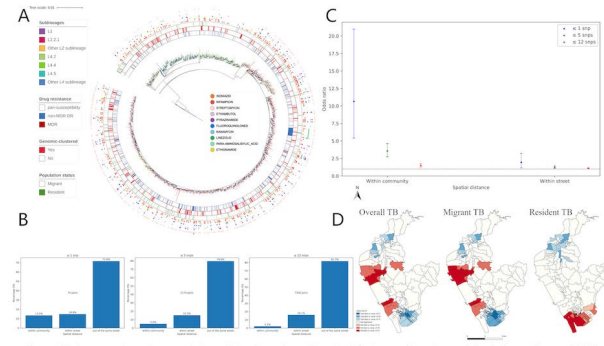

Figure. Phylogeography and transmission of *Mycobacterium tuberculosis* in Baoan, Shenzhen. A. The phylogenetic tree of 4629 MTB strains isolated in Baoan. B. Histograms geographic distance for pairs with ≤1 SNP difference, ≤5 SNP difference, and ≤12 SNP difference. C. Associations between pairwise geographic distance and SNP differences using pairs located out of the same street apart as the reference category. D. Spatial clustering patterns of culture-positive TB notification rate by community level in Baoan, illustrate the overall, migrant, and resident TB, respectively.

Results: Among the 4629 enrolled patients, 93.5% (4328/4629) were internal migrants, with 51.6% (2598/4629) employed in housekeeping or unemployed. Nearly half (54.2%, 1967/3627) of migrant patients developed TB within three years after arriving in Baoan.
Overall, 14.2% (658/4629) strains were in genomic clusters, with L2.2.1 being the most prevalent sublineage (61.5%, 2847/4629). Illiteracy or semi-illiteracy patients

had a greater risk of clustering (aOR 2.024, 95% CI 1.039-3.944). The odds of close genetic relatedness fell rapidly with increasing distance between individuals' residences, but over 70% of clustered patient pairs lived in different streets or communities. *treeWAS* identified 10 significant SNPs associated with genomic clusters. The Getis-Ord General *Gi** analysis showed significant heterogeneity in hotspot community distributions between internal migrants and residents.

Conclusions: In Shenzhen, where migrants form a significant part of the population, about half are diagnosed with TB within three years of arriving, and most transmissions occur among individuals who are not closely located. Innovative active case-finding strategies are needed to target hotspots and high-risk individuals who will benefit most, especially housekeeping workers or the unemployed with lower educational attainment.

SOA03-621-13 Internal migrants as drivers of long-distance cross-regional transmission of TB in China

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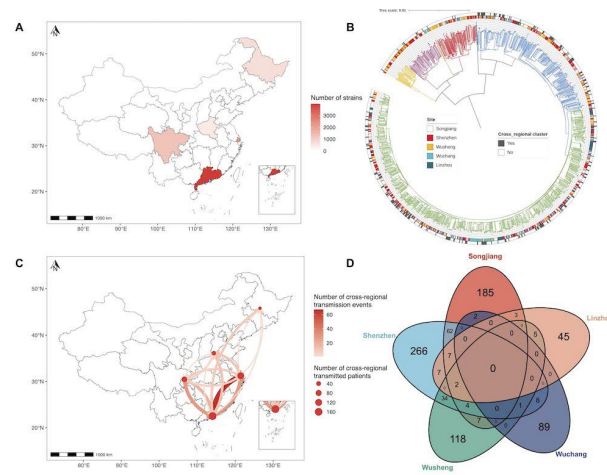
Background: Since China's economic reform, a massive influx of young rural inhabitants, known as internal migrants, has migrated to large cities, predominantly engaging in temporary jobs. Unlike immigrants, they maintain close familial connections with their hometowns. While previous studies have focused on the source of TB infections and their impact on urban epidemics, little attention has been paid to the risk of cross-regional transmission due to their frequent mobility between cities and hometowns.

This study aims to preliminarily explore the influence of internal migrants on cross-regional TB transmission in China.

Design/Methods: A total of 8664 TB patients and their strains from two large cities with a large number of internal migrants and three rural areas were included. Genomic clusters were defined with a threshold distance of 12-SNPs based on WGS. A cluster containing patients from at least two regions was classified as a cross-regional cluster, indicative of cross-regional transmission.

Results: A total of 2403 clustered cases (27.7%) were grouped into 845 clusters, including 142 cross-regional clusters (16.8%). Comparative analysis revealed that high-risk populations for cross-regional transmission included internal migrants (OR=1.93, 95% CI 1.57-2.37), housekeepers (OR=1.85), factory workers (OR=2.12), and individuals aged less than 34 years (OR=4.98). Out of 200 cross-regional transmission events, 96 occurred between urban patients, 98 between urban and rural patients, and only 6 between rural patients. Notably, 93.5% (187/200) of cross-regional transmission events were associated with internal migrants. Epidemiological data indicated that some patients within cross-regional clusters hailed from the same township or neighboring counties, suggesting plausible transmission before their arrival in the city.



Conclusions: Internal migrants emerge as the principal drivers of cross-regional TB transmission in China. It is recommended to establish a TB transmission surveillance platform spanning multiple regions or the entire nation to accurately assess the magnitude and dynamics of cross-regional transmission, facilitating targeted TB control.

SOA03-622-13 Predicting TB prevalence and transmission hotspots in urban areas: A genomic epidemiology approach with machine learning models

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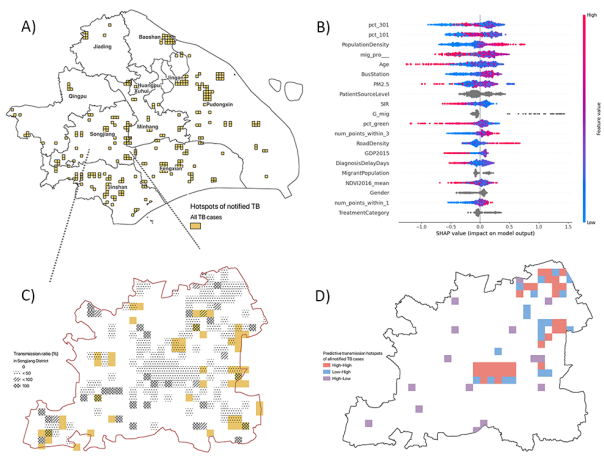
Background: Tuberculosis (TB) remains a significant and prevalent infectious disease in China. Recent research has demonstrated that localized factors significantly impact TB epidemics at the local level, leading to considerable variation in both incidence and transmission within regions. Targeted interventions focused on transmission hotspots are more effective than average interventions.

Design/Methods: We developed a systematic analysis framework and applied six candidate machine learning (ML) models to genomic, spatial, and epidemiological data collected from all notified TB cases in Shanghai's Songjiang District between 2009 and 2016.
Using routine data only, we applied these models to predict genetically clustered TB cases and identify transmission hotspots.
Results: We found heterogeneity in the distribution of notification rate hotspots among overall TB cases, internal migrant TB cases, and residential TB cases. The categorical boosting model (CATBoost) outperformed the other five candidate ML models in binary classification, demonstrating exceptional predictive capabilities. It achieved above-average accuracy on the validation dataset, with a recall of approximately 87% and an AUC of 0.738.
Using explainable ML techniques, our study identified industrial and residential land use, population density, internal migration proportion, and age as the primary determinants influencing TB transmission.
The hotspots of notified TB cases and genetically clustered cases (indicating local transmission) exhibited significant heterogeneity, with transmission hotspots primarily concentrated in the central and northeastern parts of Songjiang District.
Conclusions: Our research developed a method using genomic, epidemiological, and spatial information to predict the binary classification of genetically clustered or unclustered TB cases from the surveillance notification system. The identified areas with concentrated TB transmission could provide a scientific basis for formulating specific intervention strategies for TB prevention and control in urban areas.



A) The distribution of notification rate hotspots in Shanghai between 2009 and 2016; B) SHAP summary plots for genetically clustered TB cases. The x-axis represents the SHAP value, while the y-axis represents feature importance. Primary determinants include industrial landuse (pct_301), residential landuse (pct_101), population density, proportion of migrant population (mig_pro), and age; C) The distribution of notofication rate hotspots and transmission ratio in Songjiang District, with transmission ratio calculated from culture-postive TB cases; D) The distribution of predicted transmission hotspots in Songjiang District, with high-high color blocks representing the significant spatial clusters, and low-high and high-low color blocks indicating local spatial outlier.

SOA03-623-13 Mapping TB prevalence in Africa using a geospatial meta-analysis

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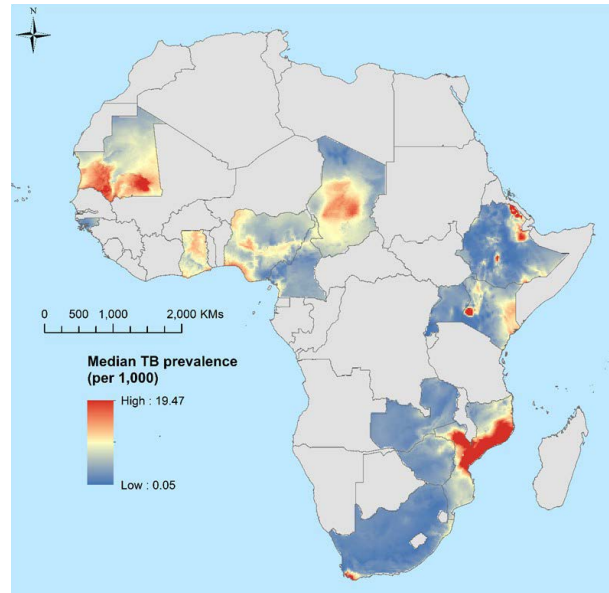
Background: Tuberculosis (TB) remains a major cause of death from infectious diseases worldwide. Africa is the second most-affected region accounting for a quarter of the global TB burden, but subnational variation in TB prevalence is unknown.
We aimed to provide the estimates of the continental, national, sub-national, and local prevalence of TB in Africa, by synthesizing community-based surveys through a geospatial meta-analysis.
Design/Methods: Community-based TB surveys with subnational geographical information and spatial covariates obtained from publicly available sources were used to estimate TB prevalence across Africa at a higher geographic resolution. Meta-analysis for proportions was used to estimate the continental and national pooled prevalence of TB among individuals screened for TB. Bayesian geostatistical model was used to generate predictive prevalence maps of TB across countries where data were available, and results were aggregated to policy-relevant administrative units.



Results: A total of 223 location-specific data points from 19 countries with more than 2 million people screened for TB were included in the analyses. The overall pooled prevalence of TB in these countries was 4.2 per 1,000 (95% CI: 3.1 to 5.8 per 1,000). The geospatial analysis estimated about 0.98 (95% CrI: 0.47 to 1.98) million TB cases in 14 African countries. Substantial national, regional, and local-level variations in TB prevalence were also observed. Climatic factors such as mean temperature

(β: 0.552, 95% CrI: 0.496 to 0.609) and precipitation (β: 0.074; 95% CrI: 0.014 to 0.135) were positively associated with the spatial distribution of TB prevalence in Africa while altitude (β: -0.382; 95% CrI: -0.438 to -0.326) was negatively associated.
Conclusions: There was a lack of community-based TB prevalence data for most African countries, including most high TB-burden countries, indicating the need for more community-based surveys. Geospatial analysis of the available data revealed substantial differences in the prevalence of TB at national, regional, and local levels.

SOA03-624-13 Spatio-temporal patterns of TB in Makassar, South Sulawesi Indonesia

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Background: Information about the distribution of the tuberculosis (TB) incidence rate over time and space is necessary for the effective control of the disease. This study aims to identify the spatio-temporal pattern of TB incidence rate in Makassar, South Sulawesi.
Design/Methods: This cross-sectional study was conducted on aggregated TB data from The Indonesia national tuberculosis information system, Sistem Informasi Tuberkulosis (SITB) between January-December 2022 (3977 patients). Kulldorff's space-time scan statistic was used to identify TB clusters. The Getis-Ord Gi* and Anselin Local Moran's I statistics were used for further characterisation of TB hotspots and cold spots.
Results: The highest incidence rate of TB was observed in middle west area in Makassar during 2022. According to Kulldorf's space-time scan statistic, the most likely cluster was located in 60 villages in the middle-west of Makassar between July and December 2022, with a relative risk (RR) of 1.50 (p-value= <0,001). Some high-trend TB statistically significant clusters were found in the same places.
Conclusions: The TB cluster was located at Middle west Makassar. Prioritising these clusters for resource allocation could lead to more effective tuberculosis control and prevention.

SOA03-625-13 Risk spatial clusters and mapping of attention to drug-resistant TB in the state of São Paulo (2013-2020)

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Background: Drug-resistant tuberculosis (TBDR) consists of resistance to one or more drugs standardized for the treatment of tuberculosis (TB). A significant emphasis should be placed on cases where there is resistance to rifampicin (TB RR), as it constitutes the most effective drug used in TB treatment. In Brazil, 1,104 cases of TBDR were reported in 2022, approximately 67.1% of the total estimated by the WHO in the country. The objective was to identify spatial clusters of risk and map the care network for individuals with TBDR in the state of São Paulo.
Design/Methods: An ecological study conducted in the state of São Paulo. The population consisted of individuals affected by TBDR, undergoing treatment at one of the state CRTs from 2013 to 2020, with case closure on the Site-TB occurring by July 2023. To identify the spatial distribution of TBDR cases, a point density analysis was performed using the Kernel density estimator, generating a case concentration surface to identify vulnerable areas classified as „hotspots" or „coldspots."
Results: 1,084 cases of DRTB were reported in the state of São Paulo from 2013 to 2020. The kernel density estimator made it possible to identify a distribution pattern with considerable variation between the different regions of the state. The highest density of cases, 84.9 cases per km², was identified near the city of São Paulo. There was also a cluster of cases that followed from the state capital region to the municipality of Campinas and a high density of cases in Baixada Santos, the coastal region of the state and Ribeirão Preto.

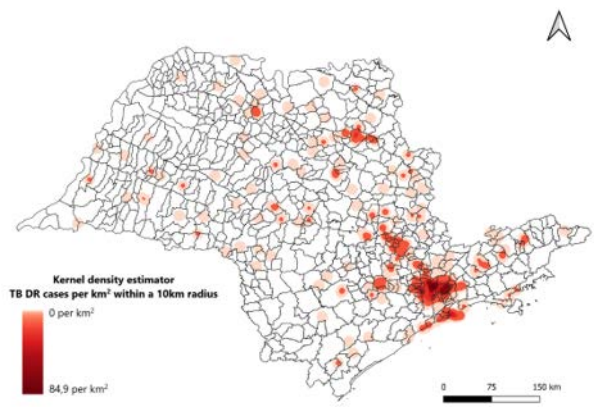

Figure 1. Kernel density estimates for geolocated cases of drug-resistant tuberculosis, Sao Paulo, 2013-2020.

Conclusions: The identification and proposal of mechanisms to overcome gaps in care regarding drug-resistant tuberculosis are essential for disease control in the São Paulo context.

SOA03-626-13 Identifying emerging high burden clusters of TB in Uttar Pradesh, India: A comprehensive geospatial analysis

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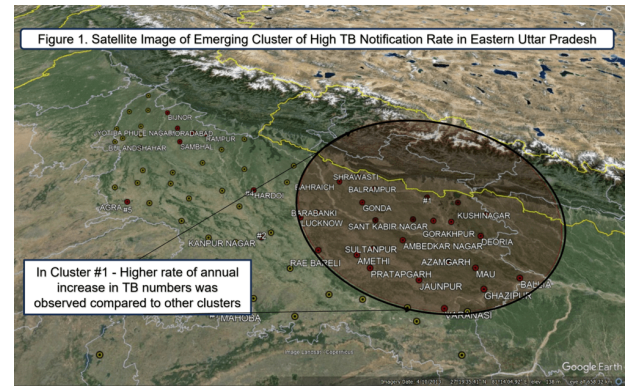
Background and challenges to implementation: In resource limited settings, the ability to geospatially analyse areas with high tuberculosis (TB) notification rates have important public health implications as it helps to modify risk exposure. This study assessed the spatial and temporal patterns in TB notification over the span of 2018-2023 in Uttar Pradesh (UP), India.
Further, the study aimed at identifying the emerging clusters of high TB notification for making data-driven policy decisions.
Intervention or response: Notification data was sourced from Ni-kshay (India's web-based digital TB surveillance system). Population data for all 75 districts of UP was projected for years 2018-2023 using government census reports. District co-ordinates were sourced from Google Maps.
Retrospective spatial and temporal analysis was conducted to scan for areas with high TB notification rates. Subsequently, prospective space-time analysis was conducted to identify the emerging clusters of high TB notification rates. SaTScan was used to undertake this analysis.
Results/Impact: Spatial analysis revealed that TB notification was significantly concentrated along western borders of UP with three secondary clusters #12, #14 and #15 found in districts Jhansi, Lalitpur, Etah, Kanshiram Nagar, Bulandshahar and Hapur.
Temporal analysis indicated that while the high TB notification rate clusters were present in western UP during the years 2018-2019, there were significant clusters found in eastern UP for the years 2022-2023. Prospective space-time analysis indicated an emerging high burden cluster #1(figure.1) covering 25 districts, all in eastern UP spanning a radius of about 215 km.
Observed annual increase in TB cases within cluster #1 is at a rate of 8.79% per year while outside this cluster the rate is slower at 5.60% per year ($p < 0.01$).



Conclusions: Comprehensive geospatial analysis of TB burden emphasizes the need for targeted interventions and data driven decisions by policymakers to prioritize resource allocation in the emerging clusters, for accelerated efforts to eliminate TB in high burden resource-limited settings.

SOA03-627-13 A geospatial analysis of TPT treatment outcomes among PLHIV in Ethiopia, South Africa, and Zimbabwe

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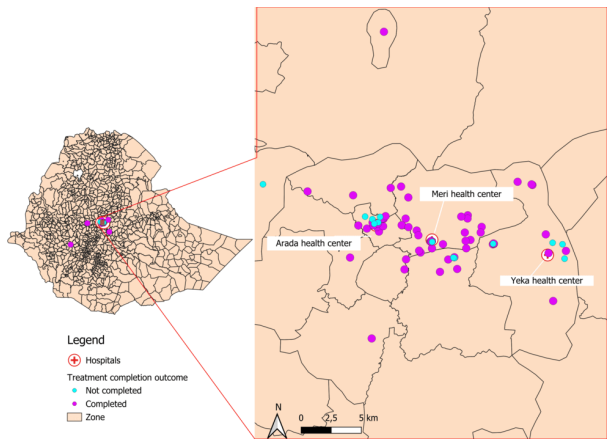
Background: In South Africa, Ethiopia, and Zimbabwe, the adoption of the World Health Organization (WHO)-recommended short tuberculosis preventive treatment (TPT) regimen, 3HP, has been implemented. A prospective study, conducted in these countries, examined the care continuum of 3HP and isoniazid preventive treatment (IPT) from eligibility to completion at a country level. We applied geospatial analysis to assess variations in completion of treatment in the administrative areas for each country.
Design/Methods: Between July 2021 and December 2023, treatment completion data on patients initiating TPT was abstracted from clinic records. We conducted a descriptive geospatial analysis to identify geographical trends potentially influencing treatment completion rates, while taking the geospatial distribution of gender and age-groups into account. Next, we calculated local indicators of spatial autocorrelation (LISA) to identify significant hot- and cold spots with relative high/low treatment completion outcomes and spatial outliers with high or low treatment outcomes across Ethiopia, South Africa, and Zimbabwe.

Results: Of 2,095 participants, 1,076 datapoints could be geolocated (484 in South Africa, 83 in Ethiopia, and 509 in Zimbabwe). 768 (71,4%) participants were female, 164 (15,2%) participants were younger than 30 years, 673 (62,5%) between 30-50 years, and 239 (22,2%) were older than 50 years. Treatment completion varied with 93,5% in Zimbabwe, 87.6% in South Africa, and 83.1% in Ethiopia. Notably, some of the participants who did not complete treatment live close to the healthcare facility, as can be seen in the figure, which shows treatment completion outcomes across the healthcare facilities in Ethiopia. Similar trends were seen in South Africa and Zimbabwe. Spatial autocorrelation analysis revealed no significant hot- and cold spots.



Conclusions: Geospatial techniques provide insights into geographic trends in TPT treatment outcomes, aiding decision-making for targeted interventions. Findings suggest a need for additional support near clinics to improve completion outcomes.

SOA03-628-13 Whole genome sequencing reveals M. tuberculosis lineages and drug resistance distribution in Northeastern Thailand

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Background: Tuberculosis (TB) remains a significant public health challenge in Thailand, particularly in the northeastern region. Utilizing Whole Genome Sequencing (WGS) offers a promising approach to understanding the epidemiology and drug resistance patterns of *Mycobacterium tuberculosis* (MTB) strains circulating in this region.
Design/Methods: We conducted WGS analysis on 1,128 MTB isolates collected between 2022 and 2023 across four provinces in northeastern Thailand (Khon Kaen, Roi Et, Maha Sarakham, and Kalasin). Lineage identification and drug resistance profiling were performed using mtbtyper and TB-Profiler (v.5.0.1) pipeline, respectively. Additionally, sub-lineages were characterized to provide further insights into the genetic diversity of MTB strains.
Results: Among the isolates, 67% were from male patients. Lineage distribution revealed L1 as the predominant lineage (62.4%), followed by L2 (32.7%), L4 (4.6%), and a minimal presence of L3 (0.1%). Sub-lineage analysis uncovered that L1.1.1.7 (12.32%) and L1.2.2.2 (11.97%) were the most prevalent.
Our findings indicate a greater prevalence of Lineage 1 compared to previous studies. Drug resistance analysis demonstrated that 24.2% of the isolates exhibited resistance to any drugs, including 11.5% (130/1128) isoniazid mono-resistant (HR-TB), 1.0% (11/1128) rifampicin mono-resistant (RR-TB), 2.8% (32/1128) multidrug-resistant (MDR-TB) and 0.4% (4/1128) pre-extensively drug-resistant TB (pre-XDR-TB).
Moreover, two isolates exhibited the rpoB I491F mutation that cannot be detected by GeneXpert MTB/RIF. Regarding drug resistance by lineage, we observed a higher proportion of any DR-TB in L2 (35.1%) compared to L1 (18.7%), with an odds ratio of 2.35 (95% CI: 1.77-3.13).
Conclusions: Our study highlights the prevalence of specific MTB lineages, sub-lineages, and drug-resistant strains in northeastern Thailand. WGS-based approaches

provide valuable insights into TB epidemiology and can inform targeted interventions for effective TB prevention and care strategies in high-burden regions. Further comparative analyses with other regional and global studies are warranted to elucidate the regional variations in MTB lineage distribution and lineage-specific drug resistance patterns.

SOA03-629-13 Integrating genomic and spatial analyses to understand TB transmission: A scoping review

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Background: Recent advances in pathogen sequencing and innovations in the analysis of genomic and spatial data have provided new opportunities to describe the patterns of tuberculosis transmission with high resolution. Here, we aim to provide a scoping review of studies that combine pathogen genomics and spatial analysis to study *M. tuberculosis* transmission.

Design/Methods: We conducted a systematic literature search in October 2023 from major databases including PubMed. Studies published in English that combined genomics and spatial analysis of tuberculosis disease in humans were included.

We classified each study into several categories based on the genotypic and spatial analytic methods used and the major research question addressed.

Results: A total of 181 studies from 1994 to 2023 were included in our final review. By 2019, whole genome sequencing (WGS) had largely replaced less high-resolution genotyping methods (e.g., RFLP, Spoligotyping, MIRU) as the genetic characterization method of choice (Fig a). 50% of the studies simply described the spatial distribution of genetically clustered isolates (n=91, of which 56 included maps), while the other 50% (n=90) paired genetic analysis with spatial analysis.

Of these studies with formal statistical analyses, 61 studies conducted hypothesis testing of factors related to the spatial distribution of *M. tuberculosis*, and 41 studies identified the spatial aggregation of genetically related isolates (12 studies included both types of analyses) (Fig b).

Conclusions: Joint analysis of WGS and spatial data has allowed for the study of tuberculosis transmission with unprecedented detail. The ongoing development and application of new approaches to analyze these data jointly holds great promise for transforming our understanding of tuberculosis transmission dynamics.

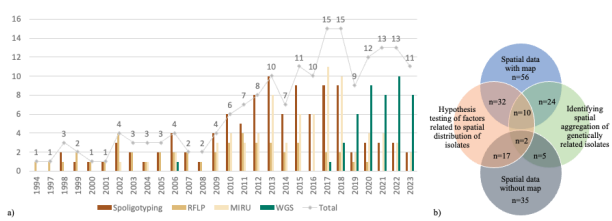

Figure. Summary of included publications: a) total number of studies by year (line) and methods of genomic analysis used by year; b) approaches for description and/or analysis of spatial and genomic data.

PRINTED POSTER SESSION (PP)

PP06 Surviving TB and its aftermath

PP06-852-13 Microbial cross-talk of the gut-lung axis in people with pulmonary TB in South Korea

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Background: Recent studies have described microbial cross-talk between the gut and lungs, often known as the gut-lung axis, in *Mycobacterium tuberculosis* infection in an animal model. However, existence of the microbial gut-lung axis remains unexplored in pulmonary tuberculosis (TB) patients.
Design/Methods: Here, we investigated microbial correlation in the gut-lung axis using the stool and sputum samples of 52 naïve TB patients and 81 healthy controls (HCs) from South Korea. Compositional data analysis of taxonomic profiles was based on full-length 16S and 23S rRNA gene amplicon using Nanopore sequencing.
Results: Compared with HCs, TB patients presented a different gut-lung microbial community and decreased microbial diversity (sputum $p < 0.05$; stool $p < 0.56$). The gut microbiota of TB patients showed a decrease in short-chain acid producing species, such as *Lachnospira*, *Eisenbergiella*, and *Fusictenibacter*, and an increase in several conditional pathogen-related species, such as *Neisseria* and *Staphyloccus* species.
In the lung, the differential abundance of species such as *Gemella*, *Fusobacterium*, and *Actinomyces* as lower, while that of species such as *Faecalibacterium*, *Neisseria*, and *Bacteroides* was higher. Furthermore, the microbiota of the gut-lung axis was observed to cluster according to TB infection status. Microbial cluster in a pulmonary TB patient was noted as significant gut-lung interactions, characterized by lung *M. tuberculosis*, *Gemella haemolyans*, and gut *Lachnospira* species. The lung *Mycobacterium tuberculosis* and gut *Fusicatenibacter saccharivorans* was negatively correlated with the high gut-lung interaction, but also lung *Gemella haemolysans* with gut *Neisseria flavescens* was negatively correlated with the low gut-lung interaction.
Conclusions: Significant alterations in gut-lung microbiota composition and diversity in TB patients were observed. To our knowledge, this study, for the first time, demonstrated the existence of the gut-lung axis and bacterial associations through its axis in TB patients. In future, microbial therapies through probiotic agents may help in treating TB patients.

PP06-853-13 Beyond the illness: A qualitative exploration of the burden of caring for people with TB on caregivers and their households in South Africa

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Background: Tuberculosis is inextricably linked with a vicious cycle of poverty, and affecting not only the person sick with TB but also their households. Our study aimed for a deeper understanding of the multiplicative impact of TB on households, and more specifically on caregivers of people with TB, as well as factors that influence the burden on caregivers in South Africa.
Design/Methods: We conducted an exploratory study using qualitative methods to focus on the lived experiences of people providing care to a family member sick with TB.
Results: The impact of caring for a household member sick with TB was inextricably linked with other pre-existing stressors and demands on (predominantly female) caregivers such as financial stress, food insecurity, illness, death, and conflict in the household.
The multiple stressors and strains caused by poverty had already diminished the capacity of most caregivers affecting their resilience and that of their household. Providing care to a household member sick with TB added in many cases an additional strain resulting in a deterioration in their physical and mental health, loss of income and debt, loss of education and future prospects, relocation and displacement, behavioural issues in children, and increased conflict in the home.
For many households, this impact continued beyond the TB episode leaving the household in a worse-off position and at a higher risk of continued ill health and further poverty. Social support was found to mediate the burden on caregivers, however, was lacking for many as kinship bonds are being weakened by high levels of poverty, inequality and unemployment.

Conclusions: Support to households is recommended to ensure recovery of the person with TB and their household post illness and prevent further ill health and poverty for caregivers and their households.

PP06-848-13 Persistence of respiratory impairment six months after completion of TB treatment in Gambian children and adolescents

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Background: There is increasing evidence to suggest that post-tuberculous respiratory impairment plays a significant role in the prevalence of chronic pulmonary disease in adults. However, there is still limited understanding of the long-term effects of childhood pulmonary tuberculosis (PTB).
As such, we aim to investigate the pattern of development and progression of respiratory impairment in Gambian children and adolescents who have successfully completed PTB treatment.
Design/Methods: In an ongoing longitudinal study, participants aged younger than 19 years with microbiologically confirmed and unconfirmed PTB are consecutively recruited within six weeks of completing PTB treatment and followed up for 12 months. We collect demographic and clinical data at recruitment and 6-monthly follow-up visits, including respiratory symptoms, chest X-ray, and spirometry.
In this abstract, we compare data collected at treatment completion (baseline) versus six months later. Lung function was assessed using Global Lung Initiative (GLI) and American Thoracic Society/European Respiratory Society (ATS/ERS) guidelines and reference standards.
Results: Of the eligible 80 participants, 79 (98.8%) provided valid spirometry at the baseline visit and 74 at the six-month follow-up. Of these, 41 (51.9%) were female, with a median age of 15.6 years (IQR: 11.8-17.9). TB diagnosis was confirmed in 53 (67.1%) participants, while 8 (10.1%) also had HIV. After six months, self-reported respiratory symptoms were less frequent than at baseline (table). However, spirometry measurements (FEV_1, FVC, and FEV_1/FVC) remained similar at six months compared to baseline. The proportion of children with abnormal lung function increased slightly from 57.0% at baseline to 66.2% at six months, p=0.549.
Conclusions: Our findings indicate that even though respiratory symptoms become less frequent, post-TB residual lung function impairment may persist up to six months after treatment completion. Therefore, it is imperative to develop follow-up strategies for children and adolescent TB survivors to enhance their overall health and well-being following TB treatment.

		At TB treatment completion (N=79)	At 6 months after TB treatment completion (N=74)	P-value (from paired samples t-test or McNemar's test as appropriate)
Clinical variables	Cough, n (%)	21 (26.6)	13 (17.3)	0.248
	Sputum production, n (%)	14 (17.2)	5 (6.7)	0.035
	Shortness of breath, n (%)	9 (11.4)	5 (6.7)	0.388
	Wheeze, n (%)	5 (6.3)	3 (4.0)	0.500
Spirometry variables	FEV_1 z-score, mean (SD)	-1.91 (1.38)	-1.93 (1.27)	0.350
	FVC z-score, mean (SD)	-2.05 (1.41)	-1.99 (1.28)	0.097
	FEV_1/FVC z-score, mean (SD)	0.04 (1.16)	-0.14 (1.20)	0.379
Spirometry interpretation	Abnormal, n (%)	45 (57.0)	46 (62.2)	0.549

Table: Respiratory parameters at TB treatment completion versus six months after TB treatment completion

PP06-850-13 Baseline C-reactive protein is associated with neurological disability in TB meningitis

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Background: Tuberculous Meningitis (TBM) complicates ~5% of all TB cases in people living with HIV with case fatality of up to 50%. A third of survivors experience long-term disability. Excessive inflammatory response to mycobacteria in the brain is detrimental, and customized adjunctive immunomodulatory therapy may improve disability-free survival. A prognostic biomarker that is sensitive to inflammation could be useful for identifying those needing customized adjunctive immunomodulatory therapy. We determined if C-reactive protein (CRP) predicts poor TBM outcome.

Design/Methods: From March 2021 to November 2023, we enrolled Ugandan adults with TBM. We obtained serum CRP within 48 hours of enrollment and assessed the association between CRP and neurological disability after 8 weeks of anti-TB treatment using logistic regression. Neurological disability was defined as modified Rankin score >3. TBM severity at presentation was measured by the Medical Research Council (MRC) grade.

Results: Among 136 participants with TBM, 82% (111/136) were living with HIV, and baseline CRP was median = 41.7 mg/L, (IQR 12.0 to 97.6). Baseline CRP did not differ by HIV status. Participants with CRP >40 mg/L were more likely to present with severe (MRC grade IIII) TBM (p=0.007).

By 8 weeks, 59% (41/69) of participants with baseline CRP >40 mg/L had modified Rankin score >3 versus 30% (20/67) of participants with baseline CRP ≤40 mg/L. Baseline CRP >40mg/L was associated with neurological disability at 8 weeks (Odds Ratio 3.44, 95%CI 1.69-7.00; P<0.001).

After adjusting for certainty of TBM diagnosis (microbiologically confirmed versus presumptive), MRC severity grade, and HIV status, baseline CRP remained significantly associated with neurological disability at 8 weeks (adjusted Odds Ratio 2.75, 95%CI 1.28-5.93; P=0.01).

Conclusions: Baseline CRP >40 mg/L was associated with neurological disability after the intensive phase of TBM treatment. CRP could be a prognostic marker indicating excessive immune response and need for adjunctive immunomodulatory therapy.

PP06-855-13 Linking whole genome sequencing of M. tuberculosis isolates to epidemiological and social network data from passive and active community case finding in Bandung, Indonesia

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Background: Mycobacterium tuberculosis (Mtb) transmission in Indonesia is poorly understood. Whole genome sequencing (WGS) can provide precise estimates of Mtb isolates' relatedness, complementing epidemiological and social network data, as well as drug-resistance profiles. We aimed to understand transmission patterns through linking epidemiological, social network, and WGS data in contiguous areas of Bandung City.

Design/Methods: Newly diagnosed pulmonary TB patients, along with actively identified prevalent and incident cases in their household and neighborhood contacts, were interviewed and sampled between April 2021 and October 2022. Sputum samples underwent DNA isolation and WGS, which was analyzed to determine lineage and phylogeny, genotypic drug resistance, and pairwise SNP distance (SNP-Distance of <10 defined close relatedness).

Results: A total of 223 patient MTB isolates successfully underwent WGS and subsequent analysis. The majority of isolates belonged to the Euro-American lineage (L4) (118/223, 52.9%) followed by the East-Asian (L2) (97/223, 43.5%) and Indo-Oceanic lineages (L1) (8/223, 3.6%). Forty-two (18.8%) isolates were genotypically resistant to at least one anti-tuberculosis drug, of which 8 (3.6%) were predicted to be MDR. Of 19 intra-household isolate pairs, 6 (31.6%) were determined to be closely related to each other. Of 77 household-to-neighborhood isolate pairs, 4 (5.2%) were closely related.

Half of all closely related pairs (10/20, 50.0%) shared no epidemiological link and were not explained by social network analyses. The largest cluster identified comprised 3 cases. In keeping with their relative proportions, 12 of 20 (60%) isolate pairs belonged to L4, the rest belonging to L2.

Conclusions: In keeping with very high Mtb transmission settings, even the majority of household TB cases appear to have acquired the pathogen externally in the

community in Bandung, and only a little more than 5% of neighborhood TB cases are genomically linked. A general community approach to TB control is likely to be necessary to reduce the burden of TB.

PP06-849-13 Paediatric post-TB lung disease in Kenya: Longitudinal insights and health implications

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Background: Post-Tuberculosis (TB) lung disease (PTLD) in children presents challenges to respiratory health and well-being, yet longitudinal studies remain limited.
This study aims to elucidate the trajectory of PTLD by characterizing lung function changes, assessing structural abnormalities, and identifying risk factors.
Design/Methods: Symptomatic children aged ≤15 years in Nairobi, Kenya underwent evaluation for pulmonary TB and were categorized based on National Institutes of Health criteria (confirmed TB with positive Xpert and/or culture, unconfirmed based on clinical diagnosis, and unlikely if otherwise).
Baseline assessment included chest X-rays (CXR), sputum testing, and symptom evaluation. Prospective follow-up assessments were conducted over one year. PTLD assessments comprised CXR, spirometry (for participants >5 years) and clinical evaluations at 1, 6, and 12 months.
PTLD was defined as abnormal CXR, spirometry, or persistent cough in children receiving TB treatment for ≥5.5 months.A generalized linear model with a log link was used to evaluate various associations with PTLD.
Results: At baseline, 382 children (median age 2 [IQR 1–5] years) were enrolled, with 279 (73%) aged under 5 years and 204 (54.4%) female. Twenty-six (6.8%) children had Confirmed TB, 300 (78.5%) Unconfirmed TB, and 56 (14.7%) Unlikely TB. At ≥5.5 months, 189 (49.4%) participants on treatment were followed up, among whom 54 (28.6%) were diagnosed with PTLD, 36 (66.7%) were under 5 years old.
Unconfirmed TB status correlated with a lower risk of PTLD at ≥5.5 months (p = 0.001), while a positive GeneXpert was associated with PTLD occurrence (P=0.020). Participants with better nutritional status (higher weight-for-height ratios), had a higher risk of PTLD at 12 months compared to undernourished individuals (p = 0.031).

Variable	PTLD Present N=54 n (%) or Median (IQR)	No PTLD N=135 n (%) or Median (IQR)	RR	p-value	Variable	PTLD present N=25 n (%) or Median (IQR)	No PTLD N=112 n (%) or Median (IQR)	RR	p-value
	Month 6					Month 12			
Age (median IQR)	3.7 (1.4, 5.7)	3.4 (1.6, 6.1)	0.99 (0.92, 1.05)	0.677	Age (median IQR)	4.6 (3.1, 5.9)	4.0 (2.1, 6.9)	0.99 (0.90, 1.09)	0.849
Female Sex	33 (61.1)	65 (48.2)	1.5 (0.91, 2.33)	0.114	Female Sex	14 (56.0)	62 (55.4)	1.02 (0.50, 2.1)	0.954
Unconfirmed TB (N=170)	46 (85.2)	124 (91.9)	0.17 (0.08, 3.36)	**<0.001**	Unconfirmed TB (N=170)	25 (100.0)	99 (88.4)		
Confirmed TB (N=19)	8 (14.8)	11 (8.2)	1.56 (0.87, 2.79)	0.138	Confirmed TB (N=19)	0 (0.0)	13 (11.6)		0.125
Abnormal Chest x-ray (N=187) **	36 (73.5)	13 (15.5)	4.75 (2.80, 8.10)	**<0.001**	Abnormal Chest x-ray (N=187) **	3 (17.7)	1 (1.4)	4.5 (2.16, 9.60)	**<0.001**
GeneXpert Positive (N=249)	8 (15.7)	8 (6.1)	1.93 (1.11, 3.36)	**0.02**	GeneXpert Positive (N=249)	0 (0.0)	10 (9.1)		0.208
Cough**	28 (51.9)	16 (11.9)	3.55 (2.34, 5.37)	**<0.001**	Cough**	25 (100)	10 (8.9)		**<0.001**
WHZ (median, IQR), (N=128)	0.02 (-1.6, 0.7)	-0.07 (-1.23, 0.6)	0.99 (0.83, 1.20)	0.983	WHZ (median, IQR), (N=128)	0.7 (0.2, 1.2)	-0.11 (-0.85, 0.73)	1.50 (1.04, 2.05)	**0.031**

Abbreviations: PTLD, Post TB Lung Disease; IQR, Interquartile range; RR, Relative risk; WHZ, Weight for height; [1]Fishers exact
** Part of PTLD definition, RR not applicable for these categories.

Table 1. Correlates of post TB lung disease at months ≥5.5 months and 12 months.

Conclusions: Pediatric post-TB monitoring is essential for understanding development of PTLD, guiding interventions, and improving respiratory health. Spirometry and oscillometry (as a planned future intervention) in this study promises valuable insights into lung function assessment among children.

PP06-851-13 Persistent respiratory symptoms and residual lung disability in people post-TB: A pilot study in Bandung, West Java, Indonesia

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Background: Despite advancements in tuberculosis (TB) treatment, many individuals who survive TB continue to face health challenges. Post-TB lung disease (PTLD) significantly contributes to TB-related morbidity and mortality. A substantial proportion of patients who complete TB treatment may experience chronic respiratory symptoms and continued lung function loss.
Design/Methods: Adult patients aged 18 years and older with bacteriologically confirmed pulmonary TB were recruited at the time of diagnosis and followed up to 12 months. Their clinical symptoms, lung function, 6-minute walk test (6MWT) results, and quality of life were assessed during each follow-up visit.
Results: In this pilot study, thirty four participants (median age 34 years (IQR 22-49), 38.2% male) were enrolled. At TB treatment completion, 25.5% of patients continued to experience persistent cough, while 11.8% reported ongoing shortness of breath. Some of these symptoms persisted after 12 month, with 8.8% of patients experiencing cough and 3% experiencing shortness of breath. Median percentage of predicted FEV_1 at the end of treatment was 65.2 % (IQR 58.3-83.6), and some patients still exhibited

persistent lung function impairment at month 12 (median FEV_1 67.0% (IQR 57.0-83.6)). FEV_1/FVC was 80.8% (IQR 67.2-85.5) at the end of treatment and 83.5% (IQR 73.3-91.5) at month 12. The 6MWT distance was 324 meters in patients (IQR 278-378) at the end of treatment and 349 meters (321-414) at month 12. The St George's Respiratory Questionnaire (SGRQ) score was 6.7 (IQR 2.6-12.0) at end of treatment and improved at month 12 (median 1.0 (IQR 1.0-2.7)).

Conclusions: Our preliminary findings indicate persistent respiratory symptoms and moderate to severe lung function impairment among PTB patients, even after successful treatment completion. Developing effective strategies to prevent and manage post-TB sequelae is crucial. Ongoing studies are underway to determine the precise incidence and characteristics of post-TB lung disease in Indonesia.

PP06-854-13 TB incidence in people living with HIV attending routine settings post-TB preventive treatment initiation in Ethiopia, South Africa, and Zimbabwe

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Background: Tuberculosis preventive treatment (TPT) limits progression to active TB disease although the durability of protection is unclear. TPT in many countries is delivered once for people living with HIV (PLHIV). We determined the TB incidence among PLHIV initiating TPT in routine care clinic settings in Ethiopia, South Africa, and Zimbabwe.

Design/Methods: We conducted a prospective cohort study of PLHIV (July 2021–December 2023). We abstracted clinical data on TPT initiation, TB symptoms and diagnosis from records at 3-, 6-, 12- and 24-months post-enrolment. All participants provided a sputum specimen at month 12 and 24 for Xpert MTB/RIF ultra and culture. TB incidence rates per 100 person-years and their corresponding 95% confidence intervals were calculated and summarized by country and TPT regimen.

Results: Of the 2,095 PLHIV enrolled and followed-up, TPT was initiated in 1,940 (93%). Overall, 54 participants were diagnosed with incident TB for an incidence of 1.45 (1.11-1.89) per 100-person-years. Country-specific incidence rates were as follows: Ethiopia, 2.02 (1.38-2.97); South Africa 2.02 (1.35-3.01); and Zimbabwe, 0.32 (0.12-0.85). TB incidence was highest in those with last IPT >1 year prior to enrolment (2.38; 1.58-3.58) compared to IPT <1 year from enrolment (0.99 (0.56-1.7), 3HP (1.2 (0.75-2.0) (all 3HP prescribing was <1 year from enrolment), and no history of TPT (1.3 (0.4-4.1). Time to TB diagnosis after TPT initiation was 1.9 (IQR:1.2-5.3) years. Of incident TB, 29/54 (53.7%; 95%CI:39.6%-67.4%) did not report symptoms on screening.

Conclusions: TB persists among PLHIV who are receiving ART and have received TPT making ongoing TB screening and testing important for this population. The TB disease incidence appeared to be higher among participants who had received TPT longer ago suggesting potential benefit with repeating TPT.

PP09 Capacity building for TB prevention, care and management

PP09-877-13 Extending capacity for pediatric stool processing: The Uganda Supranational Reference Laboratory's (SRL) program for multi-country training and capacity building

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Background and challenges to implementation: TB diagnosis in children aged 0-14 years remains a challenge; a majority of pediatric TB cases are clinically diagnosed or are missed altogether. In 2022, WHO recommended stool as an alternative sample method for diagnosing TB in children. However, country uptake of stool sample collection and analysis for TB has been suboptimal.

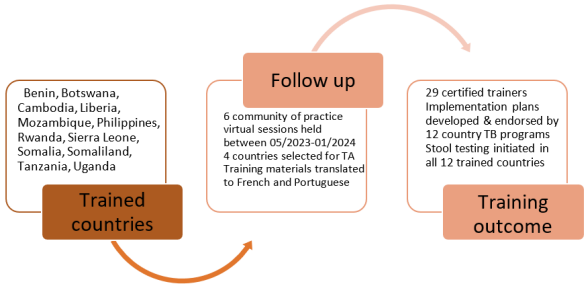
To address this gap, the Uganda Supranational Reference Laboratory (SRL) implemented a capacity strengthening approach consisting of a regional training-of-trainers, virtual community of practice and targeted technical assistance (TA).

This work was made possible through the U.S. Agency for International Development under the Tuberculosis Implementation Framework Agreement.

Intervention or response: In march 2023, SRL developed training materials following an IACET accreditation structure using resources from WHO and KNCV. A Five-day training included theoretical and practical sessions on pediatric TB screening, diagnosis, management, and treatment and comprised 13 modules - available in three languages - PowerPoint presentations, facilitator guides, and exercises. Trainees from 12 countries, including pediatricians and laboratory personnel, completed a pre- and

post-test to evaluate knowledge and skills acquired. SRL supplemented the training with a virtual community of practice and targeted TA to facilitate adoption and rollout of stool-based testing for pediatric TB management.

Results/Impact: Twenty-nine (29) personnel were certified as trainer-of-trainers. All participants scored above 80% in the post-test compared to pre-test scores of 34-74%. Twelve country National TB programs developed and endorsed country-specific stool-based testing implementation plans and initiated stool-based testing using the SOS technique. Six community of practice virtual sessions were held, and four countries were selected to receive TA to support country stakeholder engagement meetings, trainings and data management.



Conclusions: Regional-based technical support hubs are critical to extending new and improved diagnostics across countries. Capacity strengthening support including, but not limited to training are needed to support countries to overcome hurdles to rolling-out new diagnostic methods.

PP09-879-13 Evaluation of PrimeEQA® Xpert MTB proficiency panels at WHO TB Supranational Reference Laboratories in South Africa, Uganda and Benin

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Background: Robust External Quality Assurance (EQA) programs are essential to ensure the accuracy of Xpert MTB diagnostic results. Currently available Xpert MTB EQA materials cannot satisfy demand due to labor-intensive production methods and high cost. PrimeEQA® Xpert MTB Proficiency Panels (PrimeEQA®) are less labor intensive to produce, follow standard processing procedures and are less expensive (~USD20). They are composed of mycobacterial isolates grown in MGIT culture, then inactivated in PrimeStore® MTM molecular transport media (Longhorn Vaccines and Diagnostics LLC, Bethesda, USA) which stabilizes the DNA in a liquid matrix for up to 30 months at ambient temperature. We sought to assess the performance and the stability of PrimeEQA® stored at ambient temperature over time.

Design/Methods: PrimeEQA® panels, composed of four mycobacterial isolates (MTB pan-susceptible [PS], MTB RIF mono-resistant [RR], MTB INH/ETH/PZA-resistant [IEPR], NTM/negative control), underwent blinded testing using GeneXpert MTB/RIF Ultra and MTB/XDR cartridges, per manufacturer's instructions, at WHO TB Supranational Reference Laboratories (SRL) in South Africa (Sep 2023), Uganda (Jan 2024) and Benin (Mar 2024). All samples were from a single lot, produced in January 2022 and expiring 31 July 2024, and were stored and shipped at ambient temperature.

Results: In the first round of testing, 215 of 216 (99.5%) PrimeEQA® samples were correctly identified. One result was partially incorrect (‚MTB DETECTED; RIF resistance DETECTED' reported as ‚MTB DETECTED; RIF resistance INDETERMINATE') and one failed sample was correctly identified upon retesting. There were no significant differences in median cycle threshold scores across sites and the coefficient of variance (CV) was between 0.9% and 1.86%.

	Isolates	South Africa	Uganda	Benin
No. correct / No. tested = % correct	PS/RR/IEPR/NTM	100/100 = 100%	79/80 = 98.75%	36/36 = 100%
Xpert grades: Low / Medium / High	MTB pan-susceptible (PS)	0 / 16 / 9	0 / 10 / 10	3 / 6 / 0
	MTB RIF mono-resistant (RR)	0 / 24 / 1	2 / 10 / 8	6 / 3 / 0
	MTB INH/ETH/ PZA-resistant (IEPR)	1 / 22 / 2	4 / 7 / 9	4 / 5 / 0
IS1081-6110 Ct: median (IQR)	MTB pan-susceptible (PS)	16.5 (16.4,16.7)	16.2 (16.1,16.3)	16.6 (16.4,16.9)
	MTB RIF mono-resistant (RR)	16.6 (16.5,16.8)	16.4 (16.3,16.6)	16.8 (16.6,16.9)
	MTB INH/ETH/ PZA-resistant (IEPR)	16.6 (16.5,16.7)	16.4 (16.1,16.6)	16.6 (16.5,17.0)
IS1081-6110 Ct: Coefficient of Variation (CV)	PS/RR/IEPR	1.34% / 1.29% / 1.34%	0.90% / 1.59% / 1.61%	1.86% / 1.54% / 1.61%

Table 1: PrimeEQA® Xpert MTB Results.

Conclusions: Results from testing of PrimeEQA® Xpert MTB Proficiency Panels at WHO TB Supranational Reference Laboratories in South Africa, Uganda and Benin were highly concordant and reproducible. PrimeEQA® is a simple, cost-effective method that can be produced locally to help meet the need for Xpert MTB EQA materials.

PP09-881-13 Results of community approach to improving access to mental health services in Nigeria TB programme

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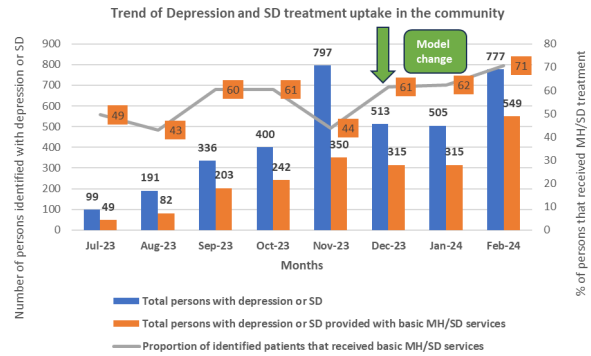
Background and challenges to implementation: Nigeria faces high mental health disorder (MHD) prevalence rates among TB and TB/HIV patients (46% and 66.7% respectively), compounded by a shortage of mental health professionals. The ratio of psychiatrists and psychiatric nurses to the population is 1:1,000,000 and 40:1,000,000 respectively, favoring urban areas. Hence, a need to explore more efficient approaches to improve access to mental health services (MHS).
Thus, RedAid Nigeria adopted a community-driven integrated service delivery model in the ongoing TB REACH wave 10 project to improve access to MHS within the project communities for persons, including TB patients with depression and substance use disorder (SD).

Intervention or response: Community health workers underwent training in integrated screening for TB, depression, and SD utilizing TB symptom checklist, Patient Health Questionnaire-9, and Alcohol, Smoking, and Substance Involvement Screening Test tools respectively. Presumptive TB cases identified are further evaluated for TB, while mild to moderate cases of depression and SD are referred to lay counselors (community members trained with WHO mhGAP to provide basic psychotherapy and brief counseling). Severe cases are referred to mental health (MH) experts. Continuous capacity-building is ensured through retraining sessions and periodic supportive supervision conducted by MH experts.
Results/Impact: Between July 2023 and February 2024, 3,618 cases of depression or SD were identified and referred for treatment in the community. 2,105(58%) received basic MHS and/or brief counseling for SD which would have otherwise been missed. Of 197 TB cases identified, 39(19.8%) were co-morbid with depression and/or SD. A persistent MHD/SD treatment gap prompted a service model change in December 2023, incorporating lay counselors into the outreach team with CHWs. This led to progressive treatment uptake improvement (see chart). The new model enabled immediate counseling at identification, fostering rapport for follow-up sessions.



Conclusions: Lay counsellors are feasible options for closing MH treatment gap in countries with shortage of MH experts.

PP09-880-13 Empowering community-based volunteers: Harnessing tele-mentoring to combat TB in Zambia

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Background and challenges to implementation: In 2022, the Zambia TB incidence stood at 59,000 (295/100,000 population). TB is the top 10 cause of morbidity and mortality in-country. To increase access to health services, the Ministry of Health (MoH) adopted community-based volunteers (CBVs) through the neighborhood health

committees (NHCs) as part of the lowest level of the health workforce, supporting community TB screening, linkage to treatment and prevention. However, ongoing training and mentorship for CBVs' capacity building are limited due to the cost of in-person training approaches. Jhpiego, with funding from Health Resources and Services Administration (HRSA) under PEPFAR, is supporting MoH to implement a low cost TeleECHO mentorship approach, linking learners to specialists.

The present study examines change in knowledge among CBVs enrolled in a Community TB TeleECHO intervention.

Intervention or response: The intervention is implemented in two purposively selected districts (Nkeyema and Petauke), with 110 CBVs enrolled in a 6-month cohort (December 2023 – June 2024), covering topics on: basic TB facts, TB approaches, data capturing and reporting, at community level. Each NHC is supported with tablets for virtual participation by the CBVs and bicycles to facilitate transportation of the tablets, contact tracing etc.

Results/Impact: Preliminary pre-course knowledge assessment analysis conducted with CBVs revealed lowest and average score at 20% and 44%, respectively, indicating minimal knowledge among CBVs regarding TB facts, community TB approaches, data collection and reporting. Following completion of 12 learning sessions, participants will undertake a post-assessment to assess knowledge change. Potential outcomes - improved knowledge, skills, confidence and self-efficacy among CBVs in community TB services; increasing access to TB treatment, limit the spread of TB, and improve treatment outcomes.

Conclusions: Ongoing training and mentorship through a community TB TeleECHO are needed to keep CBVs updated, motivated and retained to offer quality community health services mitigating spread of TB in communities.

PP09-882-13 The impact of sustained advocacies to clinicians in strengthening childhood TB surveillance and GeneXpert stool assay optimisation: Lessons from the TB-LON project in Nigeria

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Background and challenges to implementation: The introduction of stool-based TB evaluation heralded a significant milestone in addressing the challenges of obtaining sputum samples for prompt diagnosis of TB in children. As a novel diagnostic method in 2020, the KNCV Nigeria lab team organized a nationwide training and awareness campaign targeting both lab scientists and clinicians. However, a notable decrease in referrals prompted additional efforts to engage clinicians through coordinated state-based webinars, further advocating for the adoption and utilization of stool-based TB evaluation.

Intervention or response: Between July and August 2022, a series of webinars were conducted across fourteen TB-LON-supported states in close collaboration with State TB program officials. Each state engaged resource persons and developed informative flyers that were extensively disseminated among clinicians, laboratory technicians, and other TB stakeholders through various communication channels. The webinars were specifically designed to raise awareness about TB surveillance using the GeneXpert stool assay.

Further nationwide advocacy efforts were undertaken during the, Childhood TB Testing Week' in May 2023. Subsequently, data collected over two years were analyzed to assess trends in TB diagnosis through stool assay.

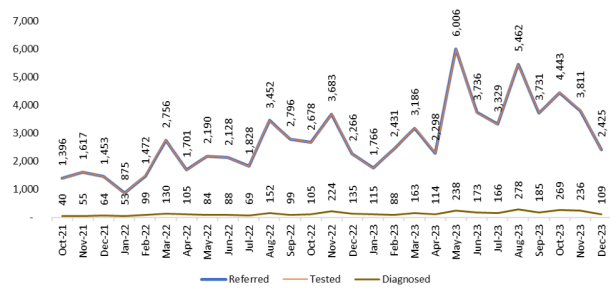

Figure 1. GeneXpert stool assay referral, evaluation and diagnosis trend.

Results/Impact: Before the webinar series, the average number of stool referrals stood at 1,732, with an average diagnosis of 80. However, following the awareness webinars, the average stool referral increased to 3,378 (95% increase), and the diagnosis rose to 169 (111% increase). The peak referral of 6,006 was recorded because of the 'Childhood TB Testing Week' in May 2023, while the highest number of diagnoses (278) occurred in August 2023 during the 'National TB Testing Week'.

Overall, there was a substantial increase in stool referrals and TB diagnoses following the implementation of these awareness campaigns.

Conclusions: The result showed that childhood TB surveillance using stool testing was significantly aided by nationwide training and awareness campaigns. Sustained advocacy and collaboration are essential to further improve pediatric TB surveillance and diagnosis.

PP09-876-13 Demonstration and cross learning forums contributed to the transformed TB programme in Ethiopia

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Background and challenges to implementation:
In Ethiopia, review meetings are the only experience sharing forums that are rarely monitored as part of TB intervention scale up strategy. Delays in the scale up of routine program implementation were partly due to the absence of monitored cross-learning forums.
Intervention or response: USAID Eliminate TB Project designed demonstration and cross-learning to improve TB program in 26 demonstration zones. These are zones with high populations and high TB cases with direct support from the project. Project's intensive support included training, TB supplies and equipment, mentorship, and quarterly review meetings.
The project established quarterly learning forums--performance review and catchment area meetings, experience sharing field visits, and supportive supervisions. At these exchanges, non-demonstration zones (zones with no direct support from the project but from government) can learn and scale up experiences from the demonstration zones. We compared performances in demonstration and non-demonstration zones using DHIS2 data during July 2020-December 2023
Results/Impact: The difference in a quarterly mean increment of drug susceptible (DS)-TB cases over 14 quarters in demonstration zones (228) as compared to non-demonstration zones (276) is not statistically significant (t-value=0.1, p-value=0.93). The difference in this increment is not also statistically variable among demonstration and non-demonstration zones regarding contact investigation (0.48% vs 0.68% t-value=0.08, p-value=0.94), TB preventive treatment (2.6% vs 2.5%, t-value=0.05, p-value=0.96), and treatment success rate (TSR) for DS-TB (-0.37% vs -0.28%, t-value=-0.16 p-value=0.87).
The average quarterly increment is greater in demonstration zones, but the difference is not statistically significant regarding PPM DOT contribution (0.25% vs 0.04%, t-value=0.19, p-value=0.85), community TB contribution (0.74% vs 0.18%, t-value=0.27, p-value=0.79) and first-line drug susceptibility test (FL-DST) (0.45% vs -0.6%, t-value=0.33, p-value=0.74).
Conclusions: Except FL-DST and TSR, there was a parallel improvement of TB program both in demonstration and non-demonstration zones. Therefore, innovative interventions could be demonstrated and scaled by planning cross-learning forums from early outset.

PP09-878-13 Reducing diagnostic delays: The 2RF model of review, reorientation and feedback for culture & DST Labs (C&DST) in Andhra Pradesh, India

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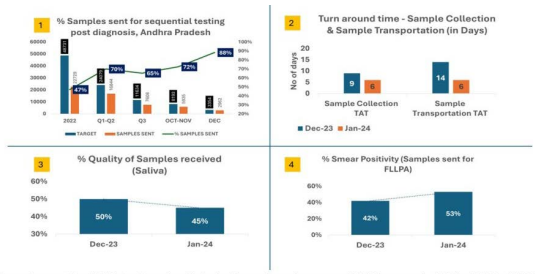
Background and challenges to implementation: In Andhra Pradesh, with a population of 53.5 million and 239 sub-district program management units, 736 NAAT machines have been deployed for TB diagnosis up to the sub-district level to facilitate early diagnosis and provide upfront NAAT to all presumptive TB patients.
However, challenges persist in sequential testing for first and second-line probe assay (FLLPA & SLLPA), and timely dissemination of results by centralized C&DST Labs. This is due to delays in sample collection and transportation, poor sample quality leading to low smear positivity, necessitating samples to be tested on liquid culture resulting in high turnaround times (TAT) (7-8 days for FLLPA) compared to National TB Elimination Program(NTEP) guidelines of 3-5 days.
Intervention or response: To address these challenges, State NTEP team devised a model termed 2RF: Review, Reorient, and Feedback. Since October 2023, monthly meetings were held following the 2RF model, utilizing a structured template.
These sessions involved all four C&DST labs in the state with NTEP staff. The meetings are geared towards identifying and rectifying gaps, reorienting guidelines, and refining the template based on program feedback.
With each review session, the template evolved to address issues like sample collection, sample quality, and transportation delays.
Results/Impact: Number of samples sent to C&DST labs among microbiologically confirmed persons with TB increased from 2521/3878 (65%) in July 2023 to 2962/3354 (88%) in December 2023.
Saliva sample rates dropped from 1677/3354 (50%) in Dec 2023 to 1184/2656 (45%) in Jan 2024. TAT for sample collection and transportation to C&DST labs decreased from

9 to 6 days and from 14 to 6 days, respectively, leading to a smear positivity increase from 42% to 53% and reduced FLLPA TAT to 4 days.



1 - %samples sent for FLLPA test for microbiologically confirmed persons with TB improved - 47% in 2022 to 88% in Dec 23
2 – Turn-around-time for sample collection reduced from 9 to 6 days and sample transportation reduced from 14 to 6 days from Dec 2023 to Jan 2024
3 – Quality of samples improved - %Saliva samples reduced from 50% in Dec 2023 to 45% in Jan 2024
4 – Smear Positivity for samples sent for FLLPA improved from 42% in Dec 2023 to 53% in Jan 2024

Conclusions: The 2RF model demonstrated that improvising operational processes improves program performance. This is a fundamental system strengthening measure that is easily replicable in other similar settings.

PP09-883-13 Enhancing Truenat sample processing accuracy through continuous supportive supervision and refresher training: Implementation approach

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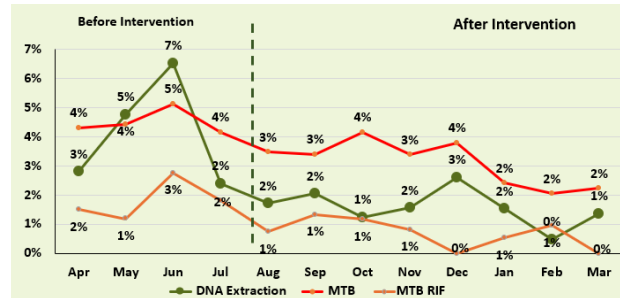
Background and challenges to implementation: World Health Organization in the year 2020 recommended the use of Truenat as a replacement for smear microscopy in Tuberculosis (TB) diagnosis and detection of rifampicin resistance. Since the adoption of the platform in southwestern Nigeria in Q4 2021. It was observed that the error rates surpassed the national acceptable threshold of 5%. The Institute of Human Virology Nigeria took note of these challenges, investigated, and carried out an intensify supportive supervision to address the challenges in June 2023 across the Truenat Laboratories in Oyo, Osun, and Lagos State.
Intervention or response: The Institute of Human virology Nigeria (IHVN) TB LON 3 project funded by USAID in Southwestern intervened by carrying out challenged facilities target intensify supportive supervision and refresher training to address the knowledge gaps and ensure strict adherence to standard operating procedures (SOP).
Results/Impact: Post intervention data shows a significant reduction in error rates across the analytical steps, with DNA extraction, MTB test, and MTB RIF test error rates dropping from 7% to 1%, and 5% to 2%, and 3% to 0% respectively. This improvement underscores the effectiveness of continuous mentoring and intervention in enhancing sample processing accuracy and quality laboratory service delivery.



Conclusions: This study offers valuable insights into the effectiveness of continuous mentoring and interventions in improving Truenat sample processing outcomes, emphasizing the significance of proactive measures in mitigating error rates, and ensuring diagnostic accuracy.

PP03 Lab and sample transport

PP03-826-13 A regional approach to strengthening TB laboratory systems

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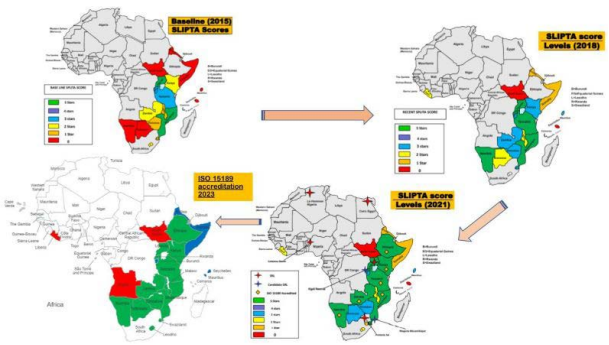
Background and challenges to implementation: Tuberculosis (TB) continues to be the leading cause of death in the East, Central and Southern Africa (ECSA) region. Out of the estimated 10.6 million who fell ill with TB in 2022, 23% were from the African region (WHO). Despite concerted efforts with significant strides, approximately 4 million TB cases are missing worldwide. The laboratory is key in bridging this gap but faces significant challenges in Human Resources (HR), quality assurance, data management and coordination.
Intervention or response: Numerous efforts have been made to ensure access to WHO Recommended Diagnostics and Drug Sensitivity Testing (DST) in the ECSA

region; since 2016 ECSA-Health Community and the Uganda Supra-National Reference Laboratory (SRL) are implementing a catalytic regional project in 21 countries aiming at strengthening the regional network of National TB Reference Laboratories (NTRLs), uptake of diagnostic tools, surveillance and partnerships through training, technical assistance, benchmarking and peer-to-peer learning.

Results/Impact: Through this approach, achievements realized include Laboratory Quality Management Systems strengthening through ISO 15189 accreditation in 13 countries; 2 countries have applied for ISO 17043 accreditation; 2 candidate SRLs created; molecular DST introduced in 3 countries; Culture and DST introduced in 2 countries; all NTRLs have capacity for 1st line DST; provision of proficiency testing panels for microscopy, GeneXpert, DST, culture and COVID-19 to 23 countries; Integrated Sample Referral Systems implementation in 4 countries; strategic planning in 7 countries; and Laboratory Management Information Systems adoption in 6 countries. During the pandemic, countries were supported to allay disruption of TB services through re-assignment of testing platforms and HR.



Conclusions: This unique effort is unique and the first of its kind, globally. It is proof that continual investment, networking and integration are key to maintaining and expanding laboratory capacity, addressing emerging challenges, and adapting to evolving epidemiology while maximizing efficiency and sustainability towards TB elimination.

PP03-824-13 Improving sputum collection and transportation in Madhya Pradesh, India by linking peripheral health centres with TB diagnostic centres through private-sector engagement

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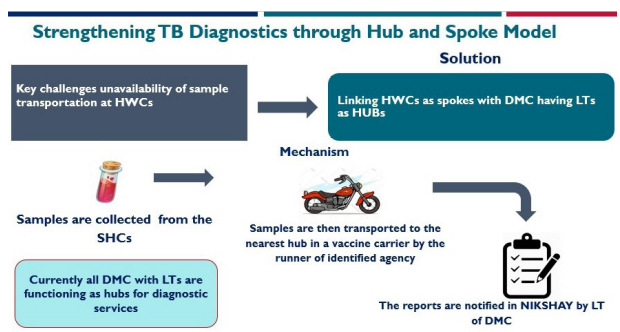
Background and challenges to implementation: TB remains a significant public health challenge in India. Expanding community-based TB services is crucial for achieving India's goal of eliminating TB by 2025. Historically, individuals with presumed TB had to visit diagnostic centers or rely on outreach workers to transport samples to TB Diagnostic Centres (TDC), leading to testing delays. Leveraging *Ayushman Arogya Mandir* (AAM)- peripheral primary health centers- is essential in overcoming challenges related to TB service access and high out-of-pocket expenditure.

This is particularly more challenging in a state like MP which has population of ~87million and a Presumptive TB Examination Rate (PTER) of 1,505 per 100,000 in 2022.

Intervention or response: A Hub-Spoke model was developed in Jan'23 and implemented across all 52 districts to reduce testing and reporting times. The implementation was supported by USAID's-funded NISHTHA project of Jhpiego. Under this model, AAMs act as Spokes and the respective Community Health Officers (CHO), are trained to ensure quality sample collection and packaging. The collected samples are transported to the nearest designated Hub by a runner, identified by a transporter agency. The runners are either alternate vaccine delivery carries, survivors of TB or community members who are given a target of 250 samples/month and compensated with $0.24 per sample. The TDCs with a lab technician are developed as Hubs which are involved sample testing and uploading results on government-MIS (Nikshay) for appropriate case-management.



Results/Impact: A total of 9,443 CHOs have been trained on good quality sample collection, packaging and transportation till Mar'24. The model improved the PTER from 1505 in 2022 to 2215 per 100,000 in 2023.

Conclusions: This model highlights the impact of capacity building on sample collection and transport for timely and enhanced case finding. Implementing this across facilities lacking diagnostic services (Primary Health Center, Urban Health Centers, etc.) could further enhance PTER.

PP03-819-13 Expanding the laboratory hub systems for enhanced drug-resistant TB surveillance in Karamoja region

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Background and challenges to implementation: Multi-drug-resistant Tuberculosis (MDR-TB) is a public health challenge, particularly in low-income settings. In 2020, the MoH estimated that at least 88 patients could develop drug-resistant TB every year in the Karamoja sub-region. However, in the same year, only 39 patients with MDR TB were notified in the region.
We purposed to improve the diagnosis of drug-resistant tuberculosis in the Karamoja Region by expanding the specimen transportation system to include health facilities at all levels of care.
Intervention or response: The USAID PACT Karamoja project expanded the specimen referral system to include more primary care facilities (HC IIs, HC IIIs and HC IVs). The project trained health facility staff at public health facilities on specimen handling and transportation.
The project also ensured that these primary care facilities had enough supplies for safe packaging and transportation of sputum samples. And sputum specimen from the primary care facilities were safely transported to 10 established GeneXpert testing hubs across the region.
The project established ongoing communication between testing hubs and primacy care facilities through group SMS messaging using WhatsApp.
Results/Impact: We expanded the number of primary health facilities participating in the specimen transportation system from 53 to 105. This resulted in an increased number of sputum samples transported through this system from 19,692/2020 to 54,365/year, an increase of 176%.
As a result, the number of patients diagnosed with MDR TB increased from 39/year in 2020 to 65/year in 2023 (Figure 1).

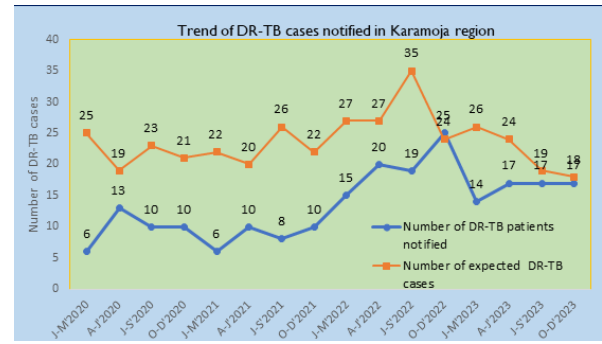

Figure 1.

Conclusions: We recommend an expanded specimen transportation system to enhance the surveillance of drug-resistant TB in the Karamoja sub-region.

PP03-820-13 Enhancing TB diagnosis accessibility utilising community volunteers in Rajasthan, India

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Background and challenges to implementation: Rajasthan, India's largest state, faces challenges in conducting widespread TB screenings due to its diverse geography and harsh climate. With population density varying from 17 to 200 individuals per square kilometre, ensuring comprehensive testing for all potential TB cases is a significant challenge. To overcome this, Rajasthan has implemented an innovative approach: incentivizing sample transportation through community volunteers. These volunteers collect TB samples as part of population-based testing and are reimbursed for their travel expenses under the Sample Transportation scheme.
This strategy connects testing centres without facilities (SPOKE) with TB testing centres (HUB), minimizing turnaround time. Community volunteers ensure widespread access to diagnostic services.
Intervention or response: In 2023, ASHA (Accredited Social Health Activist)/Community volunteers in Rajasthan were tasked with referring 3-5 Presumptive TB Cases per 1000 population monthly, prioritizing vulnerable groups such as TB survivors, their contacts, COVID-19 survivors, co-morbid patients, and malnourished individuals. Through this initiative, 10,399 samples were transported to DMCs and NAAT sites, streamlining the diagnostic process.
Results/Impact: In 2023, a total of 10,399 samples were transported to 1,389 DMCs and 148 NAAT sites in Rajasthan by 16,681 ASHA workers and 1,219 volunteers. Notably, the number of bacteriologically confirmed TB patients with valid DRT results for Rifampicin (RS/RR) was increased to 68410 (76%) from 63824 (71%) in 2022.

Additionally, the average turnaround time for NAAT testing was reduced to 16 days in 2023, and the Presumptive TB Examination rate increased from 1478 in 2022 to 2038 in 2023.

Conclusions: The results indicate a high positivity rate among samples transported with mobility support, facilitating a reduction in treatment initiation time. ASHAs and community volunteers have played a crucial role as treatment supporters in this process.

PP03-823-13 External quality assurance for molecular WHO-recommended diagnostics (mWRDs): Its significance for clinical interpretation of results

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Background and challenges to implementation: Laboratory quality is the accuracy, reliability, and timeliness of reported test results. Most laboratories do not participate in Quality Assessment System (QAS) to continuously improve the reliability and efficiency of laboratory services. EQA compares participant laboratories to assess their capabilities with the results of other laboratories in TB laboratory network through panel testing.

The aim of the study is to show the importance of EQA participation and confidence in clients' management.

Intervention or response: KNCV - Nigeria TB LON 1&2 Project is supporting Xpert MTB/RIF Ultra, TB-LAMP and TrueNat machines, these being in the WHO TB diagnostic algorithm (Algorithm 1). These diagnostic sites are mandated to institutionalize quality systems, including participation in EQA schemes. Diagnostic sites are registered with the NTBLCP-managed EQA scheme. EQA feedback from the NTBLCP is shared with the laboratory and facility management. 45 GeneXpert sites participated in the EQA scheme between 2022 and 2023.

	Akwa Ibom State				Cross River State				Rivers State					
Sites and Scores	2022 Cycle 1	2023 Cycle 1		2023 Cycle 2	2022 Cycle 1	2023 Cycle 1		2023 Cycle 2	2022 Cycle 1		2023 Cycle 1		2023 Cycle 2	
No of GeneXpert sites	14	14		14	14	14		14	14		14		17	
No of participating Xpert sites	13	12		14	12	12		14	13		14		17	
Final Score Attained (%)	100% (13)	100% (8)	80% (4)	100% (1)	100% (12)	100% (9)	80% (3)	100% (14)	100% (13)	90% (1)	100% (12)	80% (2)	100% (16)	80%(1)
Pass (%)	93%	67%	33%		86%	75%	25%	100%	93%	7%	86%	14%	94%	6%
Reason for non-participation	1 site undergoing renovation	2sites undergoing renovations			2facilities had infrastructural challenge									

Results/Impact: In 2022 Cycle 1, 38 out of 48 (91%) registered GeneXpert sites had satisfactory feedback with scores of 100%. During 2023 Cycle 1, 38 sites participated (91%) with 29 (76%) sites scoring 100% and 9 (24%) scoring 80%. By 2023 Cycle 2, 44 (98%) sites scored 100% while 1 (2%) scored 80%. The results showed that all participating sites had satisfactory results.

Conclusions: The overriding goal of EQA is to enhance the quality of care. When test result is "MTB not detected", the clinician has various options: re-evaluation, conduct additional tests, repeat with mWRDs in children or use clinical judgement for treatment decisions.

Feedback from EQA schemes may instill confidence in clinicians who use reports to treat patients. Confidence in laboratory results may reduce waste of time, resources, and delay in taking clinical decisions, and ultimately in better management outcome for clients with tuberculosis.

PP03-825-13 Enhancing TB diagnosis: Implementing laboratory quality management systems in Kenya - A case study of five laboratories accredited

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Background and challenges to implementation: Tuberculosis (TB) remains a significant global health challenge, with the accuracy and reliability of TB diagnosis continues to be a persistent issue. Laboratory Quality Management Systems (LQMS) is a coordinated set of policies, process, procedures, as well as practices implemented in laboratory to ensure consistent quality and accuracy in scope of work. The scope is based on specific test parameters offered by a particular laboratory, which includes but not limited to TB diagnosis methods.

Implementation of reliable and functionable LQMS plays a pivotal role in improving diagnosis by enhancing accuracy, detection rates, minimizing diagnostic errors, shortening turnaround times, instilling confidence in TB test diagnosis as well as more effective ending TB initiatives.

Intervention or response: From 2022 to 2023, Amref Health Africa, Kenya in collaboration with the Ministry of Health, National Laboratory Services supported implementation of LQMS in 11 laboratories. Prior, baseline assessments were conducted using WHO-SLIPTA (World Health Organization - Stepwise Laboratory Improvement Process Towards Accreditation) checklist. One laboratory achieved a two-star rating from a possible 5 stars. Others attained zero stars underscoring a significant need for quality improvement interventions.

Four mentorship sessions, each accompanied by comprehensive assessments were conducted. Gaps identified were addressed through a targeted mentorship session. Later, Kenya Accreditation Scheme (KENAS) was invited

to assess the extent of LQMS implementation. Gaps identified by KENAS were closed through a targeted closure mentorship approach.
Results/Impact: Five laboratories were accredited with one achieving a notable 4-star rating, while the remaining four attained a commendable 3-star rating each. Accreditation was based on various scopes of test parameters, with TB diagnosis being a dedicated test scope.
Conclusions: Implementing a robust LQMS enhances TB diagnosis by improving detection rates, accuracy, reliability, and efficiency of TB diagnostic services. It also emphasizes the need for continued investment in quality improvement initiatives to combat the global burden of TB effectively.

PP03-828-13 Optimised specimen referral system plus: Leveraging local capacities for sustainable solutions in health systems strengthening in Cebu City, the Philippines

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Background and challenges to implementation: Cebu City had low TB testing rates (1,703 tested from April-June 2023) despite an optimized specimen referral system (OSRS) using specimen transport riders (STRiders). Specimen collection, pick-up, transport, and testing days were limited. Additionally, turn-around-times (TAT) from collection to results averaged 3.6 days.
Intervention or response: A community-based organization (CBO) was engaged to enhance OSRS to OSRS+ in six barangays. For OSRS+, local transport groups (tricycle operators and drivers association [TODA]) transported specimen from facilities to rapid diagnostic test (RDT) laboratories. In addition, the CBO engaged community navigators for household contact investigations (HHCI), linked barangay vehicles for patient transportation for chest X-rays, and developed a barangay-level ordinance for sustainability. OSRS+ training included TB basics; specimen collection, packaging, and transportation; infection prevention and control; recording and reporting; and a web-based specimen tracker. Local government coordinators engaged in regular OSRS+ monitoring.
Results/Impact: Using the OSRS+ model, from July to September 2023, 576 specimens were transported by TODA for RDT, with 75 (13%) testing positive for TB and 80% of TB patients initiating treatment. Forty-two of these specimens came from HHCI, with 14% positive and 100% initiating treatment. Barangay vehicles transported 157 people for chest X-rays, of whom 34 (22%) were TB presumptive, however, test results were unavailable to investigators.
Overall, specimens tested in Cebu City increased to 2,858 from 1,703 the previous quarter. Specimens were transported same-day in six barangays and 84% received same-day results. TAT was two days from specimen collection to results delivery. The model was sustained post-project through the ordinance and city health budget.

		TAT in days (average and range)					
Site	Freq.	Specimen collection to pick-up	Specimen pick-up to receipt	Specimen receipt to result release	Result release to pick-up	Result pick-up to receipt	Specimen collection to result delivery
Alaska	173	0.02 (0-3)	same day	1.9 (0-5)	Same day	same day	2.7 (0-5)
Duljo	56	same day	same day	2.0 (0-4)	same day	same day	2.0 (0-4)
Ermita	63	same day	same day	2.7 (0-13)	2.9 (0-25)	same day	5.8 (0-26)
Mambaling	12	same day	same day	2.0(1-4)	same day	same day	2.0 (0-4)
Pasil	46	same day	same day	1.8 (0-5)	same day	same day	1.8 (0-5)
Sawang Calero	125	0.06 (0-7)	same day	2.7 (0-5)	same day	same day	2.0 (0-5)

Table 1. Turnaround time in days in six barangays in Cebu City.

Conclusions: CBO engagement through an OSRS+ approach can improve specimen referral, reduce TAT, address system barriers, and increase testing through tapping local transport groups and inclusion of community navigators. Active involvement of local communities can foster a sense of ownership and establishing policy and local-level budgetary resources helps ensure sustainability.

PP03-827-13 Using digital tools for streamlining TB specimen transport tracking and timely result communication in Tamil Nadu, India

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Background and challenges to implementation: The prevalence of Isoniazid resistance among New and Previously treated patients are 11.06% and 25.09% respectively. Although early detection of resistance to Isoniazid through line probe assay (LPA) contribute to better treatment outcomes, proportion of microbiologically confirmed Rif sensitive patients offered FLLPA remains low due to the lack of transparency in sample transport and delay in communication of the result from the testing lab. Common issues encountered were delay in the transport of samples to labs for LPA testing, non-availability of line list of patients, delay in communication of results etc.
Intervention or response: A comprehensive system was established across all districts and six LPA testing labs, utilizing Google Spreadsheets in the month of July 2023. These sheets were interconnected, enabling real-time updates between districts and testing labs. Field staff responsible for sample collection input patient IDs, sample collection dates, and courier information into the spreadsheets, ensuring that labs received necessary details before sample arrival on a real time basis. The microbiologists promptly enter test results into the lab's spreadsheet, which was then transferred to the respective district for further action.
Results/Impact: The results were compared between August to December 2023 (intervention period) with January to July 2023 (non-intervention period). The proportion of FLLPA testing increased from 62% to 71%. The LPA lab smear positivity at sample receipt increased from 70% to 83%. The average time taken from sample collection to receipt at lab decreased from 4.3 days to 2.1 days. The average time taken to report the test results decreased from 4 days to 1.6 days. The time taken to initiate a patient on H-Mono/ poly regimen came down from an average of 13.7 to 7.2 days.
Conclusions: Digital tools help field staff and program managers in monitoring of samples transported as well as to initiate patients on appropriate regimen in a timely manner.

PP03-822-13 Improved specimen referral system and increased access to quality TB laboratory services in Zambia: The role of integrated system

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Background and challenges to implementation: In Zambia, the challenge of tuberculosis (TB) persists, with over 25,000 cases missed annually due to fragmented specimen referral systems and limited access to quality laboratory services. The COVID-19 outbreak necessitated the need to strengthen the country's laboratory infrastructure. Recognizing this, the Ministry of Health prioritized integrating vertical disease-specific referral systems into a unified, specimen referral system to improve detection, confirmation and prevention of priority diseases, including TB. We assessed the implementation of an integrated intra-district specimen referral system in Zambia.
Intervention or response: Weekly referral schedules were assigned to low volume districts and daily schedules for high volume facilities. On-call courier was assigned to presumptive TB cases whose' s visit could not be scheduled. Communication between riders and facilities was provided through the use of cell phones. Technology integration included adopting the Life Logistics App for real-time sample tracking.
Results/Impact: TB Sample testing increased by 48% (from 200382 in 2019 to 420, 315 in 2023) even when there was no significant increase in GeneXpert machines 314 in 2020 and 343 in 2023. There was a 40% saving on fuel usage for riders due to improved communication between riders and facilities.

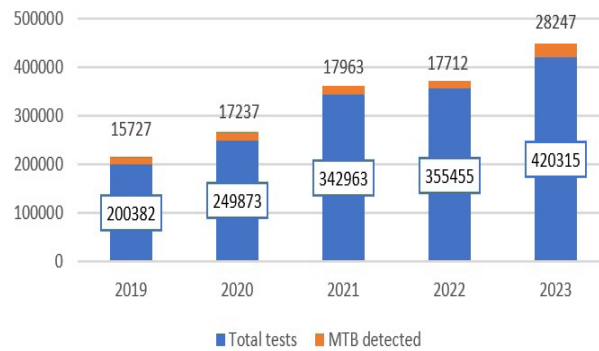

Figure. GeneXpert tests conducted and MTB detected.

Conclusions: The implementation of an integrated specimen referral system in Zambia led to increased TB sample testing particularly for vulnerable populations. This marks a significant advancement in strengthening Zambia's laboratory infrastructure and addressing the TB epidemic.

PP03-821-13 Promoting universal health coverage through integrated specimen referral systems in arid and semi-arid regions of Kenya

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Background and challenges to implementation: The arid and semi-arid regions of Kenya face healthcare challenges due to remoteness, limited infrastructure, and harsh conditions, hindering disease diagnosis and treatment. This demands for innovative healthcare delivery.
The abstract discusses Integrated Specimen Referral Systems (ISRS) as a vital strategy to improve healthcare access and quality in these regions.
Intervention or response: Amref Health Africa supported community integrated specimen referral in nine arid and semi-arid counties via sub-recipients. These counties were chosen due to sub-optimal ISRS support, attributed to challenging terrain, insecurity, or limited healthcare workforce. The initiative encompassed all specimen types, including routine, outbreak, and surveillance samples. Amref Health Africa prioritized patient-centered care, involving county management, healthcare staff, riders, and communities. Bi-annual ISRS review meetings were conducted to enhance system effectiveness. Patient-experiential learning outcomes from May 2022 to December 2023 are presented.
Results/Impact: For a period of 20 months, a total of 241 health care workers and 150 riders were trained to support spoke-hub-spoke model with 314 facilities connected out of the possible target of 414.
Interestingly, 72,505 samples were referred and sputum specimens for TB diagnosis had the highest proportion 40,602 (56%) closely followed by viral load 23,926 (33%). There was a steady increase of samples referred, sample mean 3625 (95% CI: 3621- 3628) signifying increased access, enhanced diagnostic accuracy, timely treatment initiation, and post-treatment follow-up.
In the realm of implementing the ISRS, other aspects became an impetus for patient support spanning, enhanced ISRS coordination, laboratory-clinical interface, effective and seamless tracking of patient specimen and results.
Conclusions: In conclusion, the implementation of Integrated Specimen Referral Systems holds promise as a transformative approach to advancing Universal Health Coverage in arid and semi-arid regions of Kenya. Through collaborative efforts and innovative solutions, ISRS has the potential to revolutionize healthcare delivery, reduce health disparities, and improve health outcomes for underserved populations in these regions.

PP10 Align cases demand under cost perspective

PP10-887-13 A study to reduce financial burden of TB by social PROTECtion in Timor-Leste (TB-PROTECT): A cluster randomised trial

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Background: Timor-Leste identified that more than 80% of TB patients suffered from catastrophic cost in 2017. The study aims to reduce the proportion of household experiencing catastrophic costs due to TB using TB-specific cash transfer.
Design/Methods: The study was designed as a cluster randomized controlled trial. Thirty-two health centers were randomized into two arms (intervention and control groups). In the intervention group, thirty US dollars were provided to participants monthly (totaling 180 USD), while the control group was managed as usual. Patient cost surveys were conducted twice: within a month after treatment initiation and in the last month of their treatment, using a modified questionnaire developed by WHO. The study analyzed the primary outcome according to intention-to-treat principles. Primary outcome was the risk differences (%p) of catastrophic costs between arms using both output and human capital approaches. As a set of sensitivity analyses, the cut-off to define catastrophic costs was replaced with 40% and propensity score matching comparison was added.
Results: In total, 329 TB patients were enrolled and underwent the first survey (161 participants in the intervention group and 168 participants in the control group). Eight patients could not perform the second survey due to deaths or loss to follow-up. The proportion of catastrophic costs in the intervention group was 22.09%p (95% confidential interval: 14.37-29.81) less than in the control group according to the output approach (71.02% vs. 93.11%). Gender-stratified analysis and sensitivity analyses were like to present similar trends to the main analysis.
Conclusions: Cash transfer for TB patients could reduce the proportion of catastrophic costs in resource-limited settings. However, protecting income loss was not enough to meet the global target of zero catastrophic cost, as 67.08% of the intervention group still suffered from catastrophic costs. It is an urgent concern to develop innovative interventions to reduce non-medical costs.

PP10-886-13 The burden of pre-diagnosis costs: Association between catastrophic health expenditure and diagnostic delay for TB in Cambodia

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Background: The evidence of catastrophic health expenditure (CHE) before tuberculosis (TB) diagnosis and its association with TB diagnostic delay remains limited, particularly in Southeast Asia. This study aimed to estimate the prevalence of CHE before TB diagnosis and its association with diagnostic delay among newly diagnosed adults with TB in Cambodia.
Design/Methods: This cross-sectional study used baseline data from a cohort study involving newly diagnosed people with TB aged ≥18 collected from March to September 2022. A total of 712 participants from ten operational districts in Cambodia were included. CHE is the total expenditure on TB ≥10% of annual household income. Diagnostic delay is the duration between TB symptoms onset and TB diagnosis.
A multivariable logistic regression model was used to identify the association between CHE and diagnostic delays and other factors.
Results: Overall, 62 participants (8.7%, 95% confidence interval (CI): 6.74%—11.02%) experienced CHE before TB diagnosis. The median diagnostic delay was 64 days (range: 1—365). Longer diagnostic delay (adjusted odd ratio (aOR): 1.17, 95%CI: 1.07–1.27) and seeking private care before being diagnosed with TB (aOR: 2.98, 95%CI: 1.38—6.87) associated with CHE. Those who had above primary education (aOR: 0.5, 95%CI: 0.24—0.99), larger household size (aOR: 0.41, 95%CI: 0.23—0.70), and did not seek any health services regarding their TB symptoms before TB diagnosis (aOR: 0.21, 95%CI: 0.08—0.55) were less likely to experience CHE.
Conclusions: Approximately one-tenth of people with TB experienced CHE before TB diagnosis and diagnostic delay is associated with CHE in Cambodia.
This calls for strategies to increase TB awareness, especially among people who did not receive higher education and those with financial difficulties and improve accessibility of TB services at public health facilities.
Additionally, seeking private care associated with CHE prompts the need for new approaches to engage the private sector in TB care.

PP10-892-13 Challenges and opportunities in integrated TB and diabetes screening: Insights from Indonesia

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Background and challenges to implementation: The intersection of tuberculosis (TB) and diabetes (DM) exacerbates the prevalence and severity of each, highlighting the need for prompt and integrated detection and treatment strategies. We described the challenges and opportunities inherent in the integrated implementation of DM and TB screening in North Sumatera, Indonesia.
Intervention or response: We adopted a qualitative study design and conducted interviews with 11 key informants on the challenges and opportunities for integration of DM and TB care, while program indicators and implementation barriers were assessed using a data collection form, distributed to TB coordinators. in 160 primary care (PHCs) and 73 hospitals.
Results/Impact: Routine TB screening among DM patients is not widely practiced—, only 8 hospitals and 8 PHCs screened all DM patients. Around 10% of PHCs and 20% of hospitals screened over 40% of their DM patients for TB. Identified challenges include patient reluctance to participate in TB screening, absence of TB symptoms leading to difficulty in sputum sample collection, knowledge, and additional costs for radiographic assessment.
From the health care provider perspective, challenges comprise high workload, limited radiography access, lack of job aids, inconsistent adherence to guidelines, lack of coordination between NCD and TB clinics, and varying levels of facility management commitment. Nonetheless, opportunities for TB-DM care integration are present, such as national policies targeting TB screening in high-risk groups, hospital internal linkage, trained PHC's physicians, funding support from the Social Health Insurance Administration Body, and partnership with the chronic disease control program (Prolanis).
Conclusions: There was a concerning under-participation of health facilities in TB screening for DM patients. To bolster an integrated approach to TB and DM control, facility management and TB program coordinators must address the identified barriers and leverage facilitators to enhance the health care system's capacity for comprehensive care.

PP10-884-13 Socioeconomic status of households containing children exposed to multi-drug-resistant TB in South Africa

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Background: Tuberculosis (TB) is both a cause and result of poverty. However there is limited quantitative evidence to inform our understanding of the dynamics of socioeconomic status (SES) in households containing children exposed to multidrug-resistant (MDR)-TB.

Design/Methods: A household survey was conducted within a randomised controlled trial of TB preventive treatment in children (the TB-CHAMP trial) in n=497 households at five sites in South Africa. Routine SES data were collected including employment, asset ownership, access to water and electricity and recent household experiences including crime and food security.

A household wealth index was developed using principal component analysis to determine within-sample relative poverty. The South African Demographic and Health Survey 2016 was used to compare households to the general South African population.

Results: There were substantial differences between household SES at the different trial sites: households in Matlosana (Free State Province) were poorer on all included SES indicators whereas Shandukani site (Gauteng Province) consistently demonstrated higher SES than the South African general population.

The TB-CHAMP households had higher proportions of some major drivers of low SES compared to the general South African population, such as dwelling in informal settlements (25% vs 7.9%), and shared/public toilet facilities (35.5% vs 11.3%) but had higher ownership of indicative assets including television (85.2% vs 75.4%) and refrigerator (81.5% vs 74.5%).

None of the richest 20% of households within the sample incurred a case of MDR-TB, regardless of whether preventative treatment or placebo was received during the trial.

Conclusions: Households containing children that are exposed to MDR-TB are not uniformly poor compared to the general South African population, but have high levels of absolute indicators of poverty. Relative household wealth within the sample indicated that high SES may be indicative of a reduced risk of developing MDR-TB, however low overall incidence of progression to disease limits interpretation.

PP10-889-13 Assessment of Body Mass Index and nutritional supplementation are important for preventing incidence amongst contacts of people with TB, especially in high underweight prevalence areas

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Background and challenges to implementation: Household contacts (HHCs) of index pulmonary TB patients are at high risk of infection and progression to disease. Malnutrition increases risks of TB and unfavorable treatment outcomes, including death. India TB Report 2023 indicates for each unit reduction in BMI, the risk of TB increases by 14% and risk of relapse becomes four times. Research suggests adequate nutrition supplementation in underweight individuals can reduce the risk for disease progression. National TB Program targets HHCs for TB Preventive Treatment (TPT), however, nutritional status assessment and supplementation is only offered to patients.

Intervention or response: Drug sensitive pulmonary TB (DSPTB) patients notified in 2022 across seven districts of Bihar, with 'Death' reported as Treatment outcome, were purposively sampled for a cohort survey of household contacts' Body Mass Index (BMI) and TB status, in January 2024. (Bihar is amongst the five highest underweight prevalence provinces in India).

Results/Impact:

Age range	Gender	No. of HHCs (A)	No. of HHCs with BMI <18.5 (% of A)	No. of HHCs taken TPT (% of A)	No. of HHCs with symptoms / TB diagnosis (since index case diagnosis) (% of A)
0-14 years	total	499	335 (67%)	94 (19%)	18 (3.6%)
	male	280	197 (70.3%)	46 (16%)	14 (5%)
	female	219	138 (63%)	48 (22%)	4 (1.8%)
>= 15 years	total	1394	318 (22.8%)	210 (15%)	47 (3.4%)
	male	652	115 (17.6%)	73 (11.2%)	19 (2.9%)
	female	742	203 (27.3%)	137 (18.4%)	28 (3.8%)
Total (All ages)	total	1893	653 (34.5%)	304 (16.1%)	65 (3.4%)
	male	932	312 (33.5%)	119 (12.8%)	33 (3.5%)
	female	961	341 (35.5%)	185 (19.2%)	32 (3.3%)

Table.

Of 1417 died patients (3.4% of notified DSPTB), families of 746 (53%) participated in the survey. Of total 2255 HHCs, 1893 (84%) consented for data collection.
79% households were linked to government ration scheme and 88% of them reported receiving ration (primarily rice/wheat) in last six months. 34.5% of all HHCs had BMI <18.5 (underweight). 67% of HHCs aged 0-14 and 22.8% aged >=15 years were underweight.
Uptake of TB preventive therapy amongst HHCs was 16%. 65 HHCs (3.4%) reported either being symptomatic at the time of survey or had a diagnosis of TB (since index patient diagnosis).
Conclusions: HHCs of index TB patients are priority target group for preventing incident cases. BMI is a standard tool that can be easily used even under low-resource settings in India. Systematic, timely BMI assessment and nutrition support- with protein & micronutrients, for HHCs, together with TPT scale-up, should be strongly considered for adoption as part of the country's TB elimination policy.

PP10-893-13 Evolution of direct benefit transfer under National TB Elimination Programme: Innovations enhancing efficiency and programme impact

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Background and challenges to implementation: The Ni-kshay digital surveillance system of the National TB Elimination Programme (NTEP), houses a comprehensive database of person affected with TB (PwTB), including their bank account details which are managed by the NTEP staff.
This application is integrated with the Public Financial Management System (PFMS) which is further linked with all banks operating in India.
Intervention or response: The National TB Elimination Programme (NTEP) initiated Direct Benefit Transfer (DBT) schemes in April 2018. NTEP personnel seed beneficiaries' bank account details into the Ni-kshay digital system, which undergoes automatic validation through the Public Financial Management System (PFMS). Benefits under DBT schemes are generated within Ni-kshay based on predefined criteria.
Following a meticulous maker-checker-approver process, NTEP staff initiate the transfer of benefits into PFMS. Subsequently, the accounts department verifies the transactions, digitally signs them, and transmits the verified data to the respective banks for crediting the beneficiaries' accounts.
Over the past five years, this system has undergone significant technological advancements, including beneficiary de-duplication measures and a reduction in the number of transactions, ensuring more efficient and transparent disbursement of benefits to those PwTB.
Results/Impact: Ni-kshay Poshan Yojana (NPY) stands as the world's largest scheme providing nutrition support to PwTB. Under the NTEP, > ₹1.5 crore has been disbursed daily to > 6.5K PwTB across four DBT schemes. From April 2018 to December 2023, an astounding sum > ₹3105 crore has been directly transferred into the bank accounts of >1.11 crore TB patients, private healthcare providers, and treatment supporters through the NTEP's DBT process.
Conclusions: The NTEP's DBT process evolved through regular technical advancements and policy-level changes. This significantly impacts the program by enhancing treatment adherence, engaging private and community healthcare providers, addressing nutritional needs, and reducing out-of-pocket expenses for PwTB.

PP10-885-13 Namibia's catastrophic costs: A situational analysis and recommendations

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Background: Although TB diagnosis and treatment are free of charge in Namibia, TB patients face high indirect cost due to TB illness and in the process of seeking care. There is limited research showing indirect costs of treating TB in Namibia. This survey was needed to monitor progress toward the End TB Strategy target to eliminate catastrophic total costs due to TB.
The objectives of the study were to determine the proportion of TB patients facing catastrophic costs, identify the main costs drivers, ascertain patients' coping strategies and subsequently use the findings to reduce suffering by influencing socioeconomic policy and programming.
Design/Methods: A cross-sectional design was used. The survey population included all TB patients who were on treatment (either in the continuation or intensive phase) from Namibian public health facilities. The impact of TB costs were analysed on a household level, therefore if more than one household member was registered for treatment, that household's costs were estimated by interviewing all members on treatment.
Results: The median costs borne by patients seeking diagnosis per TB episode was N$ 1316 for direct medical and non-medical costs. Patients with DR-TB incurred higher total costs (N$ 1072.57, IQR N$ 42.0 -10814.4) in comparison to DS-TB patients (N$ 1355.81, IQR N$ 171.4 - 4911.4). The high costs among the DR-TB were largely attributed to nutritional supplement and hours of productivity lost during treatment.

Conclusions: Cost drivers such as nutrition and transport could be reduced through social support while medical insurance and improved models of TB care can help mitigate the direct medical and indirect costs.
It is recommended that adjustments be made to the current social protection system in which DR-TB patients are prioritized for assessment and recommendation to receive a social grant, to prioritize patients from poor and vulnerable households, regardless of the TB manifestation

PP10-890-13 Determinants of TB treatment completion in an inpatient setting among people with TB in Texas

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Background and challenges to implementation: This study investigates the determinants of tuberculosis (TB) treatment completion among patients in Texas, particularly focusing on the impact of sociodemographic and health-related factors. It addresses the challenge of predicting TB treatment outcomes in a patient group characterized by complex health issues, including substance use disorders and comorbidities.
Intervention or response: The research was conducted at the Texas Center for Infectious Disease in San Antonio, Texas with a cohort of 582 TB patients. Utilizing logistic regression analysis, key variables such as sex, ethnicity, HIV status, homelessness, and substance use disorder were analyzed. The study also considered the interaction between substance use disorder and homelessness.
Results/Impact: Individuals with court-ordered treatment and who self-identified as Black had significantly greater odds of treatment completion (ORs of 4.58 and 1.66, respectively). In contrast, females and individuals with HIV had lower odds of completing treatment (OR = 0.43 for both).
Differences by ethnicity were also identified, with ‚Other' ethnicities and Hispanic/Latino having decreased odds of completion compared to White. The interaction between substance use disorder and homelessness revealed a complex influence on treatment outcomes.
Conclusions: The findings highlight the significance of various factors, including racial/ethnic background, sex, and health conditions, in successful TB treatment completion. The study emphasizes the need for personalized interventions, especially considering the complex interplay between substance use disorder and homelessness. These insights are critical for TB prevention and care programs, providing a framework for future research and informing strategies to enhance treatment completion rates among diverse patient populations.

PP10-888-13 Estimation of the burden of catastrophic cost among TB-affected families of West Bengal, India: A secondary analysis of the sub-national certification survey data

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Background: In line with National targets the state of West Bengal is aiming zero catastrophic cost due to TB. Little is known about the catastrophic cost due to TB in India. In 2022-2023 sub-national certification (SNC) survey conducted in 105 clusters of 13 revenue districts of West Bengal.
The purpose of this study was to calculate the catastrophic cost and its associations using the SNC data of West Bengal.
Design/Methods: A cross sectional study conducted using the secondary data collected through SNC survey during Dec-22-Jan-23. 483 participants having history of TB were included in the study. Catastrophic cost is considered if the combined direct (medicine and diagnostics) and indirect (travel, wage loss etc.) cost due to the episode of TB is 20% or more of the annual family income.
Results: 27.5 % (23.6-31.8) families were found to be affected with catastrophic cost due to TB. Considering 1 USD = 83 INR, as on April 2024, the mean annual family income was 689 USD (SD=806). Mean total cost incurred due to TB was 164 USD (SD=1204) including direct cost of 92 USD (SD=1127) and indirect cost of 72 USD (SD=253).
No association of catastrophic cost is found with age, gender, occupation, or religion. Clinically or socially vulnerable key populations, clinically diagnosed cases, Patient visited private facilities, treatment duration more than six months and participants belong to family below poverty line were found to be independently associated with higher risk of affected with catastrophic cost (Figure 1).
Conclusions: Despite free medicine and diagnostics availabilty in Goverment Hospitals many families are still facing catastrophic cost due to TB, especially those who are visiting private health facilies.
Cost reimbursement or linkages with free services for the private sector patients can be a way-out to reduce out of pocket expenditure for the TB affected families.

Row no.	Variables		Total participant 483 (N)	Catastrophic cost incurred (133), n (%) #	aOR (95% CI) a
1	Key Population	**Key Population**	**149**	**65 (43.6)**	**2.1 (1.3-3.5)**
2		Not Key Population	334	68 (20.4)	1 (base)
3	Basis of TB diagnosis	**Clinical**	**76**	**35 (46.1)**	**2.1 (1.2-3.9)**
4		Bacteriological	407	98 (24.1)	1 (base)
5	Treatment duration	Six month or less	362	70 (19.3)	1 (base)
6		**>Six Months**	**120**	**62 (51.7)**	**2.9 (1.7-4.9)**
7	Type of health facility	**Private**	**30**	**24 (80.0)**	**8.6 (3.2-23.1)**
8		Public	453	109 (24.1)	1 (base)
9	Income Group	APL	105	19 (18.1)	1 (base)
10		**BPL**	**378**	**114 (30.2)**	**3.1 (1.6-5.9)**

Figure 1. Socio-clinical association of catastrophic cost due to TB in West Bengal. N = 483.

TB = Tuberculosis; APL = Above poverty line (monthly family income >80 USD), BPL = Below poverty line (monthly family income ≤80 USD); # = row percentage.

PP10-891-13 Impact of integration of TB active case finding, bidirectional TB/COVID-19 surveillance, and COVID-19 vaccination in Benue State, North Central Nigeria

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Background and challenges to implementation: Nigeria has highest burden of TB in Africa, ranking 6th globally. Estimated TB incidence rate is 219/100,000 population with low TB case detection. The country is among the epicenter of COVID19 pandemic in Africa. With W.H.O/USAID support, bidirectional TB/COVID-19 testing with COVID-19 Vaccinations was introduced. Tuberculosis is associated with 2.1-fold increased risk of severe COVID19 disease, while COVID-19 affects TB notification, increases stigma and may erode the progress made in ending TB epidemic.

Intervention or response: Integrated targeted community interventions were conducted in 77 communities in 12 LGAs/districts which identified presumptive TB cases, tested them for COVID-19, conducted Xpert MTB/RIF test for presumptive TB, enrolled diagnosed TB cases, linked presumtptive and TB/COVID19 co-infected to care with COVID-19 Vaccination given to willing attendees. Conducted by State TBL Control Program (STBLCP), EOC and COVID19 response pillars. The presumptive TB were tested for HIV. Presumptive TB and TB/COVID19 co-infected were appropriately managed by the case management team/STBLCP. Ten health facilities across 10 LGAs were engaged for TB/COVID-19 Bidirectional Testing.

Results/Impact: Between February and April, 2023, 5317 people were screened (5219 vaccinated), 1628 presumptive cases were identified, 20 positive cases for COVID-19, 1547 presumptive cases tested and 105 diagnosed with TB notified. 1096 presumptive cases were identified/tested for TB and COVID-19 in the 10 facilities, 93 positive for TB and 2 for COVID-19 (1 co-infection) with the work and analysis completed by May 15, 2023

Conclusions: Mandatory testing for presumptive TB Cases for COVID-19 should be included in the National policy/guideline and ensure TB patients co-infected with COVID are appropriately managed. More Targeted Community Activities in collaboration with community stakeholders in hot spot communities should be done to increase awareness about TB services and improve TB/COVID-19 Case notification. Advocacy to sub-national government/community gate keepers to support integration of COVID-19 Testing with TB Screening in High burden DOT sites.

PP02 Mixed methods and quality

PP02-809-13 Psychosocial experiences of adolescents with TB in Cape Town

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Background: Adolescents (10-19-years-old) account for almost 10% of the annual global tuberculosis (TB) incidence. Adolescents' experiences of TB care, TB stigma, and the consequences of TB for their relationships, schooling, and mental health are different, and often more severe, compared to younger children and adults. How TB impacts the lives of adolescents is not well described or understood. We aimed to locate adolescents' experiences of TB relative to their psychosocial contexts, describe the impact of TB on adolescents' wellbeing, and describe how TB and its treatment affects their socio-familial contexts.

Design/Methods: Teen TB was a prospective observational cohort study which recruited 50 adolescents with newly diagnosed TB disease (including both multidrug-resistant TB and drug-susceptible TB) in Cape Town, South Africa. A nested sub-sample of 20 adolescents were purposively sampled for longitudinal qualitative data collection. Nineteen participants completed all qualitative data collection activities between December 2020 and September 2021.

Results: Adolescents described their communities as undesirable places to live – rife with violence, poverty, and unemployment. The negative experiences of living in these conditions were exacerbated by TB episodes among

adolescents or within their households. TB and its treatment disrupted adolescents' socio-familial connections; many participants described losing friendships and attachment to family members as people reacted negatively to their TB diagnosis. TB, inclusive of the experience of disease, diagnosis and treatment also negatively impacted adolescents' mental health. Participants reported feeling depressed, despondent, and at times suicidal. TB also disrupted adolescents' schooling and employment opportunities as adolescents were absent from school and college for substantial periods of time.

Conclusions: Our findings confirm that adolescents' psychosocial experiences of TB are often highly negative, compounding underlying vulnerability. Future research should prioritize exploring the potential of social protection programmes providing adolescents and their families with psychosocial and economic support.

PP02-818-13 "Six months is a lot of time to lie": Anticipated stigma, disclosure and treatment preferences among participants in a TB therapeutic trial

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Background: People living with tuberculosis (TB) face multiple challenges around disclosure of their TB status, including the risk of stigma and discrimination. Inadvertent disclosure happens when others find out about a person's TB status without that person telling them. Certain aspects of treatment may lead to inadvertent disclosure and could influence therapeutic preferences.

Design/Methods: This was an exploratory, qualitative study using in-depth interviews (IDIs) conducted during study treatment among a sub-set of participants in CLO-FAST/ACTG A5362, a multi-center treatment shortening trial for drug-susceptible (DS) TB (NCT04311502). The CLO-FAST trial randomized individuals to receive either a three-month regimen that contained the drug clofazimine - which can be associated with skin hyperpigmentation - or the six-month standard of care for DS-TB. The responses to the open-ended questions were coded for theme and content using a modified version of the disclosure decision model.

Results: Twenty-three participants were selected from the 89 participants in the parent trial. All 23 gave consent and participated in the IDIs. Participants were from India, Malawi, and Zimbabwe. Demographics and questions asked in the interview are included in Table 1. Participant-initiated disclosure to at least one other individual was universal, with most participants reporting they disclosed to gain support, protect others, or avoid having to lie about their TB status.

Nearly half (43.5%; *n*=10) of the participants reported worrying about inadvertent disclosure, either from the skin changes associated with clofazimine, their TB symptoms, or their presence at a TB clinic/hospital.

One in three participants reported they would prefer to receive a longer regimen that was not associated with skin discoloration.

Variable	N (%)
Age	Range: 21-56 years 21-25: 2 (8.7%) 26-35: 11 (47.8%) 36-45: 8 (34.8%) 46 and above: 2 (8.7%)
Sex	F: 7 (30.4%) M: 16 (69.6%)
Gender	F: 7 (30.4%) M: 16 (69.6%)
Treatment arm	3-month clofazimine: 12 (52.2%) 6-month standard of care: 11 (47.8%)
Questions asked in interviews	Who have you told that you have been diagnosed with tuberculosis? Why did you tell these people? Do you worry about people you did not tell that you have been diagnosed with TB finding out that you have TB? Why? Are there any people you are most worried might find out you have TB? Is there anything about the treatment you have been taking that you worry might identify you as someone who has TB? If so, please describe: What do you think might happen to you if people you did not tell you have tuberculosis find out that you have the disease? Has anything bad ever happened to you when people have found out you have tuberculosis? If yes, please describe: If you had to choose between taking medicines for TB for 6 months with a treatment that caused no changes in your appearance OR taking a treatment for 4 months that might cause your skin to change, which would you prefer? Why? Is there anything else you would like to tell us about your experience being diagnosed and treated for TB?

Conclusions: People living with TB have diverse experiences with disclosure, including participant-initiated and inadvertent disclosure. Our findings were consistent with anticipated stigma driving treatment preferences, and this should be considered when assessing regimen preferences in future TB treatment shortening trials.

PP02-816-13 Perspectives from people with TB on quality-of-life transitions during and after TB treatment in South Africa

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Background: Understanding quality of life (QoL) for people with TB is key to optimizing lifelong well-being after treatment. The objective of this sub-study, embedded within a multi-level, cascade-of-care research project in the Eastern Cape, South Africa was to explore QoL during and after TB treatment.
Design/Methods: Participants who completed a QoL survey for the main project were purposively sampled early, mid, and post-treatment. Over six months starting November 2023, individual semi-structured interviews incorporating a participatory exercise and repeat survey were conducted in isiXhosa and English. QoL and stigmatized chronic illness theories were incorporated into inductive analysis.
Results: Narratives of eight men and twelve women, who were early (n=5), mid (n=8), and post (n=7) treatment were analyzed. Analysis supported a QoL framing over five stages; symptom-onset, diagnosis and disclosure, early treatment, recovery, and stabilization. Participants stated struggles began with symptom-onset, reached crisis in early treatment, and eased, but did not abate, during recovery.
Emotional distress was related to fear of death, draining scarce household resources, and social exclusion. Many reported physical disability resulting in housing disruption and financial downfall which was not rectified during stabilization.
Appreciation was expressed for health workers and families who fulfilled unmet needs for information, caregiving, food, and medications.
Several post-treatment participants described sustained QoL deficits. Lower-income, advanced symptoms, and ineligibility for social programs contributed to incomplete recovery. The mean of QoL summary scores increased during treatment.
Survey scores did not capture complex interconnections between different domains of QoL and overall household well being which were came through in interview and participatory exercise data.
Conclusions: Earlier diagnosis and treatment may minimize physical disability and improve QoL during and after treatment. Safeguards to facilitate recovery may include income support, counseling, and home caregiving. Staged, tailored interventions may reduce loss to follow-up at all stages of the cascade-of-care and minimize long-term psychosocial deficits.

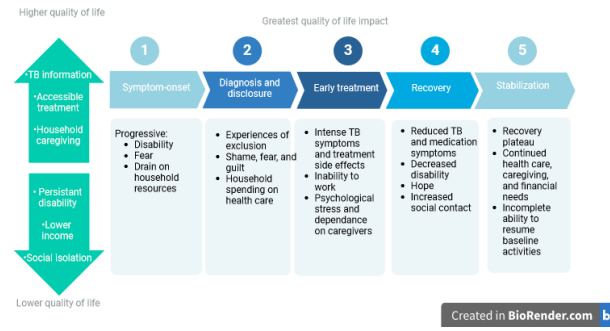

Figure 1. Transitions in quality of life during and after TB treatment.

PP02-814-13 A multi-country evaluation of patient preferences for future TB diagnostic tests using a discrete choice experiment

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Background: Recognizing new and improved diagnostics as a key step to reducing the global TB burden, the WHO published target product profiles (TPPs) to address key priorities. TPPs include the perspectives of providers, product developers, and officials but not the preferences of people undergoing TB testing. Understanding their preferences is needed to optimize the acceptability and uptake of diagnostic services in high TB burden countries.
Design/Methods: A discrete choice experiment (DCE) was conducted among adults with presumptive or microbiologically confirmed TB attending outpatient clinics in 5 countries (Philippines, Vietnam, South Africa, Uganda, and India). The DCE evaluated preferences for 5 attributes related to TB diagnostic tests (sample type, accuracy, cost, location, time to result) with 3-4 levels per attribute.

We estimated mean preference weights for attribute levels and willingness-to-trade for preferred test features using hierarchical Bayesian models.

Results: Among 1,009 participants (median age 42 years, 51% female, 10% with HIV, 15% with diabetes), and across all countries, the most strongly preferred test features were high diagnostic accuracy, free cost, and availability of rapid (within 15 minutes) results (Figure 1).

Health facilities were the most preferred testing location, although participants in Vietnam preferred home-based testing. Oral swabs and sputum were the most preferred sample types, with small differences by country.

In willingness-to-trade simulations, participants across all countries were willing to trade up to 20% lower accuracy for the availability of rapid results (within 15 minutes). Participants in Vietnam and the Philippines were willing to trade 5% accuracy for a tongue swab-based test, while in Vietnam, they were willing to trade 4% accuracy for a home-based test.

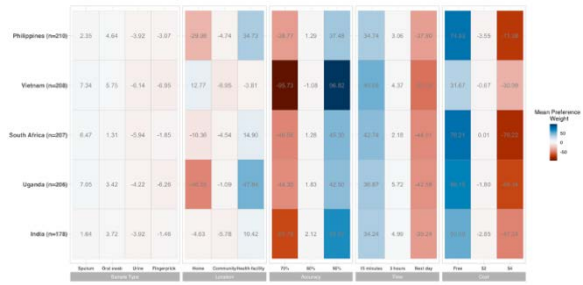

Figure 1. Mean preference weights for TB diagnostic test features among persons with presumptive or microbiologically confirmed TB in 5 countries. Mean preference weights demonstrate the negative (red shading) or positive (blue shading) preferences for TB test features.

Conclusions: Persons across 5 countries accessing TB testing services strongly valued same-day and highly accurate test results. However, there was heterogeneity for other test features by country. Future TPP updates and new test development should prioritize rapid results.

PP02-813-13 'Apart from being sick it's torturing giving them that everyday': Qualitative analysis - Lived experiences providing drug-resistant TB medicine to children, in KwaZulu-Natal, South Africa

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Background and challenges to implementation: Whilst children are initiated on treatment and receive initial care from healthcare workers, caregivers are actively involved in the treatment completion. Caregivers play a vital role in adherence to medication, an essential component in conquering drug-resistant tuberculosis (DR-TB), however, limited research is available on their experiences.

This qualitative analysis presents findings and recommendations to inform the development of innovative ideas to improve the treatment journey for children with DR-TB.

This study unpacks the experiences of caregivers, of children that received a combination of adult and child friendly formulations of DR-TB medicine between 2019 and 2022, in KwaZulu-Natal, South Africa.

Intervention or response: Children <6years initiated on DR-TB treatment in KwaZulu-Natal, from 2019 to 2022, were identified from the electronic DR-TB register. 24 caregivers were identified, 17 could not be contacted due to wrong numbers or voicemails and 7 caregivers participated in this study. Three ICIs and one FGD with 3 and 4 participants, respectively, were conducted by trained facilitators. Discussions were recorded, transcribed, translated and analyzed using Atlas.ti.

Results/Impact: Thematic analysis revealed caregivers' proficient navigation through the DR-TB journey, highlighting their critical role in medication identification, innovative preparation methods to enhance palatability, and strategic administration practices.

Caregivers expressed a preference for child-friendly formulations, manipulating adult medication when necessary, and employed innovative taste-masking techniques to ensure adherence.

Despite these efforts, challenges such as medication aversion due to bitter taste, managing side effects and financial constraints were prevalent. The importance of community and family support during the treatment journey was evident.

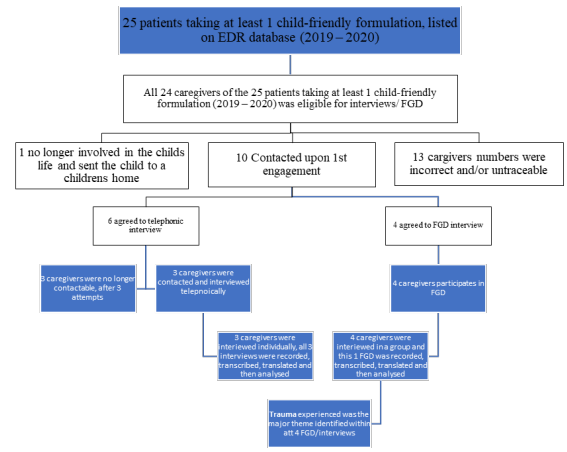

Figure 1: Flow diagram elaborating the method used to identify eligible caregivers

Conclusions: Innovative preparation and administrative practices were useful in ensuring adherence, however, this needs to be standardised to ensure the correct dose is administered. Access to child-friendly formulations, with better taste and masking agents, must be prioritized to make administration easier.

PP02-812-13 Migrants healthcare seeking behaviour and willingness to use tongue swabs for TB screening: A qualitative study

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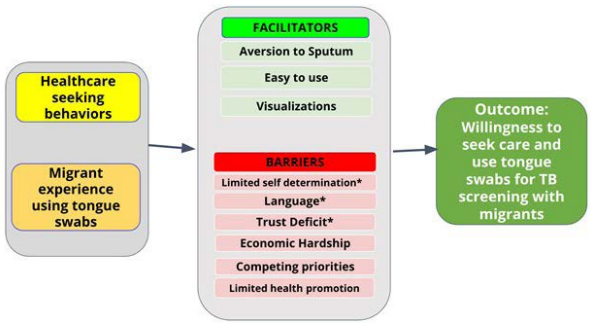
Background: TB screening is challenged by a reliance on sputum-based testing and hesitation to seek care. In Italy, a key country of the migration route from Africa and Asia to Europe, almost half of TB cases are of foreign origin. There is then the need for more comprehensive and accepted TB screening methods serving these migrants' communities.This study aims to evaluate the feasibility and acceptability of a non-sputum option, supervised tongue swabs (STS) for TB screening within the context of migrants' health care seeking behaviors. STS have a reported sensitivity up to 95% when paired with appropriate laboratory methods.
Design/Methods: This user experience study uses qualitative research methods with in-depth interviews and purposive sampling. Recruitment of migrants experiencing TB screening began in November 2023 in Milan, Italy and continues until saturation among meta themes is reached. Hamilton's Rapid Qualitative Analysis Method was adapted to summarize key findings.
Results: Preliminary results from the first 12 people interviewed reveal the barriers and facilitators to seeking care and using STS (Figure 1).



Migrants recruited are from Bangladesh, Ivory Coast, English Cameroon, Burkina Faso and Mali. All migrants had limited knowledge of the TB screening process and TB signs and symptoms. The majority of participants reported that healthcare costs were prohibitive in their country and during their journey. All participants were able to self perform the tongue swab even if they had limited or no experience of self testing.Most participants (8/12) indicated STS was easier than sputum while (3/12) had no preference. One participant preferred sputum over SSS.
Conclusions: This study explored migrants' healthcare seeking behaviours and willingness to use STS for TB screening. Preliminary results indicate that STS is feasible and acceptable. There is a lack of STS educational materials and health promotion campaigns that are targeted to migrants' needs.

PP02-810-13 The dynamics of motherhood and fatherhood and the TB experience in South Africa

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Background and challenges to implementation: South Africa, with a TB incidence of 468/100,000, faces significant impacts on family stability due to the disease. This study examined the experiences of men and women who identified as fathers and mothers during their TB illness and how TB influenced their parental roles and impacted their households.
Intervention or response: In-depth interviews were conducted with those currently or recently receiving TB treatment at primary health clinics in Buffalo City Metro Health District, Eastern Cape Province, South Africa. Informed by the Network-Individual-Resource (NIR) model, interviews examined treatment motivations, support, and family impact, and were conducted in isiXhosa or English. Interviews were audio-recorded, transcribed, and translated, and then analyzed iterative approach guided by vital conjectures to understand motherhood and fatherhood during TB illness and treatment.
Results/Impact: Of 142 individuals interviewed, 98 reported having children and were included in our analysis. Mothers cited their children as motivators for treatment adherence and did not remove themselves from the household or from their children during treatment.
They described receiving physical and emotional support from their children and from extended family with access to food, money, and domestic assistance. A third of fathers reported living in the same household as their children, and most experienced a sense of isolation and reliance on self-motivation for treatment adherence.
Fewer fathers reported receiving resource and emotional support from their extended families. Some men reported their children as motivators to complete TB treatment, though few men discussed being cared for by their children.
Conclusions: Mothers and fathers differ in their healthcare motivations, caregiving roles, and access to support from family and extended networks. Fathers are side-

lined during TB illness and treatment. Family-oriented strategies are needed to enhance TB treatment outcomes, with a focus on leveraging existing support networks for mothers and fathers. Such interventions should focus on empowering fathers and fatherhood in family well-being.

PP02-808-13 How do Indonesian doctors value the different features of a TB case notification system? Answers from a discrete-choice experiment

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Background: Increasing tuberculosis (TB) case notification from private practitioners (PPs) has been one of the primary goals in TB public-private mix. To be effective, there is a need to consider PPs' preferences.
This study used a discrete-choice experiment (DCE) to measure physicians' willingness-to-accept (WTA) for changes in levels of features in a TB notification system.
Design/Methods: We developed a DCE survey contextualised for physicians and TB notification in Indonesia. Features and their values were identified through a literature review, followed by confirmatory interviews with physicians and the National TB Program.
Following a series of piloting, a 16-choice tasks efficient design, randomised into two blocks, was developed. Data were collected by means of an online survey, distributed through social networks of physicians. Generalised multinomial logit and latent class models (LCM) were used to analyse the choices.
Results: Four features were included in the choice tasks, namely notification time burden, potential penalty for failure to notify, amount of continuing medical education (CME) credits and monetary incentive awarded for notifying cases. A total of 210 physicians participated, 29 (21%) were excluded due to possible non-attentiveness.
Overall, the WTA for initiating notification was IDR435,000, IDR57,000 for a 10-minute notification burden, IDR53,000 to forego 1 CME credit, and IDR 71,000 to accept a system that imposed a penalty for failure to notify.
Significant heterogeneity was identified. A three-class LCM differentiated between physicians who 1) did not require compensation for initiating notification and 2) those who require compensation for initiating notification but did not mind about the reporting burden or 3) did not mind about the potential penalty.
Conclusions: Some physicians require a significant monetary compensation to initiate notification, but generally only require a modest compensation for their time. However, physicians vary in their preferences. Preference group-specific strategies can be more effective to increase TB notification from PPs.

PP02-811-13 Relating the 'fourth space' to improving respiratory illness outpatient access for people aged ≥5yrs in Fiji from 2013 to 2020

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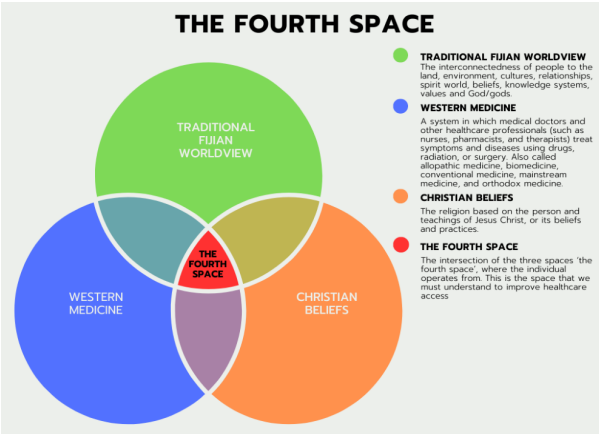
Background: Respiratory illnesses are a leading cause of hospitalisations in Fiji. There has been no published data describing primary care presentations for respiratory conditions. We consider factors influencing respiratory outpatient presentations in the context of the Pacific model: The Fourth Space.
Design/Methods: Outpatient presentations for respiratory illnesses, age ≥5 years old, in Fiji 2013-2020 were compared between the four health divisions. Population denominators were from the census and Ministry of Health and Medical Services (MHMS) annual reports. Numerator data were from Fiji MHMS's Consolidated Monthly Reporting Information System. Annual visit rates for respiratory illness for each medical area from 2013-2020 were described per 1,000 person-years in each medical area/subdivision/division.
Qualitative interviews exploring the 'fourth space' Pacific model gave insights into factors influencing access to outpatient care for indigenous Fijians.
Results: The average annual rates for respiratory illnesses for each division were: Western 27.22, Northern 22.56, Central 16.28, and Eastern 13.55. Ranges of average annual rates for respiratory conditions for each subdivision and medical areas, respectively, within each division were: Western (7.33 -86.10), (0.48-391.22), Northern (11.18 -35.66), (1.69-68.53), Central (13.29 -18.87), (0.18-28.26), and Eastern (0.00 -26.51), (0.0-46.30).
It was considered that access to outpatient care is influenced by the indigenous Fijian worldview ('first space), Christianity ('second space') and (western) healthcare ('third space').
The intersection of these three spaces is the 'fourth space' - where the individual operates from.



Conclusions: Respiratory illness presentation rates vary widely between divisions. These data inform whether patterns of outpatient healthcare use for respiratory illness reflect regional differences in disease burden or in healthcare access and utilisation. A full understanding of healthcare access is not possible if restricted to western biomedical health system models.

The impact on healthcare access of the 'fourth space' that people operate in needs to be acknowledged and services adapted accordingly.

PP02-815-13 Contribution of 3rd Party Logistic (3PL) support services in anti-TB drugs and logistics supply chain management in West Bengal, India

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Background and challenges to implementation: Strengthening of procurement and supply chain management is very essential for uninterrupted supply of quality drugs and less wastage in terms of expiry and damages. Many districts of West Bengal don't have dedicated vehicle for transport of anti-TB drugs and logistics.

As a result, there was often delay in supply leading to issues like over or under stocking, stock out and drug expiry. In 2021 a Global funded project started in West Bengal with an aim to strengthen the technical capacity of the state to design, manage and monitor supply chains of anti-TB drugs and diagnostics.

Intervention or response: The 3 PL agency implemented their project and helped the states by three ways-

- Deploying dedicated supply chain expert for training, moitoring & supervision.
- Dedicated vehicles for real time transport of drugs and logistics
- Developing practical manuals and supply chain management SOPs.

The agency covered 100% of SDS to DDS & DDS-TU and 50% of TU-PHI shipments of West Bengal. They have arranged over 2000 shipments and shiped a total of nearly thousand metric tons of drug, logistics & other comodities during 2021 to 2023.

The transport support area of operation was to and from any level in between SDS and PHI [Figure 1]

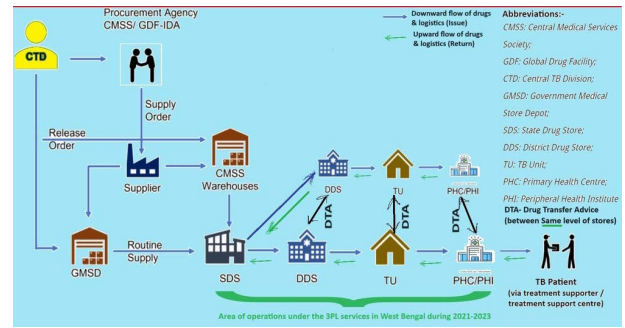

Figure 1. Overview of anti-TB drugs & logistic supply chain under National TB Elimintion Program & the scope of work of 3PL agency.

Results/Impact: The issues like overstocking and understocking were minimized greatly. There was never a stock out issue. There was no expiry of any drugs except a few which were near expiry drugs pushed from CTD without indent. Lead-time of indents reduced to 48 hours from an average of 10 days before 2021. 100% pharmacist and store in-charge was trained in Nikshay Aushadhi. A comprehensive supply chain management training module developed.

Conclusions: The 3PL support service was very helpful for TB supply chain management in West Bengal. This support or similar may be extended for few more months till the health-system is self-sufficient.

PP02-817-13 Exploring the rising trends of deaths in persons with TB: A mixed-methods study from Kashmir, India

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Background and challenges to implementation: Kashmir is the first region of India to achieve more than 80% decline in tuberculosis (TB) incidence in three out of its six districts (2023 levels vis-à-vis baseline year 2015). Despite this achievement, a rising trend of deaths in persons with drug sensitive TB (PwTB) was observed from 2018 to 2022. The present study aims to examine the rising trends of deaths in Kashmir and explore underlying risk factors using mixed-methods approach, to devise a targeted strategy to address the same.
Intervention or response: Secondary data was extracted for the period 2018 to 2022 from Ni-kshay (India's digital TB surveillance system) to explore the trends in deaths among PwTB in Kashmir. Time trend analysis was performed in SPSS ver21. Key informant interviews (KIIs) and focussed group discussions (FGDs) were conducted in January 2024 with stakeholders from peripheral health facilities and medical colleges. Qualitative data was manually coded and thematically analysed. The converging themes from various sub-groups were identified independently by the researchers and researcher triangulation was performed to increase rigor in the findings.
Results/Impact: Kashmir region showed a significant decline (16%) in trends of Annual TB notification rates (34.4/100,000 in 2022) but increase in deaths among PwTB (z score:-6.56; p-value:<0.00001). The two overarching themes that emerged from reflexive thematic analysis were (i) patient side determinants and (ii) health system determinants contributing to deaths in PwTB. Sub-themes under patient side determinants were delay in seeking care, reliance on informal practitioners, pulmonary complications, and role of co-morbidities. Sub-themes under health system determinants were non-availability of specialized tertiary care and delay in availability of drug resistance status.
Conclusions: This study gives a deep insight into the operational and system gaps in TB care cascade. Learnings from the study have promoted the formulation and execution of a differentiated TB care approach to reduce deaths in PwTB in Kashmir.

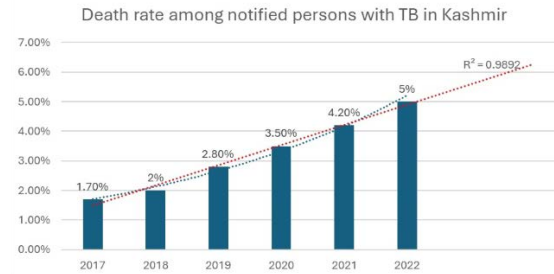

Figure 1. Trend analysis and forecasting of death rate among persons with TB in Kashmir.

PP07 Implementing strategies for drug-resistant TB assistance: Time for strengthening person-centred care

PP07-858-13 Drug-resistant TB: Biosocial approach with attention to food security in Sao Paulo State (2021 to 2024)

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Background and challenges to implementation: Tuberculosis (TB) is a curable infectious disease linked to inequalities. The disastrous consequences of interrupting treatment, leading to drug resistance and adverse socioeconomic conditions, create vulnerabilities to the disease. DRTB has its characteristics, requiring unique attention from the health service to the patient for better adherence and cure, requiring a practical biosocial approach. The project aims to support the social protection and food security of patients undergoing DRTB treatment by the Unified Health System (SUS) in Sao Paulo, Brazil.
Intervention or response: Patients with DRTB diagnoses were included. Services carried out several activities: support for TB education actions, listening service for the patient with the social worker and psychologist, and stimulating social protection and food security.
Results/Impact: Figure 1-A demonstrates the outcomes of cases. The project created a homepage with updated content (https://tbdrsp.com.br/) containing videos with guidance on TBDR. Educational folder and posters containing a QR Code that can be accessed by cell phone, both for health professionals and patients, to be fixed in the care facilities which attend DRTB patients. Regarding food security, the social service provided a food card (Figure 1-B) to complement their feeding, and it noticed improved self-esteem and attention to their health.

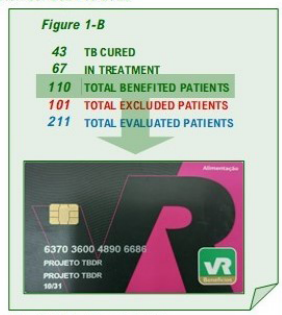
DRTB cases outcomes from September 2021 to 2022 and from September 2022 to March 2024 in the Sao Paulo State, Brazil

REGIONS OF SAO PAULO STATE	PATIENTS		INCLUDED		EXCLUDED	
	N	%	N	%	N	%
INLAND	42	19,9	13	6,2	29	13,7
SHORE AND METROPOLITAN AREA	61	28,9	20	9,5	41	19,4
CAPITAL	108	51,2	34	16,1	74	35,1
TOTAL	211	100,0	67	31,8	144	68,2

DRTB cases outcomes during project period from September 2021 to 2022

September 2021 to September 2022	N	%
Loss to follow-up	26	18,1
TB treatment success	43	29,9
TB treatment failure	1	0,7
Prisoner	6	4,2
Difficult control	10	6,9
Food card - Refusal	5	3,5
Missing	3	2,1
Hospitalized	16	11,1
Change of State	2	1,4
Do not use DOT	2	1,4
Death	7	4,9
Refuse to participate	2	1,4
TB treatment completed < 4 mo	21	14,6
TOTAL EXCLUDED DURING THE PROJECT	144	100,0

Source: SITETB August 02 2021



DRTB cases outcomes after project period from September 2022 to March 2024

September 2022 to March 2024	N	%
TB Cure	34	50,7
TB Treatment completed	14	20,9
in Treatment	2	3,0
Loss to follow-up	11	16,4
Change of TB treatment	1	1,5
Change of Diagnosis	1	1,5
Not Evaluated	4	6,0
TOTAL INCLUDED	67	100,0

TB treatment success 71,6%

Source: SITETB April 2 2024

Conclusions: This project consisted of specific strategies, creating the opportunity to implement consistent and feasible actions to improve care for individuals with illnesses at social risk, contributing to reducing and eliminating stigma. The TB treatment success was significant in the follow-up of this population after the end of the project, reaching a rate of 71.6%. Loss to follow-up is still an important problem due to the majority of patients having economic difficulties, malnutrition, and little knowledge about the disease. A more extended study period would be necessary to obtain more robust data and better assess the actions' effectiveness. A PPM could be a feasible strategy to address DRTB.

PP07-856-13 Decentralising drug-resistant TB care in South Africa: The trade-off between service coverage and quality of care

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Background: A policy of decentralised care for drug-resistant (DR)-TB was introduced in South Africa in 2011, transferring responsibility for the treatment of people with DR-TB to lower levels of the health care system. Despite improved initiation, treatment outcomes remained poor. We aimed to describe the trade-off between increasing coverage of services and maintaining quality of care.

Design/Methods: This was an embedded qualitative case study, comparing implementation in two provinces, through data collected in 94 in-depth interviews. Interpretive policy analysis was applied. Ethics clearance was obtained.

Results: There were 17 DR-TB sites in the country when the policy was launched. The target was to establish one initiating site per district and when that was achieved, one site per subdistrict. Two case studies demonstrate how inadequate planning and preparation, health care worker capacity, and resourcing impacted quality of care.

Case 1: Clinicians in newly established sites in District A who were not adequately trained and supported, failed to follow guidelines, resulting in inadequate monitoring, and late referral of complications. Decentralisation to poorly capacitated clinicians without the necessary support and outreach, resulted in compromised quality of care.

Case 2: A year after District B established a DR-TB site, media reported that 100 people with DR-TB developed hearing loss. No baseline hearing tests were done because audiometry equipment was being repaired. Having a site not adequately resourced to deliver DR-TB care, resulted in significant morbidity to patients who did not receive effective care.

Conclusions: Against the context of existing health system challenges, coupled with introducing complicated DR-TB treatment in settings not fully capacitated and without all the necessary resources, this paper described the trade-off of quality of care that resulted from trying to increase coverage of DR-TB initiating sites. We argue for a shift in perspective towards embracing effective coverage of health programmes, which incorporates quality of care.

PP07-857-13 Engaging all care providers to increase access to drug-resistant TB services and improve decentralised care delivery in Bangladesh

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Background and challenges to implementation: In Bangladesh, a significant number of drug-resistant TB (DR TB) cases (71.2% of an estimated 4900 incident cases) remained undetected in 2022. Further, there are several barriers that prevent patients from accessing appropriate care and timely, effective treatment.

Intervention or response: A TB REACH-funded project in Bangladesh's Chattogram and Khulna Divisions tackled DR-TB detection through a comprehensive approach. Active case finding, contact investigation, and a strengthened referral system aimed to identify more cases. Training for healthcare providers (private and public)

and a digital mentorship program for junior physicians improved DR-TB management. Community awareness campaigns further supported early detection through advocacy, counseling, and social mobilization.

Results/Impact: Between January 2022 to December 2023, we identified 561 DR-TB patients through facility-based active screening and contact investigation. Of these 555 (98.9%) patients were initiated on all-oral DR-TB treatment regimens (AOTR).

In addition, we linked 514 DR-TB patients to care through referral systems. By implementing all interventions, we successfully initiated treatment for 1075 DR-TB patients, surpassing our project targets of enrolling 598 patients. Compared to 2021, these combined interventions resulted in 79.8% increase in DR-TB case notifications.

Further, our efforts led to the detection of 6 children with DR-TB. Of 1,069 DR TB individuals who initiated treatment, 251 (23.5%) were diagnosed with diabetes. The ACF and contact screening intervention also diagnosed 1,699 DS-TB patients (1577 adults; 122 children) and all were initiated on treatment.

Conclusions: This project has successfully demonstrated that by engaging all care providers, creating context-specific pathways to increase access to services, empowering and strengthening local capacity can increase TB case detection and effectively link patients to appropriate care.

PP07-863-13 Strengthening drug-resistant TB care institutions by creating structures for diffusing expertise through a Center of Excellence (CoE) program: Experiences from India

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Background and challenges to implementation: To decentralize DR-TB management expertise, NTEP-India has established a two-tier approach to treatment services through 162 Nodal DR-TB centers (DR-TBCs) and 614 District DR-TBCs. However, clinical expertise is still concentrated at select institutions, limiting access to quality care. There is a felt need to improve quality-of-services and clinical decision-making at other centers.

Intervention or response: A Centre of Excellence (CoE) based institutional strengthening framework was developed and approved by the Ministry of Health and Family Welfare. Under the framework, the hubs are select institutions providing high-quality DR-TB care designated as CoEs, and spokes are other DR-TB centers linked to them. Using the framework ten well-performing institutions across the country were evaluated and five of them were designated as CoEs and linked to 100 spoke institutions. These five CoEs provide clinical advice for difficult-to-manage cases through consultations, build the capacity of spokes through case-based discussions and short courses and, mentor the spokes to solve programmatic issues. Interim assessment was conducted to assess the outcomes of the CoE program.

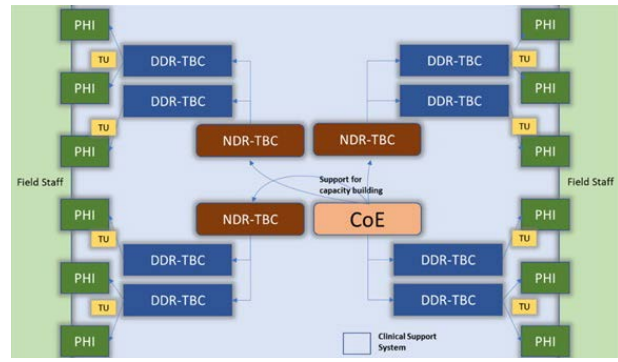

Figure. Thematic presentation of capacity building through C0E program.

Results/Impact: In 2024, five CoEs together provided 3803 rounds of clinical advice for clinical queries from spokes, conducted 118 virtual capacity building sessions and 83 mentoring sessions. A decline in referral of 12% was observed indicating improved confidence in managing cases.

Undefined care components like pulmonary rehabilitation and palliative care, were defined and demonstrated by the CoEs. CoEs have also trained 9 surgeons in TB Thoracic procedures, and they have subsequently initiated surgical procedures at their own institutions.

Conclusions: The Centre of Excellence-based hub and spoke model of institutional strengthening has diffused DR-TB clinical expertise and improved access to better quality DR-TB care at decentralized institutions.

PP07-865-13 Comparison of treatment outcomes between people with MDR/RR-TB receiving a shorter treatment regimen with injectable drugs and the 9-month all-oral regimen in Cambodia

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Background: The shorter treatment regimen with injectable drug for RR/MDR-TB was implemented in Cambodia by December, 2017 and the 9-month shorter regimen was from January 2021.
Design/Methods: We analyzed the two concurrent cohort between December 2017 and June 2021 among MDR/RR-TB patients with FQ succeptible receiving standardized short MDR-TB treatment (4-6 Km/Am-Mfx-Eto-Cfz-Hh-Z-E/5 Mfx-Cfz-Z-E), called Short injectable (SI) and cohort between January 2021 to December 2022 receiving 9-months all-oral regimen, called Short Oral (SO).
Results: A total of 253 patients were initiated with SI: 173(68.4%) were males, median age was 50 [IQR 38-62], and 33(13.0%) were HIV positive.
Treatment outcomes: success 205(81.0%), died 20(7.9%), failed 20(7.9%), lost to follow up 7(2.8%) and transferred out 1(0.4%).
Among the cases failed (n=20), were switched to longer individualized treatment regimens, in which 15 cases cured, 2 died and 3 definitively failed.
A total of 104 patients were initiated with SO: 77(75%) males, median age was 47[IQR 35-58] and 4(3.8%) HIV positive. Treatment outcomes: success 89(85.6%, died 8(7.7%), failed 6(5.8%), and lost to follow-up 1(0.9%). A mong cases failed (n=6) in SO group were switched to individualized longer regimens, in which 2 cases cured, 1 case died and 3 definitively failed.
The overall treatment success rate among SO group was slighly over the SI group with OR 1.38 (95% CI 0.73-2.61), p=0.3.
The causes of treatment failure among SI group were due to severe adverse (hearing loss, kidney failure and 6 liver toxicity, 1 due to unexpected pregnancy, and 1 was due to bacteriological failure (reconversion during continuation phase).
The causes of failure among SO group: 3 hepatotoxic, 1 GI upset, 2 bacteriological reconversion at continuation phase.
Conclusions: The all-oral shorter MDR-TB regimen implemented in programmatic conditions, shows better success rate with comfortable convenience, compared to the short regimens with injectable drug in our setting.

PP07-862-13 Identifying the steps that contribute to delays with drug-resistant TB contact diagnosis and treatment in Vietnam

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Background and challenges to implementation: Vietnam ranks among the top 30 countries with a high tuberculosis (TB) and drug-resistant TB (DR-TB) burden. The National TB Program promotes a direct-to-Xpert diagnostic algorithm for close contacts of people with DR-TB. Prompt and rapid contact investigations for all people with a DR-TB diagnosis are vital to reduce transmission.
Intervention or response: In Ho Chi Minh City, Vietnam, we measured the average number of days between key steps in the TB care cascade, between the date of diagnosis of an index DR-TB patients through to the date of treatment initiation for contacts diagnosed with TB. The intervals included the index DR-TB patient diagnosis, index patient treatment initiation, contact investigation, diagnosis of TB among contacts, and treatment linkage for contacts with TB.
Results/Impact: It took an average of 50.1 days between the diagnosis of the index DR-TB patient and the detection and treatment linkage of their contacts who were diagnosed with TB. The longest interval was the average of 43.6 days to conduct the contact investigation (T1 in the figure).
Contact enumeration and screening (T2), followed by diagnostic testing for contacts (T3) took just 2.2 and 4.3 days, respectively. The interval for diagnostic testing was cut from 5.0 days in 2023 to just 1.3 days in 2024. Linkage to treatment of DR-TB contacts diagnosed with TB (T4) took an additional 23.9 days.
Conclusions: DR-TB contact diagnosis and treatment linkage took almost two months, driven by delays in initiating a contact investigation and then contact treatment linkage.
Future contact investigation initiatives should aim to reduce these delays through community outreach efforts, and should consider offering DR-TB preventive treatment for contacts who have not yet developed TB.

PP07-861-13 Continuity of drug-resistant TB care during complex emergencies: The successful experience of the Poland-Ukraine collaboration

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Background and challenges to implementation: Ukraine has one of the highest prevalence of drug-resistant (DR) Tuberculosis (TB) globally. The ongoing war caused a massive migration of individuals leaving Ukraine to find refuge in neighbouring countries, including Poland.
Refugees previously receiving TB/DRTB care in Ukraine experienced the challenges of treatment interruption during the displacement; concomitantly, countries such as Poland, notably having achieved a low TB/DRTB incidence, had to face the challenges of ensuring continuity of TB/DRTB services to a large and unexpected number of patients.
Intervention or response: In collaboration with the Ministry of Health (MoH) of Poland, the MoH of Ukraine, and the World Health Organisation (WHO), Médecins sans Frontières (MSF) started in 2022 TB activities in Poland, supporting the country to identify measures ensuring the continuity of TB/DRTB care among Ukrainian refugees.
Progressive solutions were identified to overcome the challenges of the existing hospital-based model of care as well as the limited access to the drugs needed to implement the latest recommended treatments. Successful measures included the switch to an ambulatory model of care, implementation of patient-support activities and endorsement of hoc solutions for access to medicines, allowing the roll out of the WHO-recommended BPaLM regimen.
Results/Impact: Between Januray 2023 to end of March 2024, 110 patients affected by DRTB were continued or started on an all-oral shorter DRTB treatment, 56 of them on the 6-month all oral BPaLM. Most (62%) of them received care at ambulatory level, which became the preferred model in Poland.
Conclusions: This experience shows that political will and multi-stakeholders' collaboration to implement adapted solutions, with focus on patient-centred measures, are essential to ensure continuity of TB/DRTB care for vulnerable populations during complex emergencies. Nevertheless, the need to enhance preparedness, update TB policies and services, and to solve the challenges of access to TB drugs in Europe, remains.

PP07-864-13 Differentiating TB service delivery in an urban setting: Lessons from a community drug delivery program in Central Uganda

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Background and challenges to implementation: Optimizing TB treatment outcomes in urban settings remains a major challenge. During 2021, 5.8%(745/12864) patients enrolled on TB treatment in three of the central Uganda urban districts (Kampala, Mukono and Wakiso) did not complete treatment.
A root cause analysis revealed that busy schedules and TB related stigma were major challenges to treatment completion. The USAID Local Partner Health Services TB Activity developed a community drug delivery program to address this challenge.
Intervention or response: Working with the district leadership, we identified and trained TB survivors and community owned resource persons (CORPs) to support drug delivery to patients within their catchment areas. With the coordination of the TB clinic focal persons, the project supported the CORPs and TB survivors to carry out community-based TB treatment refills and collected sputum samples for treatment monitoring.
Data was managed using a drug delivery form, entered into the health facility TB register and then digitized for easy back up.
Results/Impact: From July-2022 to March-2024, 1,752 patients were enrolled of whom 1,416(80.8%) were supported by survivors and 336(19.2%) by CORPs. The average age was 33.5 years, the majority were males 1,063(60.7%), and 560(32%) were PLHIV. Major delivery points were: homes (84%), workplaces (7%) and socializing places (2%).
Among the 1,101 assessed for their occupation, 43% were peasants, 23% traders, 5% taxi/bus drivers or conductors, 11% children/ or in school and others were casual laborers or unemployed. By March 2024, 979(55.9%) had treatment outcomes and 773(44.1%) were still on treatment.
Among those with outcomes, 958(97.9%) had successfully completed treatment and 21(2.1%) had either died, failed or were lost to follow-up. This is less than the baseline regional treatment interruption of 5.8%.

Conclusions: Differentiated service delivery models that seek to overcome patient barriers to care access and take into consideration patient preferences can help improve treatment outcomes.

PP07-860-13 Improving access to multi-drug-resistant TB care: Lessons from implementing a satellite clinic at a primary care facility in Eastern Uganda

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Background and challenges to implementation: Uganda implements the mixed model of care for the of multidrug-resistant TB (MDR TB) at tertiary referral hospitals. In this model of care, patients are initiated on TB treatment at tertiary referral hospitals, receive their daily directly observed therapy (DOT) from a primary care facility and return to the tertiary hospitals once every month for clinical review and treatment monitoring. Adherence to this model of care may be difficult for patients who live far away from tertiary-level hospitals.
We implemented a novel approach of decentralized care for a cohort of 19 patients identified during a hotspot screening activity 64km away from the nearest tertiary hospital.
Intervention or response: With support from the USAID, and MOH, we constituted a multidisciplinary team of a nurse, clinician, ophthalmic officer, and laboratory technologist to train staff from a primary care facility on MDR TB management, infection control, and contact tracing. The patients were initiated on second-line therapy according to national guidelines and monitored monthly at the primary care facility.
Contact tracing was carried out for their household members who were also educated on infection control. Modalities for effective communication with the tertiary hospital team for clinical management support, availability of medicines and supplies, patient monitoring, and aDSM were initiated.
Results/Impact: A total of 19 patients (8 male) were started on second-line therapy and followed up every month. Of the 116 close contacts, 109 were evaluated, 02 were diagnosed with DS TB and started on first-line treatment. After 10 months of follow-up, 15 patients had completed treatment, 3 patients were still on treatment, and one was lost to follow-up.
Conclusions: A decentralized care delivery model was effective in managing patients with MDR TB. We recommend the scale-up of this approach to other primary care facilities particularly those in areas with large numbers of MDR TB patients.

PP07-859-13 Treatment outcomes from implementation of the modified short treatment regimen among people with multi-drug-resistant TB in Uganda

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Background and challenges to implementation: In, 2019 the WHO advised national programs to move to shorter all-oral regimens for the treatment of multidrug-resistant TB. This was to avert the serious adverse drug reactions and subsequent poor treatment completion that were associated with regimens involving injectable drugs.
We describe the implementation and treatment outcomes of patients treated with this regimen over the past two years in Uganda.
Intervention or response: With support from development partners, the Uganda Ministry of Health rolled out the modified Short Treatment Regimen (mSTR) containing 9-11 months of bedaquiline, Linezolid, Levofloxacin, Clofazimine, and Cycloserine in the 17 tertiary hospitals. An addendum to the national DR TB guidelines was developed, healthcare workers were trained, and periodic mentorship/coaching was conducted to ensure conformity with the guidelines.
To support the implementation of the new treatment regimen, active drug safety, and monitoring was introduced at each monthly clinic visit. This included blood chemistry and hematological tests, visual acuity, and electrocardiogram tests.
The NTLP held biweekly national-level capacity-building webinars to discuss challenging clinical scenarios from the different treatment centers. Data quality was ensured through quarterly validation visits by regional and central NTLP supervisors.
Results/Impact: Between April 2020 and September 2021, 439 patients were initiated on the mSTR. Of these 311 (71%) were men; the median age was 38, and 37% had HIV. Before the regimen was introduced, the treatment success rate among the MDR TB cohorts was 87% overall and 86% among PLHIV. After introducing the regimen, the treatment success rate was 89%, 90% among PLHIV.

Conclusions: Patients with rifampicin-resistant TB who received the mSTR had comparable treatment outcomes to those in the preceding cohort on injectable agents. Morality remained the biggest contributor to the poor outcomes. The program should scale-up and consolidate the use of short all-oral regimens among patients diagnosed with rifampicin-resistant TB.

PP01 Multipronged approach for TB prevention and care

PP01-802-13 Prevalence and features of TB among people with sputum trace Xpert Ultra results in two African healthcare settings

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Background: For patients with trace-positive sputum by Xpert MTB/RIF Ultra, the appropriate clinical management remains uncertain. Studies in which such patients are treated after an initial evaluation may miss TB states near the limit of microbiological detection.

Design/Methods: We recruited adult/adolescent patients with trace Xpert Ultra diagnostic results at health facilities in Kampala, Uganda and KwaZulu-Natal, South Africa, who did not require hospitalization and had not yet initiated TB treatment.

Consenting participants underwent a comprehensive clinical, laboratory (including repeat sputum Xpert, two liquid and solid sputum cultures, C-reactive protein (CRP), HIV-related testing, urine LAM [Determine]), and radiographic (at least chest X-ray [CXR]) evaluation at baseline. Those not immediately treated for TB were clinically followed with reassessments at 1 and 3 months that included repeat Xpert and culture.

We estimated the proportion with positive culture and/or Xpert (>trace) microbiological results and proportion recommended for treatment. We evaluated risk factors using log-binomial and robust Poisson regression.

	N	Total recommended for TB treatment[1]	With positive microbiologic (sputum culture and/or repeat Xpert) status at enrollment			With negative microbiologic status at enrollment		
			Culture positive[2]	Xpert positive (non-trace)[3]	Culture or Xpert positive	Recommended at enrollment[4] based on clinical data	Recommended during follow-up, micro-negative	Recommended during follow-up, micro-positive
Overall	228	103 (45%)	35 (15%)	24 (11%)	44 (19%)	38 (17%)	11 (5%)	10 (4%)
Uganda	126	67(53%)	25 (20%)	16 (13%)	32 (25%)	28 (22%)	6 (5%)	1 (1%)
South Africa	102	36 (35%)	10 (10)%	8 (8%)	12 (12%)	10 (10%)	5 (5%)	9 (9%)
HIV positive	126	70 (56%)	23 (18%)	14 (11%)	27 (21%)	27 (21%)	9 (7%)	7 (6%)
History of TB within 5 years	55	15 (27%)	2 (4%)	0 (0%)	2 (4%)	7 (13%)	3 (6%)	3 (6%)
Household contact with TB within 6 months	14	3 (21%)	0 (0%)	1 (7%)	0 (0%)	3 (21%)	0 (0%)	0 (0%)

[1]Includes all recommendations that were based on data collected during the first 118 days of study follow-up. 19 participants had not yet been recommended for treatment but were missing data for the three-month follow-up visit at the time of analysis.
[2]Baseline culture was missing or uninterpretable for 11 participants.
[3]Baseline repeat Xpert was missing for 9 participants and presumed false-positive for 6 additional participants who were not recommended for treatment by 3 months and are not counted here.
[4]Based on data collected within 14 days of enrollment

Table. TB diagnoses and associated microbiological results and clinical risk factors among patients with initial trace Xpert Ultra results.

Results: Nearly half of sputum-trace-positive participants (103/228, 45%) were recommended for TB treatment, including 54 (24%) with microbiological confirmation (44 [19%] at baseline and 10 [4%] during follow-up; Table). TB treatment recommendation was more common among participants with HIV (RR=1.7 [95% CI 1.2-2.3]), elevated baseline CRP (RR=1.9 [1.4-2.5]), abnormal baseline CXR (RR=1.5 [1.1-2.1]), enrollment in Uganda (RR=1.4 [1.0-1.8]), or no recent TB treatment (RR=1.7 [1.1-2.6]).

After multivariable adjustment, HIV (aRR=1.6 [1.1-2.4]), elevated CRP (aRR=1.5 [1.1-2.2]), abnormal CXR (aRR=1.6 [1.0-2.3]), and Uganda enrollment (aRR=1.7 [1.2-2.3]) remained significantly associated with TB treatment recommendation.

When defining TB by baseline microbiological positivity rather than treatment recommendation, associations with HIV and country were weaker and no longer statistically significant.

Conclusions: Half of patients with initial trace Xpert Ultra results remained untreated for 3 months without further evidence of TB. Risk stratification or follow-up testing could avoid unnecessary treatment for some patients.

PP11-903-14 Tubo-ovarian masses and menstrual dysfunction in adolescent girls with pulmonary TB

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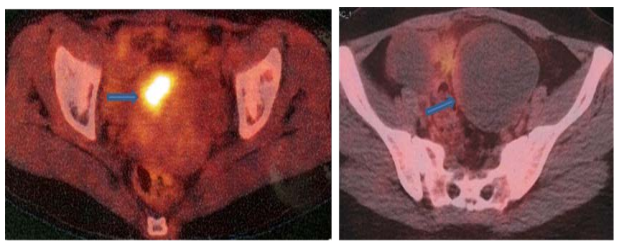
Background: The study aims to show the prevalence of genital involvement and tubo-ovarian masses in adolescent girls with Pulmonary tuberculosis (PTB).
Design/Methods: A prospective observational cohort study on 280 adolescent girls aged 10-18 years of age (mean 13.1 years) diagnosed with PTB who presented with menstrual dysfunction were evaluated by transabdominal ultrasound. PET CT, MRI and CA-125 Ag was performed only in indicated cases, where PET showed increased glucose uptake.
Results: Out of 280 PTB adolescent girls, 170(60.7%) were microbiologically confirmed with drug resistance in 54(19.3%) cases. 42 (15%) had ultrasonic abnormalities, 34 (80.95%) with tubo-ovarian masses [bilateral in 22 (52.38%), right sided 8(19%) and left sided in 4 (9.5%) cases]. Other abnormalities were hydrosalpinx in 12 (28.57%), bilateral in 7(16.6%) and unilateral in 5 (11.9%), thin endometrium in 34 (80.95%), endometrial fluid in 18(42.8%), endometrial calcification in 2 (4.7%), endometrial synechiae in 4 (9.5%), impaired endometrial vascularity in 12 (28.57%), ascites in 6 (14.2%) and peritoneal omental thickening in 4 (9.5%) cases. Menstrual blood was positive for PCR in 18 (42.8%), NAAT + in 3 cases but didn't show AFB on microscopy or culture in any case.
Figure 1 shows findings (A) F18 FDG-PET/CT study showing large cystic mass (arrow) with mildly increased FDG uptake (B) adnexal mass (arrow) with no FDG uptake. Subjects were treated with ATT as per DST results. On treatment completion, USG and PET/CT was normal in 38 patients (90.4%) but had persistent TO masses in 3 (7.14%) patients (without increase of FDG uptake) and uterine synechiae in 2 (4.7%) patients.



Conclusions: There is a high involvement of genital organs in pulmonary tuberculosis cases. Severe forms of disease, disseminated disease, TBM and drug resistance were associated with severer menstrual dysfunction. Timely diagnosis and treatment can prevent permanent damage to genital organs thus can prevent future infertility.

PP01-807-13 Scaling up the stool sample-based testing to diagnose childhood TB: Bangladesh experience

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Background and challenges to implementation: Bangladesh National TB Control Program (NTP) has a low case detection (4%) for the childhood TB cases. One of the biggest barriers to detect this case is the inability of the children to produce sputum. Stool based sample testing has been effectively proven as alternative of sputum sample for the children. NTP has taken the initiative to introduce the stool based testing using GeneXpert to improve the case detection. The objective of the study is to evaluate the performance of this approve and to document the lesson learnings.
Intervention or response: In late 2022, USAID's Infectious Disease Detection and Surveillance (IDDS) project supported NTP to train the staff of six reference laboratories on simple one-step (SOS) stool processing method using GeneXpert for Childhood TB case detection. Later NTP has provided the virtual training on stool sample processing to the staff of the existing GeneXpert sites up to sub districts level. NTP has started capturing the data on programmatic level from July 2023.
Results/Impact: As of now, 141 GeneXpert sites have been performing stool sample testing. In quarter three (Q3) and Q4 2023, a total of 3,551 presumptive Child TB patients were tested by GeneXpert for the stool sample. Out of it, 83 childhood TB cases detected. All of them were linked with the treatment.

	Presumptive Drug Resistance TB	Presumptive TB	Total
Total number of presumptive Childhood TB tested by GeneXpert	166	3385	3551
Total number of TB Positive	11	72	83
Total number of RR TB Detected	0	0	0

Conclusions: Introducing and decentralizing the stool sample testing has been a great success for the NTP Bangladesh. However, lack of sensitization at field level, limited number of stool sample referral to the GeneXpert sites, lack of funding to conduct in person training, inadequate logistic support has become the major challenges to improve the yield further. NTP is working to overcome those challenges and expand the stool sample testing to all sub district level (618 GeneXpert Sites) by phased manner.

PP01-800-13 Efficacy of TB symptom screening and added yield of chest X-ray and universal Xpert MTB/RIF in Uganda prisons

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Background: Uganda Prisons Service implements routine four-symptom TB screening for cough, fever, weight loss, and night sweats upon entry, during stay, medical visits, and exit. We assessed symptom screening efficacy, determined additional benefit of chest X-rays (CXR) and universal Xpert MTB/RIF Ultra testing in prisons.
Design/Methods: During July and August 2023, we conducted a nationally representative cross-sectional survey among people in prison and staff at 38 prisons in Uganda. Each participant had a four-symptom screen for TB (cough, night sweats, loss of appetite, and weight loss) as well as screening with a digital CXR. Participants were presumed to have TB if they had any of the four symptoms or a suggestive CXR. Each participant provided a spot sputum sample for Xpert MTB/RIF testing. Data analysis was conducted using STATA 17.
Results: Among 6,065 participants, 5,903 (97.3%) underwent a four-symptom screen, 2,380 (40.3%) had at least one symptom, and 46 (0.8%) were confirmed with TB after Xpert MTB/RIF testing (Figure 1).

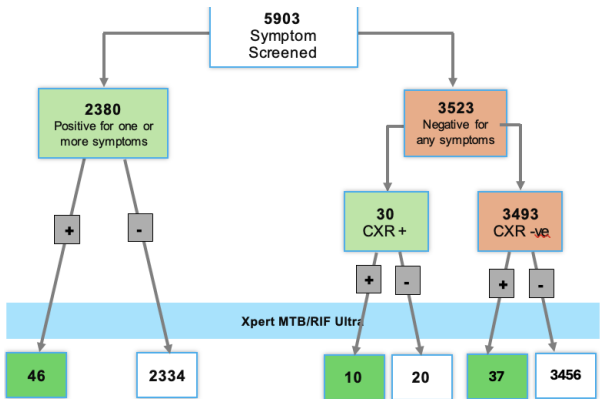

Figure 1. Study profile.

Of the 3,523 without TB symptoms, 30 (0.85%) had a suggestive CXR, and 10 (33.3%) were confirmed to have TB through Xpert MTB/RIF testing. Of the 3,493 whose CXR was not suggestive of TB, 37 (1.1%) were confirmed with TB. Introducing CXR screening among symptom-negative participants would increase TB case finding by 21.7%. Universal Xpert MTB/RIF testing would increase TB case finding by 102% (+47 cases)
Conclusions: GeneXpert testing for all, beyond symptoms screening, doubled TB case-finding in prisons. Uganda prisons could consider universal Xpert MTB/RIF testing during periodic mass TB screening exercises to minimize missed opportunities for TB case finding in this population.

PP01-803-13 Proportion of Xpert MTB/RIF Ultra "trace" result varies widely between different populations with presumptive TB: A systematic review

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Background: Xpert MTB/RIF Ultra has higher sensitivity but lower specificity than Xpert MTB/RIF for detection of *Mycobacterium tuberculosis* (MTB) compared to culture. Interpretation of low bacillary quantities ("trace") is challenging. We aimed to determine the proportion of Xpert Ultra positive results that are reported as "trace" in a range of study populations and how "trace" results are interpreted.
Design/Methods: We searched PubMed/MEDLINE, Embase, Scopus, and Web of Science (January 2017 and September 2023) that reported the number of Xpert Ultra "trace" and non-trace positive for MTB. Results are reported as range of proportions and narrative synthesis. The high heterogeneity among the included studies precluded computation of pooled proportions and meta-analysis.
Results: The review identified 62 studies conducted across 23 countries with a total of 124,749 participants. The proportion of Xpert Ultra positive results reported as "trace" varied widely (3.1% to 80%). "Trace" proportions were >30% in 26 (42%) studies. Culture, when done, was positive in 23.5% of "trace". Higher "trace" proportions were reported among children (67% studies reported over 30% "trace" versus 33% in adults), extrapulmonary samples (60% studies reported over 30% trace vs 27% for respiratory samples) and in high TB incidence settings (all 5 studies reporting >50% trace were in high incidence settings), while lower proportions in inpatients. Interpretation of "trace-culture negative/unknown" results is challenging especially in persons with prior TB and/or asymptomatic.

Our study recommends careful consideration that includes thorough medical history (prior TB outcome), clinical evaluation, additional tests (e.g. imaging, retesting), and monitoring clinical progression.

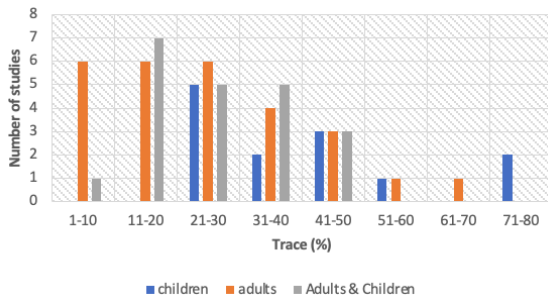

Figure. Trace proportion by age group (n=62).

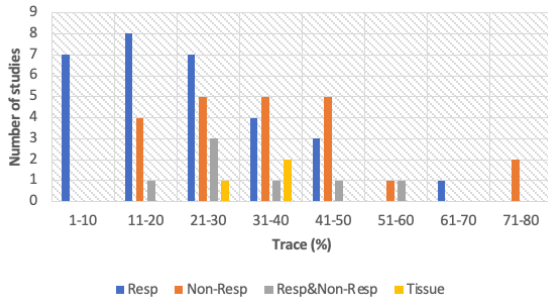

Figure. Trace proportion by sample type (n=62).

Conclusions: Inconsistencies and challenges persist in interpretation of "trace", particularly in persons with prior TB. Further research is required to understand implications of "trace" for bacteriological diagnosis of TB disease.

PP01-806-13 Seeking to combat TB in Ethiopia: A successful optimisation plan led to increased utilisation of GeneXpert testing and higher case notification rates

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Background and challenges to implementation: Despite existing GeneXpert machines, which accurately detect tuberculosis (TB) and drug resistance, many presumptive cases are diagnosed based on clinical judgment and inaccurate tests due to underutilization of GeneXpert tests since the COVID-19 pandemic. This calls for urgent action to optimize their use.

This interventional study aims to utilize the maximum capacity of GeneXpert machines and improve their access for increased case notification.

Intervention or response: Gaps from the demand and supply sides were identified and an optimization plan was implemented from October 2022 to September 2023. It involved networking 898 non-GeneXpert sites with 252 GeneXpert sites supported by a specimen referral and result delivery via a telegram channel. The intervention included clinician training, backup power supply, job aids, supply chain monitoring, and ongoing technical assistance. Data from the LabXpert connectivity solution was analyzed monthly, providing insights into the intervention's effectiveness.

Results/Impact: A 16.4% increase in GeneXpert utilization was noted, jumping from 64.8% (49,947 tests) to 81.6% (71,467 tests). This surge resulted in a statistically significant 47.7% increase in bacteriologically confirmed TB cases, from 4,538 to 6,700. Additionally, the detection of drug-resistant TB cases surged by 55.3%, from 161 to 250.

Conclusions: The intervention improved GeneXpert utilization, reduced unsuccessful test results, shortened turnaround time for result delivery and early treatment, and strengthened TB diagnostic service by integrating it into the existing system, demonstrating cost-effectiveness and scalability. The implemented intervention packages can be easily sustained as part of health system service delivery inputs which need to be considered during planning.

PP01-805-13 15,000 samples in less than seven days: Laboratory experiences and strategies during a National TB campaign in Kampala Metropolitan, Uganda

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Background and challenges to implementation: In 2021, Uganda had a low TB case notification of 127/100,000, hindering the country's ambitious target of eliminating TB by 2030. Uganda's National TB program, therefore, initiated a nationwide bi-annual CAST (Community awareness, screening, testing, prevention and Treatment to end TB/Leprosy) campaign. Despite the interest to increase case-notification, the CAST activity generated samples beyond the available molecular diagnostic capacity and required strategies to ensure sample processing while viable.

Intervention or response: Following lessons learnt in March-2022 (high sample loads, rejections, poor results dissemination), USAID LPHS-TB Activity re-strategized for September-2022 CAST campaign:
Before the campaign, stakeholder's engagement, capacity-building and orientation of VHTs on sample handling were conducted. GeneXpert machines were serviced/repaired and supplies distributed. Every facility identified committed personnel to oversee CAST activities and pooled staff to support GeneXpert sites.
During the campaign, samples and accompanying forms were double-checked before referral for molecular testing. The hub-system was streamlined and Hub-rider visits increased. Sample-tracking logs were used to acknowledge sample dispatch/results reception, ensuring no missing results. The GeneXpert sites operated for 24-hours, conducted daily inventory of samples received and processed, communicated critical results, dispatched results through SMS and participated in Daily CAST-update meetings.
After the campaign, data was reviewed and HMIS tools updated.
Results/Impact: The CAST campaign generated 15,723 samples across the capital Kampala (59%), Wakiso (22%) and Mukono (18%). The samples generated were tested at 35 GeneXpert and Truenat sites with 134 modules within less than 7 days while still viable. A total of 376 MTB and 12 Rifampicin Resistant cases were diagnosed. Only 1% of the samples were rejected due to poor labeling/transcription errors compared to 12% rejection in the previous campaign.
Conclusions: Optimization of the sample transport and diagnostic network, planning and stakeholder engagement maximizes use of molecular diagnostics to accommodate surge demands during mass TB campaigns in resource-limited settings.

PP01-801-13 Routine evaluation of stool-based testing to diagnose TB using the Truenat platform in comparison to Xpert (Ultra) on stool in Nigeria: Results and lessons learned

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Background and challenges to implementation: The potential to expand Truenat for testing stool may prove beneficial not just for children but also for their caregivers in remote areas. Leveraging on the success recorded by Institute of Human Virology, Nigeria (IHVN) in rolling out TrueNat testing platforms and Xpert-based stool testing in Nigeria, USAID/Infectious Diseases Detection and Surveillance project contracted IHVN to pilot the implementation of stool testing using Truenat in routine settings and measure the feasibility, acceptability, and cost-effectiveness of stool on Truenat in comparison with Xpert (Ultra).
This novel initiative aimed to identify the necessary processes for integrating stool-based testing via Truenat into TB diagnostic algorithms and generate the required evidence to scale it up globally.
Intervention or response: Thirty-five health facilities and 34 TB laboratories participated in a descriptive mixed-method study. Five hundred ten children with presumptive TB enrolled between February and March 2024. Two stool samples were collected from each participant and tested on Truenat and Xpert Ultra using a protocol established in other experiments.
Results/Impact: Of the 1020 stool samples collected, 510 were tested on Truenat, and the remaining 510 were tested on GeneXpert. Out of 510 participants, 482 had valid results on both platforms, with 454 MTB not detected on either platform, **8** MTB detected on both, **7** MTB detected on Truenat only, **13** MTB detected on GeneXpert only, and **28** MTB detected overall, with a high concordance rate of **96%**.
Conclusions: The findings of this pilot study confirm that the Truenat platform can successfully detect MTB in stool using the proper testing protocol. It sends a message of hope for childhood TB diagnosis in peripheral health facilities in hard-to-reach areas with limited access to infrastructure suitable for Truenat placement.

PP01-804-13 Impact of refresher training on stool GeneXpert technique and boost on childhood TB detection in Osun State, Nigeria: Implementation results and lesson learned

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Background and challenges to implementation: Children are mostly unable to produce quality sputum for timely and accurate diagnosis, this accounts for a significant portion of the global missing TB cases. Even though tuberculosis is treatable, curable, and preventable, it is nevertheless linked to a high rate of morbidity and mortality in children. The difficulties in collecting samples make diagnosing tuberculosis in this age group extremely challenging. To find the missing TB cases among this vulnerable population, creative techniques are desperately needed.
With funding support from USAID TB-LON 3, the Institute of Human Virology (IHVN) conducted refresher training in Osun State to address the knowledge gap due to the high staff attrition rate in December 2022.
This study will share the impact of refresher training on the TB yield from stool GeneXpert technique in Osun State from January to December 2023.
Intervention or response: Refresher trainings for the laboratory personnel and continuous sensitization for the healthcare workers on the utilization of stool for GeneXpert were conducted during this period. This paper is a one-year(January – December 2023) retrospective analysis of the stool samples collected from children less than 15 years old who were presumed to have TB and processed using the GeneXpert Ultra to detect MTB DNA and Rifampicin resistance.
Results/Impact: A total of **841** stool samples were tested with GeneXpert Ultra during the review period, **114** childhood TB cases were diagnosed, taking the TB case yield from **8%** in 2022 to **14%**.
Conclusions: Rather than missing this proportion of childhood TB cases to poor quality sputum samples or taking them through invasive procedures of sample collection, stool samples collected and tested using GeneXpert Ultra have proven to be an alternative and effective tool for identification of the missing TB cases in children. Training of laboratory personnel and sensitization of health care workers also played a critical role in the success recorded.

PP04 Community-led monitoring programming

PP04-835-13 Navigating towards a TB-free India: An interim assessment of Pradhan Mantri TB Mukt Bharat Abhiyaa - Unveiling barriers and enablers

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Background: Tuberculosis (TB) poses a significant health challenge globally, particularly in India. Undernutrition exacerbates India's TB burden, with 2.4 million cases, causing economic losses and deepening poverty. In response, the Government of India initiated the „Pradhan Mantri TB Mukt Bharat Abhiyaan (PMTBMBA)" that engages Ni-kshay Mitras (NM); a voluntary donor to support consented individuals with TB for better outcome.
The study aims to analyse coverage parameters, identify barriers and enablers, and explore TB patients' and NM perspectives on support mechanism established under this initiative.
Design/Methods: A mixed method cross-sectional study was conducted in two phases. The initial phase involved comprehensive analysis of secondary data, including assessing the uptake among NM and coverage of beneficiaries across the States. The second phase was executed with defined methodology involving a field survey using a multi-level selection process covering States (7), Districts (15), Blocks (30), NM (127), and individuals with TB (1122).
Results: Among 82,205 registered NMs; 39,015 (51%) provided support with an average of 6 months and cost of Rs. 625 per kit. Uttar Pradesh led with highest numbers in NM registration (27%), while Odisha (22%), Gujarat (20%) and others showed higher coverage in terms of NM support to eligible beneficiaries. Corporates covered higher numbers of beneficiaries
(1:54). The beneficiaries with NM had 5% higher successful TB treatment outcomes (95%), compared to those without one (90%). 76% of individuals with TB used nutritional kits for the entire family. The field survey revealed average waiting period of 25 days (Median) for individuals with TB to receive support. Beneficiaries with support exhibited improved adherence (91%) and reduced out of

pocket expenditure (82%), leading to enhanced quality of life. The qualitative analysis provided wider insights (figure -1).

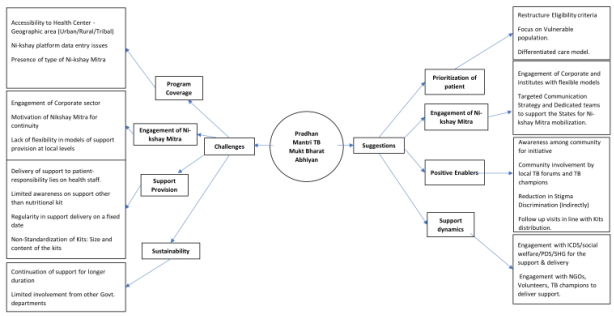

Figure. A systemic thinking approach analysis for PMTBMBA initiative.

Conclusions: Strengthening partnerships, digital tracking, collaboration, need assessments, and decentralized planning can further enhance the initiative's implementation, aiding India's TB elimination efforts.

PP04-834-13 Evaluating the role of lawyers in stigma and human rights violations in TB prevention and care programme: The Lagos experience, Nigeria

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Background and challenges to implementation: Stigma and Human Rights Violations (HRVs) are prevalent among people affected by Tuberculosis (TB) in Nigeria. Community, Rights and Gender (CRG) assessments conducted in Nigeria revealed that gender and human rights-related barriers include stigma and discrimination remains a major barrier to accessing TB services in Lagos and Nigeria.
These barriers contribute to the spread of TB and worsen its impact on individuals and communities.
The Stop TB Partnership and Civil Society Organizations e.g Debriche Health Development Centre(DHDC) and Lawyers Alert(LA) have recognized the need to address human rights abuses and stigma associated with TB in Nigeria. They advocate for legal remedies to protect the rights of people affected by TB.
We aimed to assess the use of ONEIMPACT Application to assess the role of Lawyers in stigma and HRVs in Lagos, Nigeria.

Intervention or response: ONEIMPACT-Nigeria App is a digital health platform developed by STOP TB Partnership and Dure Technologies to support community-led monitoring of TB response. From January-December, 2023, we deployed the use of ONEIMPACT-Nigeria app to 2 pilot Local Government Area(LGAs) across 20 LGAs. We reviewed the presumptive and central(case)registers, enrolled and registered people on TB treatment in participating facilities in the select LGAs into the App. Each registration was conducted by First responders(TB survivors)and followed up for further counseling and evaluation.
Results/Impact: Out of 954 case-reports from the ONEIMPACT-Nigeria Application from period under review, 11 case-reports were HRVs. Out of the HRVs case-reports, 4(36%) were addressed and resolved by Lawyers while 7(64%) were addressed but no resolutions due to people affected by TB declined to see the rights violations through.

Human Right Cases Profiling (January -December 2023)

Number of Cases Reported	Number of HRV Cases Reported	Number of Cases Resolved	Number of Cases Resolved by Lawyers
954	11	7	4

Conclusions: ONEIMPACT-Nigeria App has demonstrated the need and role of Lawyers (Pro -Bono) in addressing and resolving human rights -related violations in TB Prevention and Care Programme. Scaling up this intervention will have a significant impact in protecting the rights of people affected by TB

PP04-836-13 School-based contact tracing: Addressing TB in a community

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Background and challenges to implementation: Contact management and tracing are crucial in South Africa's battle against tuberculosis (TB). The National Tuberculosis Control Program (NTP) relies on these measures to control the spread of TB. South Africa's NTP has crafted guidelines aligned with international standards and WHO recommendations. These guidelines emphasise early identification and management of individuals exposed to or with confirmed TB, forming a vital part of TB control efforts. A 12-year-old visited a health facility showing TB symptoms and was diagnosed with Multi Drug Resistant Tuberculosis (MDR TB).
Intervention or response: The THINK, USAID-funded TB LON community outreach team conducted contact tracing within the households in the uThukela District.

Further, in collaboration with the Departments of Health and Social Development, the THINK team expanded contact tracing and launched a school-wide testing initiative.
Results/Impact: Seven household contacts were tested for TB, and none tested positive. The two < 5-year-old children were started on Tuberculosis Preventive Treatment (TPT). Four hundred eighty sputum samples were collected, 450 from learners and 30 from educators. Further, 50 digital chest X-rays were taken among school contacts. This effort resulted in four learners and one educator diagnosed with drug-susceptible TB and one learner diagnosed with MDR-TB with a 100% linkage rate.
Conclusions: The case of the 12-year-old with MDR TB underscores the significance of comprehensive contact tracing efforts that extend beyond households. These initiatives are pivotal in identifying and treating TB effectively. The success of this approach, as evidenced by the 100% linkage rate and early diagnosis, highlights the critical role played by contact management and tracing in curbing TB transmission and mitigating its impact on communities.

PP04-833-13 Why condition cash transfers? A multi-method pilot study evaluating the conditioning of cash transfers for TB treatment

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Background: Tuberculosis (TB) is driven by social determinants and causes catastrophic costs. A 2023 United Nations General Assembly resolution called for all people with TB to receive a social benefits package, by 2027. Cash transfers have been shown to improve health outcomes; however, operational evidence on their implementation and effectiveness in reducing catastrophic costs due to TB is limited.
Design/Methods: A longitudinal, non-randomized cohort study was conducted in Ho Chi Minh City, Vietnam. Half of the participants received unconditional cash transfers (UCTs), while the other half received conditional cash transfers (CCTs). We analyzed data to assess rates of participant enrollment, adherence and retention in the intervention, TB treatment success, and catastrophic cost incurrence. A time and motion study quantified the distribution of time pilot staff spent administering the cash transfer intervention by cohort.
Results: Delivering cash transfers was feasible, with 60/70 (85.7%) and 60/66 (90.9%) of eligible individuals in the CCT and UCT cohort agreeing to participate, respectively. Only 12.3% of CCT participants had one or more transfer withheld and 5.8% of the total expected CCTs were withheld. Delivering CCTs in the observation period took double the time as UCTs (32.4 hours for 43 CCT participants vs. 16.0 hours for 47 UCT participants). There were no significant differences in TB treatment success rates between the cohorts (91.7% CCT vs. 93.3% UCT). Cash transfers were associated with a proportional decrease in catastrophic cost incurrence of 12.9% in the CCT cohort (44.2% to 38.5%) and -26.9% in the UCT cohort (26.8% to 19.6%).
Conclusions: Cash transfers are a feasible way to mitigate the economic burden of TB in Vietnam. The conditionality assessed in the pilot was not associated with any quantifiable benefits to TB-affected people, and required more effort to implement. A larger trial utilizing similar methods and outcomes is warranted, with select design modifications.

PP04-829-13 OneImpact Community-led Monitoring: Using actionable data to break down barriers and provide better services for people with TB

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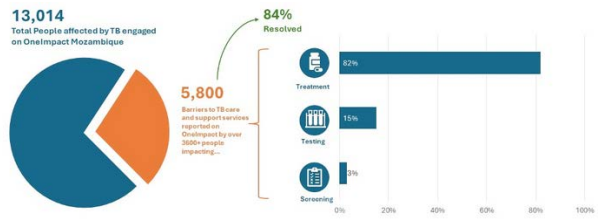
Background and challenges to implementation: Despite progress in TB detection and treatment outcomes, many challenges remain in Mozambique. Over 100,000 new TB cases occur annually, 12% among children. The DR-TB case detection rate is only 39% (2023). Persistent barriers prevent many PWTB from accessing services.
Intervention or response: Local NGO ADPP Mozambique – in collaboration with the NTP, with funding from the Stop TB Partnership, and with technical assistance from Dure Technologies – adopted the Community Led Monitoring (CLM) approach, including the OneImpact mobile phone-based digital tool to provide PWTB with a source of information on their right to quality care and a tool to report on the barriers to receiving that care.
The OneImpact dashboard then acts as an alert system, engaging community members, health workers, and the NTP to address reported barriers in a timely manner.
Results/Impact: In about two years (2022-2024), more than 13,000 PWTB reported more than 5,800 barriers through OneImpact, 84% of which were resolved. In Zambezia, where 35% of those barriers were reported, the

resolution rate was 97%, resulting from close collaboration between community members, healthcare providers, and NTP district supervisors. Among reported barriers, 82% were treatment-related, largely regarding TB medication stockouts, lack of nutritional support, and long distances to healthcare facilities offering TB services. TB diagnosis barriers accounted for 15%, primarily due to distant diagnosis facilities. 3% of barriers were screening-related, with many contacts not screened.

This data prompted action, such as adjusting medicine orders, providing mobile clinical services for TB contact screening, initiating and monitoring TPT, implementing community DOT, and enhancing person-centered care by health workers.



Conclusions: To eliminate TB by 2030, a people-centered, rights-based approach is essential to improve early TB diagnosis, treatment, and TPT initiation/completion. Deploying OneImpact CLM to identify and address barriers in real-time can drive service improvements, helping pave the way for TB elimination.

PP04-837-13 Measuring the knowledge attitude and practice of TB preventive treatment uptake among the high-risk groups in Indonesia: Cross-sectional study

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Background: Indonesia reported an extremely low TPT uptake, at 1.3% of household contact and 1.5% of high-risk people, far beyond the national target of 58% for household contact (source MoH 2023).

This study aimed to assess the knowledge, attitude, and practice (KAP) regarding the TPT uptake among the household contacts of TB patients, people living with HIV (PLHIV), immunocompromised patients, and healthcare workers. The study applied the Health Belief Model and the Theory of Planned Behavior, essential to gain insights from individuals and their decision-making process regarding TPT uptake.

Design/Methods: A cross-sectional study with a quantitative approach was conducted in four provinces: DKI Jakarta, Jawa Barat, and Jawa Timur (17 districts, 85 subdistricts). Those sites were selected randomly from those provinces as study sites. The study included 125 respondents from each district, totaling 2125 respondents.

The study used descriptive analysis, which included frequency, proportion, and cross-tabulation. The univariate analysis was used to analyze the association between the sample's characteristics and KAP factors. Furthermore, multiple regression was applied to investigate factors influencing KAP on TPT.

Results: The healthcare worker and high-risk groups demonstrated satisfactory knowledge scores of 66% and 49 % (respectively). The study also reported that 54% of individuals eligible and 79% of health care workers demonstrated a positive attitude towards TPT. In contrast, the Study showed that only 20% of the high-risk groups had a high intention to plan to start TPT within one month, and 38% of health workers had high intention to plan to deliver TPT services.

Conclusions: The study provided valuable insights that influenced the decision of the targeted population to take TPT. The study also served as a baseline for USAID PREVENT TB to set the behavioral targets for the project within four years of implementation and feed into the development of strategic health communication on TPT uptake.

PP04-832-13 Improving community outreach through contextually-relevant art-based health promotion in rural Sindh, Pakistan

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Background and challenges to implementation: Studies on community-based participatory research emphasize the importance of contextually-relevant health promotion to reduce health inequities (LeBrón et al., 2014). We implemented a decentralized, integrated TB, Hepatitis-C and mental health service delivery program in rural Sindh. This was assisted through a Community Actions Groups (CAGs) model for community engagement and health promotion. We piloted contextually-relevant art-based techniques (story-telling) versus conventional health promotion techniques (verbal information dissemination).

Intervention or response: Between December 2023-January 2024, our CAGs (grassroot members representing affected communities and people with lived experiences of TB) conducted 57 conventional health promotion sessions on TB, Hepatitis-C and common mental health conditions (anxiety and depression), including symptom identification, preventive care, and stigma-reduction.

A localized story-telling approach was piloted in 17 additional health promotion sessions, where they utilized adaptive stories reflecting lived experiences of community members. Alongside increasing engagement, these sessions encouraged experience-sharing, and sensitized community members on the importance of early detection and destigmatization for improved health outcomes. We measured the outreach of both techniques through participant engagement forms.

Results/Impact:

We engaged a total of 713 participants in our health promotion sessions, of which 385 (54%) engaged in story-telling sessions (Table 1). On average, there was higher participation in story-telling sessions compared to conventional sessions (22.7 vs. 5.8 participants per session respectively), indicating a 3.9 times increase in participation.

Gender-disaggregated outreach data revealed that 68.9% women and 31.1% men were engaged in the art-based sessions (participation ratio=16:7), while 90.6% women and 9.4% men were engaged in conventional sessions (participation ratio=5:0.5).

Although there was more women participation compared to men, participation in storytelling sessions may demonstrate a more gender-representative outreach.

Outreach through health promotion	Conventional health promotion sessions n = 57		Story-telling health promotion sessions n = 17	
	n	%	n	%
Total individuals engaged	328	46	385	54
Total number of women engaged	297	90.5	265	68.9
Total number of men engaged	31	9.5	120	31.1

Distribution of outreach in conventional health promotion sessions vs. story-telling health promotion sessions

Table 1.

Conclusions: The use of art-based health promotion techniques can improve community outreach. Health service delivery programs should consider incorporating art-based context-specific health promotion techniques for meaningful community engagement.

PP04-838-13 Mapping private sale of TB medicines as an avenue to closing the notification gap: A case study involving private pharmacies in Punjab province, Pakistan

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Background and challenges to implementation: In Pakistan, almost one third of people who develop TB are missed by the National TB Program (NTP). Most people in Pakistan initially seek healthcare in the private sector. The equivalent of 164,000 complete TB treatment courses were sold in the private sector in 2018, (about 74% of people with TB who were missed). We document the outcomes of an intervention to identify people with TB through private pharmacies engagement in Punjab Province.

Intervention or response: We implemented a comprehensive intervention comprising of:

1. Policy change requiring mandatory notification of TB medication sales,
2. Identifying and engaging pharmacies selling anti-TB drugs,
3. Reporting through a novel 'eTB' mobile application, and;
4. Providing support to pharmacies and individuals with TB via a call center.

We collected both historical and prospective TB notification data from intervention and control districts. The primary outcome was the change in TB notifications during the intervention period compared to historical and control notifications.

Results/Impact: During the 12-month intervention period, 15,669 people with TB were notified from 2,943 engaged pharmacies in four districts. Of people notified, 88% were male (n=13,673), 95% had pulmonary disease (n=14,969), and 4,256 (27%) were bacteriologically confirmed. Chain pharmacies (n=14) contributed to 39% of the yield. TB notifications increased by 17,462 (+34%) over the baseline period compared to an 8% increase in the control districts. Bacteriologically confirmed notifications increased 32% compared to 16% in the control districts. The proportion of bacteriological confirmation was similar before and during the intervention.

		Total notifications (n)		Trend difference (n)	% change
		Baseline period April 2019-March 2020	Intervention period April 2021-March 2022		
All forms TB					
Study area	Evaluation districts	50,721	68,183	17,462	34%
	Control districts	22,935	24,780	1,845	8%
Bacteriologically confirmed cases					
Study area	Evaluation districts (% of All forms TB)	18,890 (37%)	2,932 (37%)	6,042	32%
	Control districts (% of All forms TB	9,886 (43%)	11,423 (45%)	1,537	16%

Table. Private pharmacy intervention: A comparison of TB notification data and trends between evaluation and control districts.

Conclusions: The results of the largest TB intervention with pharmacies globally showed incredible potential to link people with TB who are receiving care in the private sector. Mapping TB medicine sales in the private sector with tailored interventions can contribute to closing the gap in notifications where anti-TB drug sales in the private sector are pervasive.

PP04-830-13 TB Mukt Vahini: Impact of TB survivors-led network in India

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Background and challenges to implementation: The survivor-led network plays a crucial role in both sustaining the elimination efforts and providing essential support to those impacted, making a sense of solidarity and empowerment within the community. TB Mukt Vahini (TMV) is a survivor-led network formed in 2017 for the state of Bihar by TB survivors to provide person centered care and support to People with TB (PwTB). Their vision is to provide access to health facility on time without any hurdles to make a 'TB free society'.

Intervention or response: The State TB cell, Bihar in collaboration with REACH did capacity building of TB survivors in December 2017. After which Tb survivors came together to form an independent network known as TB Mukt Vahini, in which 13 TB Champions reached out to 7 districts to identify other TB survivors in support from regional NTEP staff and ASHA workers.

Results/Impact: TB Mukt Vahini got recognition and became the first network of TB survivors to get registered under Societies Registration Act and working autonomously for spreading TB awareness and strengthening TB elimination program in India. TMV started field implementation from January 2018 onwards and after 6 years of functioning (as of December 2023), there are 659 TB Champions associated with TMV in 35 out of 38 districts of Bihar. Their objectives are to empower TB survivors, advocate for effective health services, improve quality of life of People with TB (PwTB), addressing their challenges and advocating evidence-based policy changes.

S. No.	List of activities conducted by TB Mukt Vahini	Frequency
1.	PwTB counselled	44882
2.	Presumptive PwTB referred	7319
3.	PwTB diagnosed	2336
4.	Lost to follow up cases relinked	541
5.	Community awareness activities conducted (Including school, community, frontier worker awareness, prison intervention, sensitization during the ACF campaign)	10550

Conclusions: Through advocacy and support, TMV strengthens survivors, enhances healthcare services, and spreads community awareness. TB Mukt Vahini (TMV) demonstrates the transformative potential of survivor-led networks in TB and other disease Elimination programs. Their impact, from registration to extensive outreach, highlights their pivotal role in advancing TB prevention in India.

PP04-831-13 Improving TB treatment outcomes through food enablers and livelihood to reduce catastrophic costs

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Background: TB clients in West Nile region are faced with challenges in finishing treatment despite good dot due to side effects of the drugs, lack of enablers and the associated costs while on treatment especially when the client is a bread winner. At baseline the CDR 47%, Cure rate 75%, and TSR 80% was due to poor adherence to TB treatment mainly due to lack of food and poor livelihood. Therefore the project aimed at improving adherence through provision of food enablers and reducing catastrophic costs through livelihood support.
Design/Methods: Selection of beneficiaries targeting TB clients who earn less than a dollar a day, elderly, co-infected, Children, Pregnant mothers, disabled, clients wasted. Selected beneficiaries were trained in poultry keeping, crop production and animal husbandry. Home assessment and distribution.
Results: 35 TB clients received each 25 1 month old kroiler totaling to 875 and 2450 kg of chicken feeds. 81 pairs of goats were given to 43 TB clients, Maize, onions, cabbages, groundnuts of 5kgs were given to 12 TB clients, and 12 received seedlings. 3,735 enablers received (beans of 5kgs, posho of 50kgs, cooking oil of 5ltrs, sugar 3kgs). Trained 23 families affected by TB in tailoring (15) building and concrete practice (8).
The CDR increased from 47% to 95%, Cure rate 75% to 92% and TRS 80% to 93%, Nutrition amongst the TB clients improved, and have the ability to meet their demands and settle bills for medication and school fees. Social economic welfare improved and catastrophic costs reduced.
Conclusions: Food enablers to TB clients can improve their adherence to treatment as livelihood support reduces catastrophic costs and sustainability. There is need for more support to scale up the support both within the region and other parts of the country.

PP05 Dynamic to penetrate TB barriers

PP05-839-13 Establishing the KwaZulu Natal Province TB Caucus: A collaborative endeavor between an NGO and the KZN Provincial Council on AIDS

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Background and challenges to implementation: Tuberculosis (TB) is a significant health concern in KwaZulu-Natal (KZN), South Africa, characterised by a high prevalence rate and a burden of drug-resistant TB (WHO Global Tuberculosis Report 2022). KZN consistently reports one of the nation's highest TB incidence rates, surpassing 800 cases per 100,000 population.
Despite this TB burden, KZN had yet to establish the TB caucus, an essential step to mobilise resources, empower communities, and align with global efforts to eliminate TB by 2030.
Intervention or response: THINK, a USAID-funded partner played a pivotal role by seconding a TB Coordinator to the premier's office, kickstarting a comprehensive process that was followed by the development of a work plan, extensive deliberations, and consultations, notably with the South African National Council on AIDS (SANAC), KZN Civil Society, and the KZN Provincial Council on AIDS (PCA).
The process extended to engaging with the KZN Speaker of the legislature, members of the health portfolio committee, and multisectoral forums. These interactions fostered collaborative efforts, ensuring a holistic approach to addressing TB challenges.
Results/Impact: Established a TB Caucus coordinating committee and conducted three stakeholder engagement consultations in uGu, iLembe, and King Cetshwayo districts, marking significant progress towards a multisectoral approach. These efforts culminated in the successful launch of the TB Caucus on September 1, 2023, which included signing the pledge, which the speaker of the House led. The launch highlighted its importance in outlining priorities and fostering a shared vision for improved TB outcomes.
Conclusions: The KZN TB Caucus, formed through a strong NGO-PCA partnership with support from the KZN Office of the Premier, serves as a model for addressing TB and promoting ongoing multisectoral action and advocacy, which is crucial for reaching the goal of TB elimination by 2030.

PP05-846-13 Strengthening leadership and governance: A pathway to quality and sustainable health interventions in TB - A case study of Kiambu County in Kenya (2022-2024)

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Background: Leadership and governance are concepts that work together to drive organizational effectiveness, accountability, and integrity. A shortfall in governance and leadership capacity among Kenya Civil Society Organizations (CSOs) manifests in various ways: inadequate transparency, weak accountability mechanisms, limited stakeholder engagement, and a lack of strategic direction. These issues hinder the effectiveness and sustainability of CSOs in achieving their mandates.
Design/Methods: AMREF Health Africa in Kenya recognized the importance of addressing these gaps through capacity building. With support from the Global Fund, AMREF developed organizational development and system strengthening initiatives (ODSS) and worked with CSOs to bridge the gap.
Results: AMREF has trained and offered continuous mentorship to 782 organizations across 24 Counties in Kenya. In Kiambu County, AMREF trained 28 CSOs, and 71% of them received mentorship. The findings indicated that 57% have fully met the set requirements of leadership and governance and have ratified and standardized regulations as outlined in the Community Groups Registration Act of 2022 (Kenya) . 43% of the CSOs are in the process of developing long-term strategic plans. 64% of the CSOs have integrated TB-related activities into their mainstream programming. Subsequently, 7% of organizations have attracted donor funding to the tune of USD 267,800.
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Conclusions: CSOs with strong leadership and governance structures are better positioned to advocate for policies and interventions that prioritize TB prevention and control. CSOs with robust governance structure can effectively advocate for increased government support and collaboration in implementing TB interventions.
Additionally, county government-CSO collaborations enable the CSOs to access government-owned capital-intensive infrastructure. Finally, developing supportive policies that strengthen TB prevention, diagnosis, and treatment services aligns the CSOs to their missions and mandates in offering TB interventions along the continuum of care.

PP05-845-13 Leveraging the potential of multi-sectoral collaboration towards ending TB in Himachal Pradesh, India

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Background and challenges to implementation: Lack of awareness, stigma, limited access to TB services and lack of social protection are few of major challenges for TB elimination in India. Multi-sectoral engagement (MSE) is one of the strategy in India's National Strategic Plan to meet targets of Ending TB in India by 2025[1]. We aim to leverage the potential of MSE at different level to end TB in Himachal Pradesh State in India.
Intervention or response: Following a landscape analysis, a framework for MSE was developed in 2022 by Health Department with support from the Union. First meeting of Head of Department from 23 government departments and organizations having their potential role in TB elimination was held in March 2022 under the chairmanship of Hon'ble Governor and Joint Action Plan was developed. All stakeholders supported in active TB case finding campaign, awareness generation activities and nutritional support to PwTB.
Results/Impact: Intensive awareness activities were conducted by all stakeholders. Postal department transported >60000 samples. 12 new TB Diagnostic centres

were established in Ayurveda Department where 188 new PwTB were diagnosed in 2023. Total 201047 persons were screened for symptoms of TB through 522 screening camps in collaboration with different stakeholders, 18131 (9%) individuals were found presumptive; and yield of 206 (1.1 %) new PwTB was obtained.
The presumptive TB examination rate of state improved to 4312/100,000 which is better than national average of 1281/100000. Total 6332 patients were provided supplement nutrition. Total 723 gram panchayats (20%) in the State were declared TB-free on pre-defined criteria with the collaborative efforts of Panchayati Raj Department.

Pictures. Glimpses of activities conducted under MSE in Himachal Pradesh, India.

Conclusions: This intervention highlights the significance of multisectoral collaboration in TB elimination. Inter-sectoral coordination resulted mainstreaming of TB with key departments, however more concerted and collective efforts are needed to effectively engage all sectors of society to meet India's ambitious target of TB elimination by 2025.

PP05-844-13 Catalysing self-help groups (SHG) and Mahila Mandals (women groups) to support a community-level fight against TB in Himachal Pradesh, India

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Background and challenges to implementation: In India, SHGs and Mahila Mandals are seen as one of the most significant tools for adopting participatory approach that empowers women, and have been identified for strengthening community health systems. Health department in Himachal Pradesh State sensitized and catalyzed SHGs and Mahila Mandals to reduce TB related stigma in community, awareness generation and increase in women's participation in fight against TB.

Intervention or response: Between April 2023 and March 2024, total 1208 SHGs and 684 Mahila Mandals were sensitized on TB related issues, identifying and referring presumptive TB cases for testing. SHGs and Mahila Mandals were mobilized to disseminate information to communities on respiratory hygiene and cough etiquette, provided counselling support to PwTB and their families, enabled their access to TB care and nutrition.
Both groups were also deployed in stigma reduction through community meetings and myth busting sessions and building an inclusive environment for TB patients and their families.
Results/Impact: SHGs and Mahila Mandals have reached approximately 90,000 people in the community through one to one contact by home visit, group meetings, awareness generation rallies, gram panchayat meetings and TB forum meetings for raising awareness about TB disease. Total 14318 people were screened for TB by active case finding campaign in 2023; 674 people (4.7%) found to have any TB symptom tested for TB, out of which 12 new PwTB were diagnosed (1.7%). 100 TB patients were provided food baskets by SHGs as a Ni-kshay Mitra. SHGs and Mahila Mandals further built a network of community engaging 540 ASHAs and felicitated 46 TB champions (TB survivors/advocates).

Pictures. Glimpses of activities for TB free initiatives done by SHGs and Mahila Mandals in Himachal Pradesh, India.

Conclusions: Integrating SHGs and Mahila Mandals into National TB Elimination Program proved to be an effective strategy for moving towards TB elimination as it enabled women's empowerment, mitigated stigma, built community wide TB awareness and improved accessibility to TB prevention, treatment and care services.

PP05-843-13 Extending quality TB service delivery to underserved populations: Lessons from engaging civil society organisations in central Uganda

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Background and challenges to implementation: In Uganda, both TB treatment coverage and treatment success for drug susceptible TB were above 90% in 2023. However, for selected vulnerable populations in urban central districts (Kampala, Wakiso and Mukono), treatment coverage was below the national average.

We present lessons from engaging community-service organizations (CSOs) in improving TB service delivery at health facilities serving vulnerable populations.

Intervention or response: We identified six health facilities that served vulnerable population including: fishing communities, persons living in densely populated slums and work spaces, persons with mental disorders and those traversing long distances to access TB services.

We identified CSOs through a competitive process, attached them to health facilities in these communities, oriented their staff and provided financial support from July 2023 onwards. They supported extended contact investigation for index TB patients, door to door TB screening and screening at hotspots and identified contacts for TB preventive therapy. They also scaled up the use of patient locator forms, follow up of treatment interrupters, patient education and community drug delivery.

Results/Impact: Comparing the performance 6 months, pre (January–June 2023) and post (July – December 2023) CSO engagement, we noticed an improvement in TB case finding and delivery of TB preventive therapy. The number of patients diagnosed with TB increased from 283 to 407. The proportion of TB patients identified from the community increased from 6.7% (19/283) to 30.5% (124/407).

The proportion of contacts <5 years started on TB preventive therapy increased from 40% (42/105) to 91% (323/353) while that of contacts >5 years increased from 37% (294/794) to 92.7% (997/1075).

Treatment success for patients started on TB treatment improved from 85.5% (300/351) to 88.7% (308/347).

Conclusions: Engaging and building the capacity of CSOs in TB service delivery greatly helps to extend TB service delivery closer to vulnerable populations.

PP05-842-13 Improving advocacy and political participation for TB in Eswatini

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Background and challenges to implementation: The Eswatini Coalition on TB, an organization representing TB survivors, recognized the critical need for advocacy and political participation in the fight against tuberculosis. Under the guidance of The Global TB Caucus and in collaboration with the National TB Control Programme, the organization Established and launched the Eswatini Parliamentary TB Caucus. This initiative aimed to engage parliamentarians in championing TB-related policies and human rights.

Intervention or response: The organization established a platform within the Eswatini Parliament to address TB-related issues. This caucus brought together lawmakers, experts, and advocates to drive policy changes and promote TB awareness.

Members of the parliamentary caucus received comprehensive education on TB, emphasizing the intersection of health and human rights. The training "The Rights to Breathe" highlighted the importance of equitable access to TB care and the right to a healthy life. Parliamentarians were informed about the UN High-Level Meeting targets and commitments related to TB. This knowledge empowered them to advocate for effective policies and resource allocation.

The caucus members were sensitized about the 2021 Political Declaration on AIDS, recognizing the interconnectedness of TB and HIV/AIDS. This informed their advocacy efforts and reinforced the urgency of addressing both epidemics.

Results/Impact: The Eswatini Parliamentary TB Caucus raised awareness among lawmakers, leading to informed discussions and policy recommendations. Strengthened Advocacy as Parliamentarians actively advocated for TB-related legislation, funding, and research. Collaboration between the National TB Control Programme, civil society, and policymakers enhanced TB control efforts.

Conclusions: The Eswatini Parliamentary TB Caucus serves as a model for promoting advocacy and political engagement in TB control. By empowering parliamentarians with knowledge and fostering collaboration, we can accelerate progress toward a TB-free Eswatini and a healthier global community.

PP05-841-13 Driving change: Community engagement for improved TB testing - Nagpur rural district's advocacy, communication, and social mobilisation efforts

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Background and challenges to implementation: In combating tuberculosis (TB), early detection of TB and addressing the social stigma surrounding the disease is crucial for effective ACSM activities. Late diagnosis, social stigma, and low presumptive examination rates remain challenges. Innovative approaches are essential to overcome this stigma and increase awareness, ultimately leading to an increased presumptive examination rate and early TB diagnosis.
By comprehensively evaluating the impact of ACSM initiatives and addressing the challenges encountered, this study aims to provide valuable insights into enhancing TB elimination efforts in Nagpur Rural District
Intervention or response: The strategic initiatives in Nagpur Rural District, including a mobile X-ray van along with sputum testing to the doorsteps of Citizens, the „Dawakhana aplya dari" i.e "Hospital at your doorstep" local policy where in testing for TB diagnosis along with other general laboratory investigations were conducted , and a record-setting non-stop singing marathon for 175 hours, highlight the diverse and innovative approaches needed to address TB comprehensively. These initiatives were undertaken in collaboration with general health services and key stakeholders.
Results/Impact:
1. The X-ray outsourcing approach reveals a total of 4698 X-rays done, resulting in 486 diagnosed TB cases and 202 abnormal X-rays. This suggests a relatively high yield in diagnosing TB cases through this approach.
2. The Dawakhana aplya dari strategy, with 2113 X-rays conducted, resulted in 51 diagnosed TB cases and 56 abnormal X-rays.
3. These activities have contributed to 15% of the total Presumptive examination and 19.35% to the total TB notification in the year 2023.
Conclusions: The study underscores the importance of innovative ACSM activities in raising awareness, overcoming stigma, promoting behavioral change, and engaging the community to effectively combat TB.
Additionally, it emphasizes the need for continuous evaluation and adaptation of strategies to ensure the early detection and comprehensive control of TB in Nagpur Rural District and similar regions.

PP05-840-13 Assessing the impact of community-driven nutritional support campaign on treatment outcome of persons with TB in Haryana, India

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Background and challenges to implementation: Hon'ble President of India launched Pradhan Mantri TB Mukt Bharat Abhiyaan (PMTBMBA) in September 2022. Under this programme, "Nikshay-Mitra" who are individuals, NGOs, Co-operative societies, Faith-based organizations, Cooperates, and Political parties provide nutritional support to persons with TB (PwTB). This nutritional support is given in form of a nutritional kit that contains high protein food items to aid in recovery of the PwTB. This study assesses the impact of nutritional support provided under PMTBMBA on the treatment outcomes of PwTB.
Intervention or response: India's digital TB surveillance system, Ni-kshay was used to extract the relevant records from January 2023-June 2023 to identify whether the PwTB was linked to Nikshay Mitra and if nutritional support was provided by them. Treatment outcomes for all the PwTB notified between the same period were recorded. R version 4.2.3 was used to perform a binomial logistic regression to assess the independent effect of nutritional support under PMTBMBA on the treatment outcomes of PwTB.
Results/Impact: Out of 35591 PwTB who were notified between January 2023-June 2023, 6326 (17%) received nutritional support from Nikshay Mitras. Upon regression, it was found that the odds of treatment outcomes being unfavourable reduced by 34% in PwTB who were beneficiaries under the PMTBMBA (OR: 0.66, 95% CI 0.60-0.73). It was also found that with every increase in weight of the PwTB by 1 Kg, the odds of ending up with an unfavourable treatment outcome reduced by 3% (OR: 0.97, 95% CI 0.97-0.98).
Conclusions: PMTBMBA has shown a reduction in unfavourable treatment outcomes among PwTB. Such community driven campaigns should be prioritized and implemented well by the policymakers for a sustainable effort towards ending TB globally.

PP08 Finding the missing people with TB

PP08-870-13 Active case finding efforts among homeless population in Delhi: A paragon partnership engaging Mobile Medical Vans

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Background and challenges to implementation: The urban agglomeration of Delhi faces several challenges in healthcare delivery due to high burden of slum and homeless population surrounded by poor living conditions and social marginalization. Active tuberculosis (TB) case finding initiative using mobile medical vans is a promising strategy to address these health disparities and provide comprehensive healthcare to the vulnerable groups. The study aims to explore the impact of this initiative on tuberculosis (TB) program outcomes and continuum of care among homeless population of Delhi.
Intervention or response: In 2021, a novel corporate partnership was established between Government of Delhi and Medanta Foundation. A mobile medical van equipped with diagnostic paraphernalia was deployed with four field level coordinators to undertake active TB case finding among the mapped vulnerable population. Field teams engaged with homeless individuals in public shelters, slums, and makeshift settlements. Active case finding was carried out in January, June and December months, each year starting from 2021 till 2023, for two weeks duration. TB program outcomes and continuum of care parameters assessed were increase in coverage, diagnostic yield, treatment initiation and follow-up.
Results/Impact: There was a 60% increase in individuals from target population screened for TB through this initiative in 2023 (2031) as compared to 2021 (1265). Data revealed an increasing trend in diagnostic yield for TB from 24% in 2021, to 56% in 2022 and 67% in 2023 which turned significant on two proportion z test (z-score: -9.52, p value: <0.01). Significant increasing trend in treatment initiation among diagnosed persons with TB was observed in 2023. (z-score: -6.22, p value: <0.01)
Conclusions: This partnership engaging mobile medical vans for active case finding has demonstrated significant impact in TB program outcomes and continuum of care for the homeless population of Delhi, thus signifying a strong need to expand its coverage in similar urban settings.

PP08-869-13 Yield from implementing targeted universal testing for TB among household contacts of individuals with TB disease using TB support officers in South Africa

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Background and challenges to implementation: Tuberculosis is the leading infectious disease that caused 54,000 deaths in South Africa, in 2022. The gap between the estimated number of people who fell ill with TB (280,000) and the reported number of new and relapse people diagnosed with TB (214,295) remains high. TB response has been largely focused at facility level and sub-optimally at community level. As per findings of a cluster-randomized trial conducted in 2023, the implementation of TUTT among households and close contacts of individuals with TB was prioritized.
Intervention or response: A total of 358 TB Support Officers (TSOs) were appointed in 10 Global Fund-supported districts of South Africa to trace, screen and collect sputum from household contacts irrespective of showing symptoms of TB or not. The TSOs get lists of people diagnosed with TB from clinics and trace them in households to screen their close contacts using standardised screening tools. Data captured electronically from July–December 2023 was analysed following the TB cascade approach.
Results/Impact: Table 1 shows a total of 7,039 people with active TB were identified, 18,314 people in close contact with people with active TB were identified and 17,225 were screened for TB (94%). In line with the TUTT, 14,282 sputum samples were collected (82%) and all were tested. 827 were TB positive (6%) and 789 started on TB treatment (95%). TB screening yield was (5%), and number needed to screen (NNS) and number needed to test (NNT) to find one TB positive was 21 and 17 respectively.

People with active TB identified	People in close contact with people with active TB	People in close contact with people with active TB screened for TB	TB screening rate	Sputum collected	Sputum collection rate	Sputum tested	Sputum testing rate	Tested TB positive	TB positivity rate	Started on TB treatment	Treatment initiation rate	TB screening yield	NNS	NNT
7,039	18,314	17,225	94%	14,282	82%	14,282	100%	827	6%	789	95%	5%	21	17

PP08-869-13 Table 1: Programmatic results.

Conclusions: Our analysis shows that the implementation of TUTT among households and close contacts of individuals with TB disease has a high screening yield and TB positivity rate with the benefits of early identification of people with TB at the community level. The median NNS and NNT are lower as compared to other studies.

PP08-868-13 Is drug-resistant TB transmitted as drug-resistant TB? Insights from a drug-resistant TB contact investigation initiative in Vietnam

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Background and challenges to implementation: The Ministry of Health guidelines for drug-resistant TB (DR-TB) contact screening in Vietnam endorse a direct-to-Xpert testing approach irrespective of TB symptoms or radiographic presentation.
Contacts with rifampicin-resistant TB are indicated for genotypic drug susceptibility testing (DST).
Intervention or response: Between November 2021 to December 2023, contact investigations were conducted in three provinces of Vietnam: Hanoi, Ho Chi Minh City and Can Tho. Xpert MTB/RIF Ultra testing of DR-TB contacts, followed by molecular DST using the Xpert MTB/XDR assay or Hain Line Probe Assays was implemented. We exported and analyzed the contact investigation yield data by the resistance profile of the index patient.
Results/Impact: A total of 72 DR-TB contacts were diagnosed with TB. Eight were contacts of an index patient with mono- or poly-resistant TB (Mono/Poly TB), 62 were contacts of someone with rifampicin- or multidrug-resistant TB (RR/MDR-TB), and just two were contacts of someone with pre- or extensively drug-resistant TB (pre/XDR-TB). 37 (51.4%) DR-TB contacts had a form of TB with a less serious resistance profile than their index patient (e.g. drug-sensitive TB [DS-TB] when the index had Mono/Poly TB, DS-TB or Mono/Poly TB when the index had RR/MDR-TB, or DS-TB or RR/MDR-TB when the index had Pre/XDR-TB).
Conversely, 5 (6.9%) DR-TB contacts had a form of TB with a more serious resistance profile than their index patient (e.g. RR/MDR-TB when the index had Mono/Poly TB or Pre/XDR-TB when the index had RR/MDR-TB).

		Index patient resistance profile			Total
		Mono/Poly TB	RR/MDR-TB	Pre/XDR-TB	
DR-TB contacts diagnosed with TB		8	62	2	72
Contact drug-resistance profile	DS-TB	5 (62.5%)	28 (45.2%)	1 (50.0%)	34
	Mono/Poly TB	0	2 (3.2%)	0	2
	RR/MDR-TB	3 (37.5%)	30 (48.4%)	1 (50.0%)	34
	Pre/XDR-TB	0	2 (3.2%)	0	2

Conclusions: More than half of DR-TB contacts are diagnosed with TB that has a discordant resistance profile to their index patient, with the majority requiring less toxic and shorter regimens than would be expected. The direct-to-Xpert followed by genotypic DST algorithm should be scaled up to rapidly and accurately detect TB in this key population.

PP08-867-13 Smartphone-based cough frequency monitoring among people screened for TB in an urban African community setting

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Background: Cough is a common symptom of tuberculosis (TB) infection but is often subject to self-report bias. Quantitative measurement of cough frequency could provide additional objective data during TB assessment.
Design/Methods: We conducted community-based TB screening using Xpert® MTB/RIF Ultra in and around Kampala, Uganda, enrolling all individuals with positive (including trace) results and randomly selected individuals with negative results for further characterization including cough frequency measurement. Participants were provided a smartphone, equipped with a cough recording application (Hyfe Research), to carry for 48 hours. The application records sudden explosive sounds and uses a calibrated model to assign sounds a cough predication score (0-1). TB status was determined by Xpert and culture; those with trace Xpert screening results and no positive confirmatory Xpert or culture were excluded from analysis. Using a developer-recommended cough prediction score cutoff of ≥0.85 to define cough, we evaluated differences in cough frequency using nonparametric tests. Diagnostic accuracy of cough frequency for TB was estimated using a receiver operating characteristic (ROC) curve.
Results: Among 83 participants screened, those with microbiologically confirmed TB (n = 41 [49%]) had higher cough frequency (Figure 1) than those without TB (median 2.07 [IQR 0.87-5.3] vs 0.68 [IQR 0.32-1.34] coughs per hour, $p < 0.001$). Cough frequency resulted in an area under the ROC curve (AUC) of 0.73 (95% confidence

interval: 0.62-0.84) that was robust to variation in the cough prediction score cutoff. Considering conventional targets for TB screening/triage tests, sensitivity was 68% at a specificity of 70%, and specificity was 30% at 90% sensitivity.

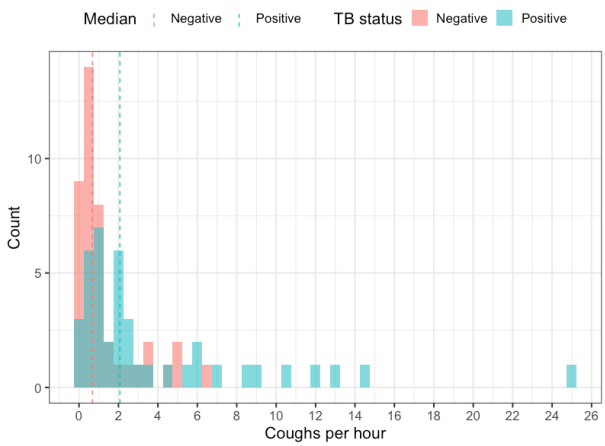

Figure 1. Distribution of cough frequency among community screening participants by TB microbiologic status, Kampala, Uganda

Conclusions: Among community screening participants, people with microbiologically confirmed TB have more frequent cough. However, cough frequency alone, even when measured with longitudinal recording, was insufficiently accurate for use as a screening tool.

PP08-866-13 Active case finding for TB in special populations: Assessing the effectiveness of routine screening in correctional centers in Lagos, Nigeria

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Background: Special populations such as correctional and rehabilitation centers, are often at a higher risk of Tuberculosis(TB) due to such conditions as overcrowding and poor nutrition. WHO recommends systematic TB screening among inmates and other individuals in closed settings. This study aimed at assessing the effectiveness of routine TB screening in correctional centers towards identifying the missing TB cases in Lagos State.
Design/Methods: A prospective implementation study was conducted across the three correctional centers in Lagos state. The screening was conducted over a period of 24 months using the standardized WHO four symptom screening (W4SS) checklist along with chest x-rays using the CAD4TB enabled mobile X-ray vans when available.
Results: A total of 20,191 inmates were screened with 4,576 (23%) presumed to have TB based on their symptoms. All presumptive patients were evaluated clinically or bacteriologically of which 398 (9%) of them were diagnosed with TB and 359 (90%) of them were initiated on treatment.

Year	Total screened	Total presumptive	Total evaluated	Total Diagnosed	% TB yield	Total Treated	NNS	NNT	Prison Population	TB Point Prevalence
2022	10,462	2,269	2,269	197	9	165	53	12	8,800	2,238 / 100,000
2023	9,729	2,307	2,307	201	9	194	48	12	8,200	2,451 / 100,000
TOTAL	20,191	4,576	4,576	398	9	359	50	12		

Table 1: TB case finding Cascade across correctional centers in Lagos state between year 2022 and 2023

Background and challenges to implementation: Special populations such as correctional and rehabilitation centers, are often at a higher risk of Tuberculosis(TB) due to such conditions as overcrowding and poor nutrition. WHO recommends systematic TB screening among inmates and other individuals in closed settings. This study aimed at assessing the effectiveness of routine TB screening in correctional centers towards identifying the missing TB cases in Lagos State.
Results/Impact: A prospective implementation study was conducted across the three correctional centers in Lagos state. The screening was conducted over a period of 24 months using the standardized WHO four symptom screening (W4SS) checklist along with chest x-rays using the CAD4TB enabled mobile X-ray vans when available.
Conclusions: Our study found that the implementation of routine screening is effective in facilitating prompt diagnosis and treatment among special populations. Going forward, continued efforts in this direction is imperative to mitigate the burden of TB within these special populations and to promote better health outcomes for all.

PP08-874-13 The TEMU TPT initiative: A case study on the uptake of TB preventive therapy through health worker-led education and contact invitation in Indonesia

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Background and challenges to implementation: Tuberculosis Preventive Therapy (TPT) uptake in West Java and DKI Jakarta, Indonesia, is currently less than 10% against the national target of 58%.

Recognized strategies to increase TPT uptake include contact invitation and face-to-face education for household contacts (HHCs) of people with TB. To leverage these strategies, USAID PREVENT TB collaborated with district health offices and Public Health Centers (Puskesmas) to implement TEMU TPT (Tatap-muka Edukasi Manfaat dan Guna/face-to-face education of TPT), aiming to increase TPT uptake among HHCs.

Intervention or response: From September 2023 to February 2024, the TEMU TPT initiative, was implemented across 36 Puskesmas in DKI Jakarta (23) and West Java (13). HHCs of people with TB were invited to Puskesmas for face-to-face educational sessions on TB and TPT benefits, followed by Tuberculin Skin Test (TST). Data were collected on event attendance, TST administration, result interpretation, TPT eligibility, and acceptance.

Results/Impact: In DKI Jakarta, among 1,349 HHCs attended TEMU TPT, 755 received TST and 664 returned for TST result interpretation. Of the 348 eligible for TPT, 208 accepted the therapy, representing an acceptance rate of approximately 59.8%.

In West Java, among 542 HHCs attended TEMU TPT, 349 received the TST, and 180 returned for TST result interpretation. Of the 111 eligible for TPT, 109 accepted the therapy, representing an acceptance rate of approximately 98.2%.

Overall, approximately 16.76% of the 1,891 attendees accepted TPT.

Conclusions: The TEMU TPT initiative, leveraging both Health Worker-Led Education and Contact Invitation, effectively increased TPT uptake among HHCs in both districts. While notable acceptance rates were observed among eligible individuals, challenges remain in ensuring retention throughout the TPT cascade. Further research is required to optimize this approach and assess its long-term impact on ending TB, highlighting the potential of combining educational and contact invitation strategies to enhance TB preventive strategies in high-incidence areas.

PP08-875-13 Increasing childhood TB notification rates in Nigeria: The impact of a collaborative childhood testing week

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Background and challenges to implementation: Nigeria has the fifth highest burden of childhood tuberculosis (TB) globally; in 2022, only 20,411 (35%) out of the estimated 58,000 children with TB were notified. Inadequate programmatic focus on the social and behavioral aspects of childhood TB contributes to low detection. Breakthrough ACTION-Nigeria (BA-N), the National TB Leprosy and Buruli Ulcer Control Programme (NTBLCP), and TB implementing partners implemented an innovative national childhood TB testing week (NCTW) to identify children with TB and facilitate timely access to treatment services.

Intervention or response: Following stakeholder collaboration to map areas of high childhood TB prevalence, BA-N coordinated intensive social and behavior change (SBC) initiatives nationwide during the week of Nigeria's Children's Day in May 2023. Activities included community outreach, facilitated discussions in the media and in schools, and increased self-efficacy in ability to test children for TB. Simultaneously, service delivery partners conducted active TB case finding, engaged caregivers, screened children for TB, and collected sputum/stool samples on-site. Routine data collected during community active case finding between January to April 2023 across 8 BA-N implementing states were compared to data collected in May 2023.

Results/Impact: A total of 27,891 children were screened, 8,840 identified as presumptive and 178 diagnosed with TB during NCTW. This is a 7.8-fold increase in case detection compared to the average of the previous four months preceding NCTW in the eight states.

Conclusions: Intentional efforts to map locations of children at high risk of TB, intensified SBC interventions, and immediate screening and testing led to a significant increase in TB case detection in children.

Sustaining such targeted interventions at scale regularly could play a crucial role in active TB case detection among children, contributing to global efforts to eliminate TB.

PP08-872-13 Finding the missing people with TB through targeted active TB screening in slum and hard-to-reach areas using peer-network strategy in Nigeria

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Background and challenges to implementation: Nigeria has the highest tuberculosis (TB) burden in Africa. Slum and hard-to-reach residents, numbering as high as 80 million in Nigeria, have been identified as a key affected population in recent strategic planning.
The USAID-funded TB LON project led by KNCV implemented a targeted TB case-finding that ensures active screening for TB among persons residing in slum and hard-to-reach areas in Nigeria.
Intervention or response: The community-based active TB case-finding intervention was implemented in 15 slums and hard-to-reach areas in 3 high-burden states.
Key activities include mapping of slum and hard-to-reach areas, identification and training of community health workers and volunteers among the slum and hard-to-reach communities' residents for active TB screening and referrals, specimen collection and transport to laboratories for diagnostic evaluation using a hub and spoke model, targeted awareness creation and group sensitization to address TB myths and misconceptions, and real-time electronic data reporting.
Remote competency-based continuous training of community health workers and volunteers was routinely conducted. Confirmed TB cases were linked to treatment and notified to the national TB program, while the community health workers and volunteers worked as treatment supporters.
Results/Impact: From January to December 2023, a total of 220,202 people were screened for TB. Of these, 17,310 (7.9%) presumptive TB were identified and 17,275 (99.8%) completed evaluation for TB, resulting in the diagnosis and enrollment of 3,917 (22.7%) TB patients to treatment. The 3,917 patients accounted for 6.2% of the total 62,887 TB notifications in the states. The number needed to screen (NNS) to find TB was 56 compared to 152 in the general population.
Conclusions: Active TB case-finding in slum and hard-to-reach areas revealed high TB yield and the potential for finding missing people with TB. Intervention utilizing resident community health workers and volunteers is crucial for peer-navigation, sustainability, and cost-effectiveness.

PP08-873-13 Enhancing TB screening in resource-limited high workload facilities: The role of auxiliary linkage assistants in improving active case finding in Machakos county, Kenya

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Background and challenges to implementation: Tuberculosis remains a major public health threat in Kenya with Machakos county ranking 8th in TB burden. As per Kenya's TB prevalence survey, the healthcare system misses 40% of TB cases each year. Though active case finding (ACF) seeks to address this, its performance remains sub optimal, partially attributed to high staff workload, limiting the proportion of clients screened at facilities. All clients should be screened for TB upon entry at health facilities yet, only 34% were screened in 2022. Machakos county's 18 public referral facilities, though representing 5% of public facilities, handle 29% of the county's workload.
Intervention or response: In August 2023, Catholic Medical Mission Board (CMMB) with support from the Global Fund through Amref Health Africa, engaged 19 auxiliary linkage assistants across these 18 facilities. They were stationed at the outpatient desks (OPD), primarily to screen for TB among OPD clients and support patient navigation. For effective supervision, they were selected by the health facilities' TB clinics as per provided criteria by the program, which included mandatory basic training on TB prevention and control.
Onboarding sensitization was done while monthly mentorship and feedback procedures jointly conducted by the program and sub county TB coordinators. Their work was summarized using standard MoH ACF monthly summary reports. Each linkage assistant was stipended $46 per month.
Results/Impact: From September 2023 to February 2024, the trend in proportion of clients screened for TB rose from 62.8% to 80%. The proportion of clients presumed to have TB increased from 2.4% to 4.9%. New TB cases identified from clients evaluated was 11.1%.
Conclusions: Linkage assistants is an efficient, low cost strategy to expand facility based screening for TB. Their identification and mentorship are vital for better outcomes. Health facilities can leverage on their local income as per existing in country guidelines to self-sustain this model.

PP08-871-13 Who do we target for TB case-finding strategies? Assessing TB positivity rates among at-risk-populations aged 15-24years using GeneXpert technology: Review of diagnostic surveillance data, Kenya

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Background: Tuberculosis (TB) prevalence in Kenya stands at 558 cases/100,000 individuals, with the burden varying among different at-risk populations, notably higher in adolescents and young adults. GeneXpert, a WHO-recommended diagnostic technology for rapid identification of TB and Rifampicin resistance, serves as the primary diagnostic tool.
This study aimed to compare GeneXpert positivity rates among various at-risk populations within this age group in Kenya.
Design/Methods: We conducted a retrospective review of Kenya's GeneXpert test data from 2017 to 2022, focussing on 15–24-year-old individuals presenting with TB symptoms across different at-risk groups. These included persons living with HIV (PLHIV), inmates, healthcare workers (HCWs), contacts of drug-resistant tuberculosis (DRTB) patients, TB patients returning after loss to follow-up (RAD), previously treated TB patients, and the general outpatient population. TB positivity rates were calculated for each population.
Results: A total of 170,017 records of Kenyan 15-24 year-olds were reviewed, split evenly by sex (50.3%:49.7%; M:F), with the vast majority (154,105, 90.6%) having been tested following referral from out-patient departments screening. The remaining population (15,912) included: PLHIV 10,298 (65%), inmates 3,499 (22%), contacts of patients with DR-TB 780 (5%), previously treated DS-TB patients 724 (5%), HCWs 405 (3%), and patients RAD 206 (1%).
TB positivity rates varied across populations, with RAD patients exhibiting the highest rate (51%), followed by previously treated patients (26%), outpatient referrals (14%), PLHIVs (10%), HCWs (9%), DRTB contacts (8%), and inmates (3%).
Conclusions: That one-in-seven outpatient referrals tests positive demonstrates the value of the outpatient screening policy for detecting TB in young Kenyans.
Furthermore, high [ET1] TB positivity rates among previously treated and RAD patients reinforce the importance of diligent TB history taking at assessment. Targeted screening strategies with prompt referral for GeneXpert testing is crucial for National TB control efforts, particularly among these young Kenyans shown to be at higher risk.

E-POSTER SESSION (EP)

EP01 Era of molecular diagnosis

EP01-600-13 Real-world accuracy and impact of Xpert® MTB/XDR in people with confirmed rifampicin-resistant TB in Georgia

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Background: Xpert® MTB/XDR (Cepheid, CA, USA) is recommended as follow-on test for drug resistance in people with bacteriologically confirmed tuberculosis (TB) by the World Health Organization, with potential for rapid accurate detection of resistance to Isoniazid (INH) and Fluoroquinolones (FQ). However, real-world performance and impact are largely unknown.
Design/Methods: We evaluated the diagnostic accuracy of Xpert® MTB/XDR during programmatic use in patients with rifampicin-resistant TB in Georgia between July 2022 and February 2024, using phenotypic drug-susceptibility testing (pDST) as reference standard. FQ resistance was defined as phenotypic drug resistance to either moxifloxacin and/or levofloxacin.
Results: 107 patients were included in the analysis. Resistance prevalence was 96% for INH and 37.4% for FQ. Xpert® MTB/XDR showed 99.0% sensitivity (95% CI 94.4-100.0) and 100.0% specificity (95% CI 39.8-100.0) for detection of INH resistance. Sensitivity and specificity for FQ resistance detection were 89.2% (95% CI 74.6-97.0) and 98.4% (95% CI 91.3-100.0), respectively.
The indeterminate-invalid rate was 6.5% (7/107) for FQ resistance detection and 4.7% (5/107) for INH resistance detection. Including indeterminate-invalid results, 15.4% of patients with FQ resistance and 5% of patients with INH resistance were missed by the assay.
Median time to treatment post-testing was 4 days (IQR 1-7, min 0 max 37). FQ treatment was started for 98.5% (66/67, 95% CI 92.0-100.0) of patients with confirmed FQ-sensitive TB by Xpert® MTB/XDR opposed to 18.8% (6/32, 95% CI 7.2-36.4) of patients with confirmed FQ-resistant TB.

	Isoniazid (0.1mg/L) (N=101)	Fluoroquinolones (LFX 1.0mg/L / MFX 0.25mg/L) (N=99)	Moxifloxacin (1.0mg/L) (N=99)
Sensitivity (%) (95%CI)	99.0% 94.4-100.0	89.2% 74.6-97.0	95.2% 76.2-99.9
Specificity (%) (95%CI)	100.0% 39.8-100.0	98.4% 91.3-100.0	82.1% 71.7-89.8
TP	96	33	20
FP	0	1	14
FN	1	4	1
TN	4	61	64
PPV (%) (95%CI)	100.0% 96.2-100.0	97.1% 84.7-99.9	58.8% 40.7-75.4
NPV (%) (95%CI)	80.0% 28.4-99.5	93.8% 85.0-98.3	98.5% 91.7-100.0

Table 1: Diagnostic accuracy of Xpert® MTB/XDR against pDST at recommended critical concentrations (Isoniazid, Fluoroquinolones) and clinical breakpoint (Moxifloxacin)

Conclusions: The high accuracy of Xpert® MTB/XDR for detection of INH and FQ resistance in a programmatic setting is in line with estimates reported in diagnostic accuracy studies. However, the proportion of FQ-resistant cases missed by the assay is higher than previously reported.
While the results show an impact of Xpert® MTB/XDR on treatment decisions, a considerable proportion of patients with FQ-resistant TB was started on a presumably ineffective FQ treatment.

EP01-601-13 Contribution of molecular XDR-TB testing to drug-resistant TB notification in Lilongwe and Chikwawa districts, Malawi

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Background: Drug resistant tuberculosis (DRTB) notification is lower than expected in Malawi. One contributing factor is unavailability of rapid diagnostic testing platforms other than for rifampicin (RIF) resistance. From February 2023, Partners in Hope (PIH), a local medical Non-Governmental Organization, with funding from USAID supported implementation of qualitative, nested real-time polymerase chain reaction testing for exten-

sively drug resistant (XDR) Mycobacterium Tuberculosis (MTB) complex DNA in unprocessed sputum samples, using 10-color GeneXpert machines procured through USAID funding at PIH Medical Centre Lilongwe and Chikwawa district hospital, both in Malawi. We aimed at assessing the platform's contribution to DRTB notification.

Design/Methods: We conducted a retrospective cross-sectional study that utilized all sputum MTB positive cases identified with MTB/RIF testing at the two health facilities from 1st February 2023 to 29th February 2024, for repeat testing on the XDR test platform, which can determine isoniazid (INH), fluoroquinolone (FLQ), amikacin (AMK), kanamycin (KAN), capreomycin (CAP) and ethionamide (ETH) resistance.

Results: 213 participants, of whom 139/213 (65.3%) were males underwent reflex testing and were included in this analysis. 86.4% (184/213) had MTB detected on XDR testing. Overall, 6.0% (11/184) of clients had resistance, 6 to RIF, 3 to INH, 2 to FLQ and 1 to AMK, KAN and CAP. 1.1% (2/184) had multi-drug resistance, one to RIF and INH (MDR-TB) and another to AMK, KAN and CAP. All clients harboring resistance were linked to appropriate treatment according to national guidelines. Clients with indeterminate results were treated with first-line drugs and samples sent for phenotypic drug sensitivity testing.

Drug	Resistance Status	Frequency	Percentage
RIF	Detected	6/213	2.8%
INH	Detected	3/184	1.6%
FLQ	Detected	2/184	1.1%
AMK	Detected	1/184	0.5%
KAN	Detected	1/184	0.5%
CAP	Detected	1/184	0.5%
ETH	Detected	0/184	0%

Table 1 Resistance patterns of MTB drugs.

Conclusions: Prevalence of multi-drug resistance among pulmonary TB cases at 2 large health facilities in Malawi was low. The molecular XDR testing platform contributed half of all notified drug resistant cases. There is need to strengthen combined molecular testing with MTB/RIF and XDR platforms to increase DRTB notification.

EP01-602-13 Drug resistance profiles of rifampicin-resistant TB in Vietnam

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Background and challenges to implementation: Vietnam has a high burden of drug-resistant TB (DR-TB), but limited capacity for rapid, genotypic drug susceptibility testing (DST) for second-line drugs. Current standard practice in Vietnam indictates that individuals with Rifampicin-resistant TB (RR-TB) identified through Xpert MTB/RIF (Ultra) testing are initiated on empiric second-line treatment. The newly implemented Xpert MTB/XDR assay, which began being programmatically rolled out in the country in 2022, has facilitated improved access to second-line DST for individuals with RR-TB, resulting in faster turnaround times.

Intervention or response: Between August 2022 and March 2024, all people diagnosed with RR-TB from initial Xpert MTB/RIF Ultra testing were eligible for an Xpert MTB/XDR test in the high-burden provinces of Ha Noi and Can Tho. Xpert MTB/XDR test results were compiled to understand the resistance profile detected during the wide-scale use of this genotypic DST.

Results/Impact: During the evaluation period, 1,092 people with RR-TB had a second specimen tested with the Xpert MTB/XDR, of which 775 (71.0%) isolates were positive. Rifampicin mono-resistance was found in 174 individuals (22.5%), while 21 individuals (2.7%) had poly-resistance, according to the TB diagnosis definitions provided by the Ministry of Health of Vietnam, which are included in the table. A total of 476 individuals (61.4%) were diagnosed with multidrug-resistant TB (MDR-TB), of which a subset of 87 individuals (11.2%) exhibited resistance to additional drugs, excluding fluoroquinolones. Additionally, 104 individuals (13.4%) were diagnosed with pre- or extensively drug-resistant TB (XDR-TB).

	Both Provinces	Ha Noi	Can Tho
RR-TB tested on Xpert MTB/XDR	1,092	483	609
MTB positive result	775 (71.0%)	338 (70.0%)	437 (71.8%)
Rifampicin mono-resistance*	174 (22.5%)	125 (37.0%)	49 (11.2%)
Poly-resistance**	1 (0.1%)	7 (0.3%)	0
MDR-TB†	476 (61.4%)	159 (47.0%)	317 (72.5%)
MDR-TB plus resistance to additional drugs‡	87 (11.2%)	14 (4.1%)	73 (16.7%)
pre-XDR-TB or XDR-TB§	124 (16.0%)	53 (15.7%)	71 (16.2%)

** resistant to only rifampicin; ** resistant to rifampicin and either second-line injectable drugs (SLIDs) and/or ethionamide (but not isoniazid or fluoroquinolones); † resistant to both rifampicin and isoniazid, and possibly SLIDs and/or ethionamide (but not fluoroquinolones); ‡ resistant to both rifampicin and isoniazid, with additional resistance to either SLIDs and/or ethionamide (but not fluoroquinolones); § resistant to rifampicin and fluoroquinolones, and possibly isoniazid, SLIDs and/or ethionamide.*

Conclusions: While RR-TB is often synonymous with MDR-TB, these findings reveal that over one fifth of people with RR-TB do not have resistance to other TB drugs, opening opportunities for more patient-friendly treatment regimens. The scale up of rapid genotypic DST for people with RR-TB is essential to avoid prolonged, costly treatment regimens and to mitigate treatment side effects.

EP01-603-13 Quantitative signature of small non-coding RNAs (sncRNAs) as a biomarker for pulmonary TB diagnosis

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Background: Timely diagnosis of tuberculosis remains paramount in the effective management of the disease, as it remains one of the leading causes of morbidity and mortality worldwide. Identifying biomarkers that can predict *Mycobacterium tuberculosis* (Mtb) infection is a pressing need that is yet to be fulfilled.
The objective of our study has been to identify circulating, small non-coding RNAs (sncRNAs) as a molecular tool for the diagnosis of pulmonary Active-TB (ATB).
Design/Methods: We recruited over 31 confirmed cases of ATB at the onset of treatment initiation and followed them up over a period of 6 months.
Additionally, we also recruited 22 uninfected controls for the study. Baseline resistance to Rifampicin was ascertained using GeneXpert. Clinical data, sera and sputum samples were collected from all the subjects. Serum samples were processed to generate small RNA libraries, which were subsequently sequenced using Illumina HiSeq technology. Sputum samples were utilized for bacterial culture and drug sensitivity assays. Validation studies were performed for shortlisted sncRNAs using qRT-PCR in an independent cohort.
The study was conducted in accordance with Institutional Ethics Approvals, and informed consent of study participants was obtained.
Results: Bioinformatics analysis of small RNA sequencing data identified 684 miRNAs, 120 piRNAs and 212 tRFs in sera samples. Quantitative analysis of sncRNAs using the DeSeq method identified differentially expressed sncRNAs between ATB and healthy subjects (fold change $\geq/\leq 2$ and $p < 0.05$). Subsequent validation through qRT-PCR confirmed significant differential levels of a specific subset of sncRNAs between the healthy and ATB cohorts (cohorts of drug-sensitive and drug-resistant cases) and validated this quantitative signature as a diagnostic biomarker.
Conclusions: Based upon detailed ROC analysis of the data, we identified a quantitative signature of five sncRNAs for diagnosis of ATB cohort having an AUC of 0.96, with high sensitivity and specificity.

EP01-604-13 Epidemic and endemic M. tuberculosis strains: How pathobiology is shaping their spread

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Background: Population structure of *Mycobacterium tuberculosis* and epidemic situation with tuberculosis have been shaped by multiple factors. Some of them are related to the pathogen itself, other depend on the human host.
We aimed to study pathogenetics, phylogenomics and phylogeography of the most epidemiologically and clinically significant (i) MDR clusters of modern and ancient Beijing sublineages and (ii) emerging subtypes of LAM_RUS sublineage in Russia.
Design/Methods: The strains were studied in C57BL/6 mouse model. Whole-genome sequencing (WGS) data were obtained using HiSeq Illumina or retrieved from GenBank, and submitted to bioinformatics and phylogenetic analysis. SIFT tool was used to predict significance of amino acid changes.
Results: The "Russian successful clone" Beijing B0/W148 is strongly associated with drug resistance and spread across all country. Its spread presents the major obstacle to the national TB control program. Recently discovered MDR, highly lethal and hypervirulent Beijing 14717-15-cluster is predominant in Buryatia, Far East (10-16%), but very rare outside it, and not forming clusters of transmission. The reasons may lie in the interplay of the human immune system and the genetic background of this strain whose cluster-specific SNPs are in genes related to immune evasion and adaptation. The virulence and WGS results on the LAM strains in Russia demonstrate an inverse correlation of resistance and virulence which is also mirrored in the spatiotemporal pattern. The most virulent drug-susceptible strain SIT264 increased its presence not only in the European but also Asian parts of Russia.

Conclusions: Different *M. tuberculosis* genotypes developed distnct ways of adaptation with humans due to different interplay of bacterial virulence and resistance. Personalized TB treatment should consider not only drug resistance but also different virulence properties of the infecting strains. TB diagnostics algorithms should include methods of targeted detection of the most medically significant strains.

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EP01-605-13 Initiating the profiling of common mutations in M. tuberculosis genome associated with bedaquiline resistance in Kyrgyzstan: Preliminary data

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Background and challenges to implementation: On July of 2023 WHO recommended the implementation of targeted next-generation sequencing (tNGS) for the diagnosis of drug resistant tuberculosis (DR-TB). Kyrgyzstan is one of the 30 countries with high MDR-TB burden (WHO). This study examined the frequency and spectrum of mutations in *M. tuberculosis* genes, associated with the resistance to Bedaquiline among rifampicin resistant TB cases.

Intervention or response: Since the beginning of the 2024, sputum samples from active TB pulmonary cases were collected and targeted sequencing (tNGS) of MTB was performed in NRL on a MiSeq Illumina device. Deeplex Myc-TB assay (GenoScreen) was used to analyze data obtained by tNGS. V3_0_1-Extended WHO catalogue was used for interpretation of resistance to 13 TB drugs.

Results/Impact: In this study, 40 sputum samples were analyzed. All samples tested as a positive and rifampicin resistance (RIF-R) by Xpert MTB/RIF. Through targeted next-generation sequencing (tNGS), mutations associated with resistance to Bedaquiline (BDQ-R) were detected in 4 samples (10%). Sample #1 exhibited mutations in RV 0678, insG (% variant - 23.95), identified as BDQ-R, along with RV 0678, A36P mutation, awaiting phenotypic drug susceptibility testing (pDST) results. Sample #2 showed an RV 0678, R156* mutation (% variant – 95.74), indicative of BDQ-R. Sample #3 displayed an RV 0678, insG mutation (% variant - 85.95), associated with BDQ-R. Sample #4 revealed RV 0678, delG (% variant - 54.5) and RV0678, G25D (%variant 34.2) uncharacterized mutation, but indicative of BDQ-R.

Conclusions: The programmatic utilization of tNGS has only recently commenced. Despite being in its initial stages, the preliminary findings demonstrate promising outcomes for tNGS in diagnosing tuberculosis. By accurately identifying mutations, tNGS underscores the transformative impact of this techniques in enhancing TB management strategies and contributing to more informed treatment decisions.

EP02 Strategies to improve TB surveillance systems

EP02-607-13 Improving utilisation of the TB electronic case-based surveillance in Uganda using simple metrics: Achievements and future direction

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Background and challenges to implementation: The national electronic case-based surveillance system (eCBSS) for tuberculosis (TB) and Leprosy in Uganda is crucial for effective surveillance, case management, and program monitoring. eCBSS has been implemented since 2021 by the Ministry of Health (MoH) in collaboration with its partners. Prior to 2023, despite roll out of eCBSS, utilisation of the system was still minimal.

However, despite these achievements, reporting challenges and data quality issues persist, emphasizing the need for ongoing efforts to enhance live data entry accuracy and timely reporting. Funding constraints have also been identified as a barrier to further scale-up efforts and prioritize additional facilities for direct support.

Intervention or response: From 2023, the Ministry of Health produced weekly eCBSS report utilizing simple metrics for 605 selected health facilities across regions.

These included the number of facilities reporting in eCBSS, weekly analytics on performance, reporting rates, and backlog data entry completion status. This weekly report was followed by meetings, discussions and system trouble-shooting support to users based on progress by region.

Results/Impact: The efforts saw an impressive increase in reporting rates of the selected facilities from 15% to 69% in 2023, with current rates at 59% by Week 13 of 2024. The backlog of data entry, a critical focus area, increased from 46% to 86% completion status by the end of 2023 and 93% by Week 13 of 2024 showcasing the effectiveness of weekly monitoring and targeted support efforts.

Conclusions: Weekly data utilization of simple metrics demonstrates a significant and sustainable potential for improving the adoption and use of eCBSS in Uganda. However, future efforts will need to focus on addressing the remaining challenges in reporting and data quality, ensuring the eCBSS achieves its full potential in transforming evidence into action for TB management in Uganda.

EP02-608-13 National roll-out of an electronic reporting system for TB in Papua New Guinea

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Background and challenges to implementation: Papua New Guinea is a high burden country for TB and RR/MDR-TB. The majority of the population live in rural areas distributed across 22 provinces.

The current surveillance system for TB in PNG relies on paper-based reporting from 254 Basic Management Units (BMUs) to the national TB program (NTP). This data informs planning and strategy.

Due to numerous challenges (human resource limitations, capacity, logistic issues), reports are often submitted late or not received by the NTP. In 2022, 61/254 (24%) of all BMUs did not submit reports to the NTP.

Intervention or response: An electronic TB reporting system has been introduced (e-TB). This system allows local direct data entry at BMUs via tablet or smartphone into a web browser. This was implemented at 2 pilot sites in 2017, with subsequent scale up.

Results/Impact: Currently 13/22 provinces have been supported with full roll out of the e-TB system, although there are ongoing challenges with timely and complete data entry. The remaining 9 provinces have data entry completed at the provincial level. The scale up of the eTB system, including BMUs now submitting electronic reports is described in table 1.

Domain	2017-21	2022	2023	2024 Q1	Total
Number of Provinces rolled out e-TB	1	7	3	2	13 (13/22=59%
Number of BMUs rolled out e-TB	14	79	42	44	180/257= 70%
Number of BMUs submitting quarterly reports via the eTB system	15	94	136	180	180
Number of BMUs trained in eTB reporting systems	14	79	42	44	180/180 (100%)

Timeliness of report submission is improving, supported by the NTP with ongoing refresher training and onsite supervisory visits.

The NTP aims to phase out paper-based reporting by the end of 2024 with a goal of 100% online submission of BMU reports. This will allow complete, timely and accurate analysis of national TB data.

There is potential to expand the scope of the current eTB system, including drug stock management, human resource tracking and program governance and coordination.

Conclusions: The transition from paper-based reporting to electronic systems has potential to improve the completeness and quality of data to inform planning. The implementation of such systems, even in resource limited and geographically isolated parts of PNG, is feasible.

EP02-609-13 Use of patient-level line list surveillance dashboard and DHIS 2 system by project enrollment task force on improving patient enrollment: USAID TB-LON 3 Project experience

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Background and challenges to implementation: One of the key objectives of the National TB Program and TB-LON Project is to strengthen systems and structures for tuberculosis detection, treatment, and notification.

TB case treatment initiation has been a huge challenge across major interventions and to bridge this huge gap, a patient-level line list surveillance dashboard was designed in conjunction with aggregate monthly data reported on the Demographic Health Information System (DHIS) platform.

Intervention or response: The DHIS captures monthly aggregated data across all interventions and the projects achievement over time in terms of enrollment rate. The patient-level line list surveillance dashboard captures all diagnosed patients, their demographics, intervention types, facilities where they were diagnosed, enrollment status as well as reasons why they are not enrolled on treatment.

To drive TB case enrollment, an enrollment task force was instituted to majorly focus on ensuring all reported aggregated data on DHIS tallies with the patient line list dashboard and to link all unenrolled patients to care on time by triangulating between both systems to extract the details of unenrolled patients.

The task force consists of staff from key programme areas, Strategic Information, Laboratory as well as cured TB patients and community gate keepers.

Results/Impact: The patient line list dashboard highlights "yet to be enrolled" patients and it availed the enrollment taskforce the opportunity to promptly engage the field officers, facility staff as well as the patients themselves in some cases. Consequently, on average, our project enrollment rate across all interventions improved greatly from 88% to 95% for each reporting fiscal year.

Conclusions: The patient line list dashboard helps to drive up our enrollment rate, improve project performance, swift decision-making, and optimize resource utilization. The enrollment taskforce was instrumental in the success of closing most enrollment gaps.

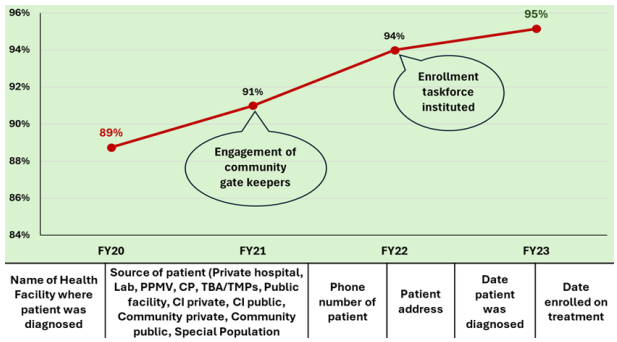

Figure. Trend of enrollment rate (%) across the fiscal year.

EP02-610-13 Enhanced data quality assessment efficiency through integrated digitised TBDQR application into the DHIS2-ETL system

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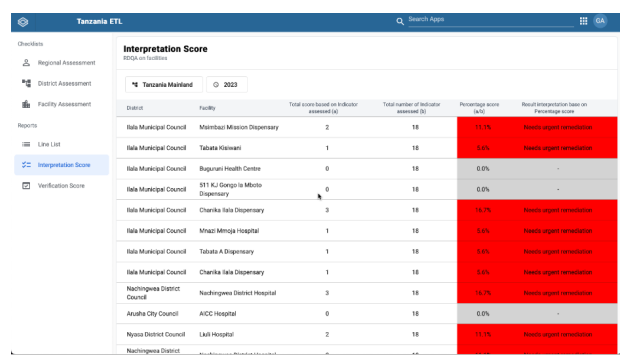
Background and challenges to implementation: Tanzania's TB recording and reporting system comprise of a hybrid of paper-based and electronic case-based DHIS2 system since 2018. A World Health Organization (WHO) Standards and Benchmarks for tuberculosis surveillance and vital registration assessment in the same year revealed no improvement in data quality. Routine data quality assessment (RDQA) activities comprise a paper-based checklist, which delays reporting and feedback, and is a tedious work for supervisors. The reports were not made available at the National level for performance measurement.

Intervention or response: A DHS2 Ministry of Health developer was consulted to integrate the RDQA tool into the existing TB surveillance system called the DHIS2-ETL. A rapid need assessment and requirement gathering were conducted, and RDQA checklists were revised to reflect the updated WHO data quality review framework (2021). A data dictionary of the required variables was prepared by National TB and Leprosy Programme (NTLP) partners in collaboration with the DHIS2 developers. The RDQA tools were configured, tested, and piloted.

Results/Impact: In 2023 DQR was conducted in 28 districts.Indicators values for verification were auto populated into the RDQA app and reports were made available after one day of completion of the assessment compared to two weeks when paper-based checklists were used. One day after the assessment feedback was given to the respective health managers with DQA scores visualizations.The reports were analyzed, and further feedback was provided during the Program's annual meeting in the same year which resulted in action plan for improvement in all other 190+ districts.



Conclusions: Digitized DQR automates population of verification indicators variables for assessment and provides timely, and accessible RDQA reports with visualized score findings. This improve efficiency by simplifying verification task and enhances timely feedback sharing for learning, performance improvement and decision making.

EP02-611-13 Utilisation of web-based tools for integrated program performance monitoring

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Background and challenges to implementation: The implementation of integrated testing on point-of-care platforms in Zambia has marked significant progress over the past 2 years. However, the program faces the challenge of transitioning from manual data reporting to a cost-effective electronic system.
This study aims to assess the implementation of an electronic reporting system within integrated testing programs, addressing the limitations of existing platforms like DHIS2, which lack a comprehensive list of laboratory indicators.
Intervention or response: A web-based data reporting tool was developed utilizing the Open Data Kit platform (ODK). This tool was designed specifically to capture monthly testing data from laboratories involved in integrated testing programs.
Subsequently, laboratory personnel underwent comprehensive training sessions to ensure proficiency in using the data entry tool for monthly reporting purposes. Following data entry, the collected information was aggregated and visualized on a custom Power-BI dashboard.
Results/Impact: A total of 302 health facilities are reporting using the ODK tool. The tool tracks program and disease specific indicators including device utilization rates, positivity and invalid rates, rejection, and reporting rates, stock status, quality assurance, result turnaround time.
Monthly reporting rates for TB have improved from 44% in quarter 1 of 2021 to 100% in quarter 4 of 2023. Through constant monitoring, test rates for TB improved by 18% and the reports enabled the program to avert the expiry of over 2 months of stock of TB reagents.
Conclusions: The successful implementation of the electronic reporting system within integrated testing programs in Zambia underscores the importance of adopting cost-effective solutions to improve program monitoring and decision-making. By addressing the limitations of DHIS2, the developed web-based data reporting tool has enabled real-time tracking of program and disease-specific indicators across 302 health facilities.

EP02-612-13 Leveraging the use of Applications Programming Interface (API) in TB diagnostics and reporting

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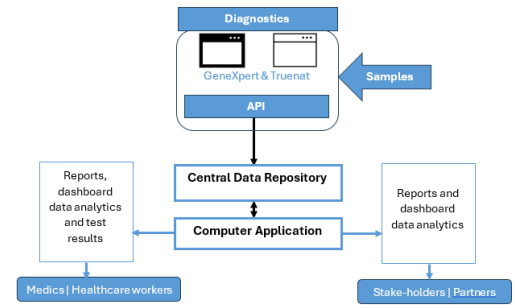
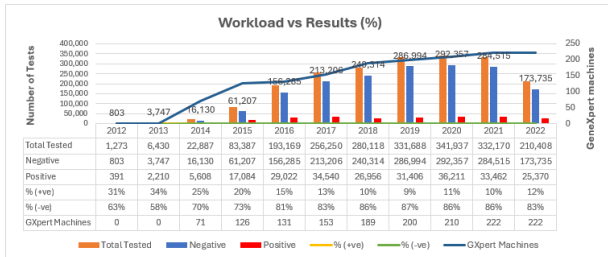
Background: In Kenya, an estimated 140,000 persons get infected by TB every year—source: National TB prevalence survey of 2016.
The effectiveness of API-enabled computer applications in transmitting accurate data processed by TB diagnostic equipment is crucial. These robust applications play a significant role in collecting and distributing timely TB data from a centralized source to various stakeholders.
This process facilitates early treatment and enables effective decision-making, demonstrating the importance of such applications in managing TB.
Design/Methods: Data collected before the introduction of the API-enabled computer application was compared to data transmitted following its implementation. This comparison spanned two years pre-implementation and cumulatively up to 2022 post-implementation. By the end of 2014, a total of 71 GeneXpert machines were utilizing the API-enabled application for reporting.
Results: The use of API-enabled computer application was rolled out in 2014, and 22,887 tests were reported by the end of 2014 this represented an increase of 355% compared to the previous year's data of 6,430 tests, when the reporting was done manually. Out of the total tests done in 2014, 5,608 were positive.





Background and challenges to implementation: In Kenya, an estimated 140,000 persons get infected by TB every year—source: National TB prevalence survey of 2016.

Challenges

- Underreporting of TB Cases.
- Manually collecting, recording, and transmitting TB data was time-intensive.
- Delays in reporting were hindering timely interventions and public health responses.
- Health workers responsible for reporting were overburdened with other tasks.
- Manual reporting systems were prone to errors, missing data, and inconsistencies. This led to flawed decision-making and ineffective resource allocation.

Intervention or response: The effectiveness of API-enabled computer applications in transmitting accurate data processed by TB diagnostic equipment is crucial. These robust applications play a significant role in collecting and distributing timely TB data from a centralized source to various stakeholders.

This process facilitates early treatment and enables effective decision-making, demonstrating the importance of such applications in managing TB.

Results/Impact: The use of API-enabled computer application was rolled out in 2014, and 22,887 tests were reported by the end of 2014 this represented an increase of 355% compared to the previous year's data of 6,430 tests, when the reporting was done manually. Out of the total tests done in 2014, 5,608 were positive.

Conclusions:

1. By promptly relaying TB results via mobile text and/or email, healthcare providers can **initiate treatment at the earliest**, which is crucial in managing infectious diseases like TB, ultimately improving their prognosis, and reducing the spread of the disease.
2. Automated systems can significantly reduce the time taken to relay results, thereby reducing the overall turnaround time (**TAT**).
3. Automation eliminates manual errors and **increases the efficiency** of the diagnostic process.
4. **Scalability and Adaptability:** Applications must handle growing datasets and adapt to evolving technologies.
5. Enhanced commodity management through online tracking.
6. Timely and accurate data presents the Government of Kenya, partners, and other stakeholders with evidence-based reports that can be used in TB interventions.

EP02-613-13 The role of enhanced monitoring and supervision in effective public-private mix (PPM) implementation

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Background and challenges to implementation: Since 2007, Mercy Corps has managed several Global Funded TB grants.

Over the past five years, expanding PPM grants from 57 to 120 districts and increasing HCPs from 2,000 to 14,000 have posed significant challenges in meeting project indicators and ensuring implementation quality.

Effective monitoring and supervision play a pivotal role in enhancing project performance and adhering to national guidelines, while meticulous oversight ensures data quality across all levels.

Intervention or response: With support from the Global Fund, Mercy Corps established an effective monitoring and supportive supervision system. This system empowered governmental counterparts and Mercy Corps personnel to conduct efficient monitoring and supervision across service delivery points at district, provincial, and national levels.

Over three years, Mercy Corps' Monitoring and Evaluation (M&E) unit, in collaboration with government staff, conducted multiple visits to all 120 project districts.

On-site assistance was provided, and expedited action plans were developed in 60 districts to achieve critical targets, leading to improved project outcomes and quality of implementation.

Results/Impact: A total of over 6,000 new Health Care Providers (HCPs) underwent training, resulting in a remarkable enhancement of project performance from 44% to 102% (all form cases).

Among 307,184 pulmonary cases, 104,956 underwent Xpert testing (34%), with a positivity rate of 37%. Laboratory External Quality Assessment performance remained consistently above 90%, with treatment outcomes achieving a commendable rate of 93%.

Moreover, over 75% of HCPs demonstrated adherence to national guidelines. Data accuracy and timeliness reached an impressive 95%, with 100% case-based data accurately entered into the Management Information System.

Conclusions: The significance of effective monitoring and supportive supervision cannot be overstated, as evidenced by the remarkable outcomes achieved. This underscores the necessity for ongoing investment in Monitoring and Evaluation (M&E) initiatives.

Such investment is pivotal for enhancing project performance, improving program quality, and fortifying efforts in tuberculosis detection and control.

Level	Stakeholders	Monitoring Activity	Frequency of activity	Responsibility
National	Common Management Unit (CMU)	1.Inter-Provincial Meeting (IPM). 2. Monitoring Visits to PPM sites. 3. Validation and consolidation of data. 4. Finalize and share revised R&R tools.	Quarterly Ongoing	MU Monitoring Unit of CMU
	Mercy Corps (MC)	1. Participate in IPM. 2. Sharing Quarterly data with NTP. 3. Desk review of data.	Quarterly Monthly/ Quarterly	MC (PR unit) MC (M&E uni)t
Provincial	Provincial TB Control Program (PTP)	1. Inter-District Meeting (IDM). 2. Monitoring Visits to PPM sites. 3. Validation and consolidation of data 4. Review of the DTC/DLS checklist. 5. District Labs Supervisor meeting.	Quarterly	PTP Senior Management of PTP
	Sub Recipients (SRs)	1. Meeting with district staff. 2. Data validation, and consolidation. 3. Preparation, and validation of monthly/ quarterly reports. 4. Submission of reports/data 5. Monitoring visits to project districts.	Monthly/ Quarterly	Project Manager (PM) PM/Regional Coordinator (RC) PM PM/RC
	Mercy Corps (M&E unit)	1. Participation in PTP and SR meetings. 2. Attend DLS meeting for data review. 3. SR office visits for data verification and quality. 4. Capacity building of SR staff.	Quarterly Ongoing	PR Unit Lab components M&E unit
District	District TB Program	1. District-level data validation meeting (Public). 2. Participate in PPM review meeting. 3. Monthly monitoring visits to the health facilities. 4. Monthly monitoring visits of labs. 5. Collection of DTC/DLS checklist. 6. Provision of ATT drugs. 7. Provision of lab reagent.	Quarterly Monthly	District TB Coordinator (DTC) District Lab Supervisor (DLS)
	SRs	1. Monthly/Quarterly data finalization. 2. Conduction of all field activities. 3. Monitoring visits to the onboard Health Facilities. 4. Monitoring visits to the onboard abs. 5. Monitoring visits to field activities. 6. Verification of registered TB patients.	Monthly/ Quarterly	RC/District Staff
	Mercy Corps	1. Monitoring visits of PPM sites. 2. On-site data verification visits. 3. Monitoring visits field activities. 4. Supervision through onsite support. 5. Verification of reported TB patients.	Monthly/ Quarterly	M&E unit

EP02-614-13 Improving scale up the national electronic case-based surveillance in Uganda using simple metrics: Achievements and future direction

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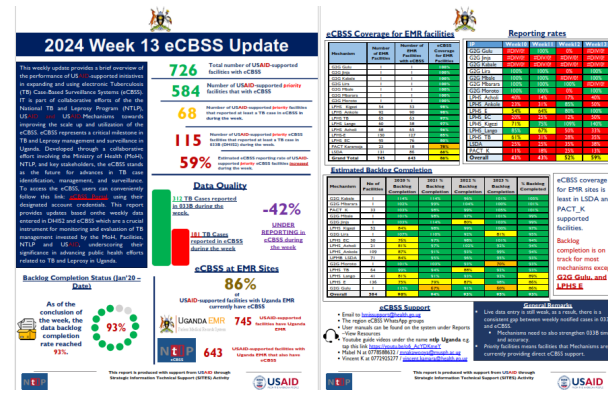
Background and challenges to implementation: The national electronic case-based surveillance system (eCBSS) for tuberculosis (TB) and Leprosy in Uganda is crucial for effective surveillance, case management, and program monitoring. Implemented since 2020 and developed through a collaborative effort led by the National TB and Leprosy Program (NTLP) and its partners, prior to 2023, in United States Agency for International Development (USAID) supported regions, less than 300 facilities had adopted eCBSS and less than 40% of facilities with electronic medical records (EMR) had eCBSS.

Intervention or response: Starting 2023, the NTLP and the USAID Strategic Information Technical Support (SITES) activity partnered to produce a USAID partner-specific weekly eCBSS report utilizing simple metrics. These included the number of facilities adopting eCBSS, integration with existing EMR, weekly analytics on performance, reporting rates, and backlog data entry completion status. This weekly report was followed by meeting and discussions based on progress by region

Results/Impact: By 2023, eCBSS expanded from under 300 to 605 facilities, with a coverage for EMR facilities increasing from 40% to 86%. The efforts saw an impressive increase in reporting rates from 15% to 69% in 2023, with current rates at 59% by Week 13 of 2024. The backlog of data entry, a critical focus area, reached an 86% completion status by the end of 2023 and 93% by Week 13 of 2024 showcasing the effectiveness of weekly monitoring and targeted support efforts.



Conclusions: Weekly data utilization of simple metrics demonstrates a significant and sustainable potential for improving the adoption and use of eCBSS in Uganda. However, future efforts will need to focus on addressing the remaining challenges in Funding, reporting and data quality, ensuring the eCBSS achieves its full potential in transforming evidence into action for TB and Leprosy management in Uganda.

EP02-615-13 TB vulnerability assessment demonstration initiative through application of digital innovation, Timor-Leste

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Background and challenges to implementation: TB vulnerability assessment is survey for identifying individuals in the community who are at high risk for developing TB and mapping their distribution in the country. The vulnerability assessment is being done using a standardized vulnerability assessment tool through the mobile prevent TB application on DHIS2 platform.
This is being implemented for the first time in the country. A key challenge was to reduce the burden of manual screening for TB vulnerabilities, data collection and testing.
Intervention or response: A mobile application with a digital platform were developed to do the TB Vulnerability Assessment in Timor-Leste at the household level that allowed vulnerability assessment of household members based on the presence of risk factors and was implemented between October 2021 and January 2022.
Results/Impact: About 1,578 (79%) households and 7,078 (61%) individual household members were assessed for TB vulnerability. Through the activity, 392 (24%) households and 2,216 (31%) household members were found to be vulnerable to TB. About 197 (~3%) persons were identified with TB symptoms of which 90 underwent TB testing, of which 11 persons were diagnosed with TB and 8 were linked to TB treatment services in a very short period of two months.
Apart from this, 106 persons eligible for TPT were also identified and linked to TPT services, and 2,231 household members were identified for close monitoring. Wth real-time data flow was captured in a visual web dashboard leading to a significant improvement in TB service delivery.
Conclusions: It was feasible to identify individuals, households, and communities with risk factors for TB disease (such as severe malnutrition, history contact with TB patients, exposure to indoor air pollution due to solid fuel use, tobacco smoking, alcohol abuse disorder, and known history of diabetes mellitus) for targeted TB interventions both for active and latent TB infections.

EP02-616-13 The talking TB performance monitoring wall chart: Madiany sub-county hospital experience

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Background: Effective monitoring of TB program indicators at health facilities is crucial for improving case finding and treatment outcomes. However, existing challenges in data synthesis and utilization necessitated the development of a TB performance-monitoring chart.
Design/Methods: The intervention involved training TB coordinators on data use for decision-making, selecting key TB indicators for the performance wall chart, developing and distributing the wall charts to health facilities, and conducting virtual trainings to sensitize healthcare workers on the use of the performance wall chart. The focus was on enhancing data ownership and utilization at the facility level to improve TB program performance.
Results: The utilization of the TB performance wall chart resulted in enhanced data ownership, monthly data reviews, and informed decision-making at health facilities. Facilities that followed the intended use of the dashboard saw enhancements in TB case finding and quality of care outcomes. The effective deployment at Madiany Sub County hospital demonstrated the intervention's positive impact on facility performance, with TB case finding increasing from 65 to 85 cases, representing a 51% rise from 2021 to 2022 and treatment success rate increased from 89% to 100%.
Conclusions: The TB performance wall chart intervention demonstrated its potential for scale-up, with distribution to 100% of all TB treatment sites in Kenya. The initiative has shown promising results in improving TB case finding and treatment outcomes, emphasizing the importance of utilizing facility data for decision-making. Further efforts to scale up the intervention and provide on-job training will be crucial for maximizing its impact across all TB treatment sites in the country.

EP02-617-13 Data collection on the benchmarks from the WHO standard on universal access to rapid TB diagnostics: The experience from Nigeria

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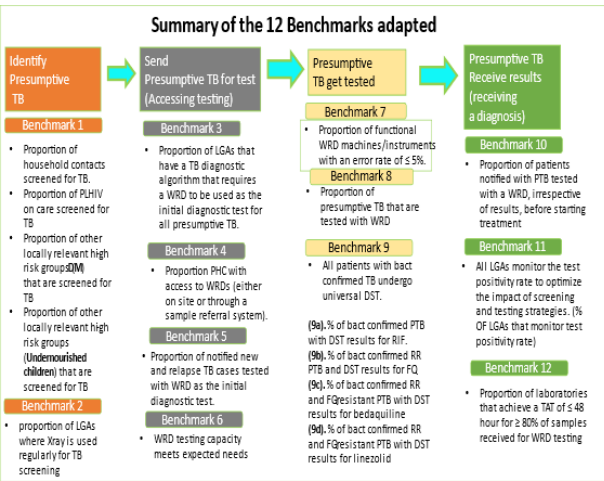
Background and challenges to implementation: The Global TB Programme's initiative to establish a standard for Universal Access to Rapid Tuberculosis Diagnostics aimed to facilitate the implementation and scaling up of WHO-recommended rapid diagnostics (WRDs). Nigeria was selected as one of the countries to pilot the implementation of this benchmark tool in 2023, with the goal of improving TB diagnosis and management across the country.
Intervention or response: The National Tuberculosis and Leprosy Control Programme (NTBLCP), supported by WHO, undertook the task of domesticating the 12 standards outlined in the WHO benchmark tool, aligning them with Nigeria's National Guidelines. This process involved hybrid meetings with WHO's Global TB Headquarters Laboratory focal points to identify areas of gaps and ensure clarity on implementation strategies. An orientation slide was developed, and trainings conducted for TB stakeholders at all levels. Data collection followed a structured assessment checklist to ensure uniformity and accuracy. The analysis of the collected data utilized color-coded grading based on coverage and the availability of data, providing valuable insights into the strengths and weaknesses of the NTBLCP's TB diagnostic and management tools.



Results/Impact: The assessment revealed the NTBLCP R&R tools were capable of reporting on all the benchmarks, except for Benchmark 12, where information was only available at the laboratory level. LGAs that monitored their positivity rate and NNT were able to guide case detection activities effectively, resulting in increased yield during active case searches.
The analysis informed NTBLCP's strategic decisions on distribution of newly procured WRDs. Benchmark 6 was used to prioritize states with low diagnostic coverage and machine utilization, ensuring optimal resource allocation.
Conclusions: In conclusion, the WRD benchmark assessment provided a comprehensive overview of the NTBLCP's diagnostic capacity along the cascade of care. This evaluation was instrumental in guiding WHO's support in addressing programmatic, administrative, and technical gaps while strengthening areas of success within Nigeria's TB control efforts

EP03 TB diagnostic markers

EP03-618-13 Unexpected positivity rate with VIDAS® TB-IGRA and validation of the corrective solution

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Background: VIDAS® TB-IGRA is an automated diagnostic test intended as an aid in the diagnosis of Mycobacterium tuberculosis infections (latent or active forms). This assay was commercially launched in 2021. In 2022, an unexpected positivity rate on a low risk population for latent tuberculosis, resulted in a field safety corrective action. Investigations determined that the root cause was the diffusion of a chemical component embedded in the VIDAS TB-IGRA strips, that triggered a non-specific cell stimulation, resulting in false positive results. To solve the issue, a surface treatment of the specific well involved in the stimulation step was implemented in the VIDAS® TB-IGRA strip manufacturing process. The efficiency of this treatment was validated through studies evaluating clinical specificity and sensitivity.
Design/Methods: Two studies were conducted to verify clinical performances after surface treatment implementation within the VIDAS® strip. One study checked clini-

cal specificity on samples from blood donors in France, population with a very low incidence of latent TB. Acceptance criteria was a specificity ≥ 93.1%, corresponding to data shared in 2021 package insert. A second study was conducted to check clinical sensitivity on samples from culture-confirmed active TB patients in South Africa.
Acceptance criteria was a sensitivity ≥ 94.2%, corresponding to previous data shared in 2021 package insert. Both studies were conducted across different lots of treated strips to validate the new manufacturing step.
Results: Specificity was estimated at 98.7% (153/155) for VIDAS® TB-IGRA and 97.4% (151/155) for QFT®-Plus assay. Sensitivity was estimated at 95.9% (210/219) for the VIDAS® TB-IGRA and 77.8% (156/198) for QFT®-Plus assay.
Conclusions: After investigation revealed a non-specific stimulation triggered by a chemical component embedded in the VIDAS TB-IGRA strips, a surface treatment of the strips was implemented. The two performance studies demonstrate sensibility and specificity in accordance with the initially claimed performances and validation of the corrective solution.

EP03-619-13 Polystyrene nanoparticles impact the course of infection of Staphylococcus aureus on a 2D minilung model

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Background: Nanoplastics are ubiquitous plastic particles smaller than 1µm that have been detected in our bodies. Many studies are elucidating their impact on health but little is known in regards of infection.
Our aim is to study the impact of 50nm polystyrene (PS) particles on *Staphylococcus aureus* infection in bidimensional arrays of airways and lung cells generated from human embryonic pluripotent stem cells.
Design/Methods: The minilungs were infected at day 81 of differentiation. The impact of PS was studied through two approaches:
1. PS direct impact: 100µg/mL PS was added to the cultures and incubated for 24-48-72h, supernatants were used for cytotoxicity evaluation.
2. PS impact on infection outcome: *S. aureus* was incubated in tryptic soy broth (TSB) or co-cultured in TSB with 100µg/mL PS for 2,5h.
Next, cultures were infected at a multiplicity of infection of 1 and incubated for 1-2-4-24h. Supernatants were used for cytotoxicity evaluation, and cells were lysed. Intracellular content was plated for colony forming units (CFU) quantification.
Results: In both infection conditions, intracellular CFU/mL counts decreased three orders of magnitude between 1h and 2h; then, CFU counts remained constant up to 24h. However, intracellular CFU counts at all timepoints were higher by an order of magnitude in PS-*S. aureus* cultures compared to *S. aureus* cultures (Fig. 1). In regards to cytotoxicity, values were smaller than 5% at all timepoints in both infection conditions. However, PS exposed cultures showed an increase of cytotoxicity through time up to a 20 % at 72 h.

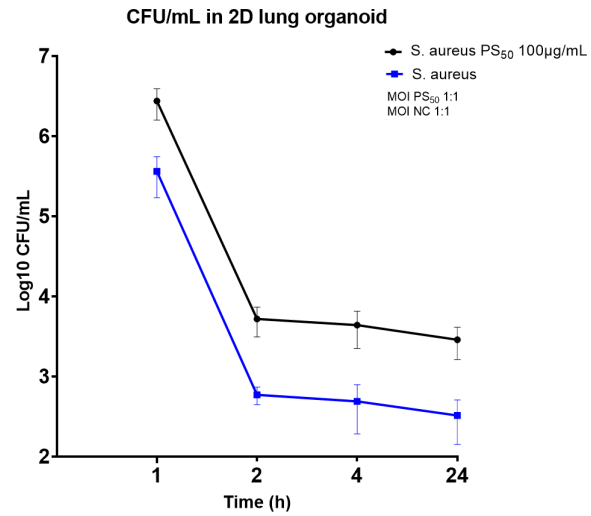

Fig 1. Intracellular CFU/mL.

Conclusions: The presence of PS seems to cause cytotoxicity and facilitates the invasion and infection of *S. aureus*. Thus, PS might alter the host's cellular response against infection.

EP03-620-13 Cytokine responses in a Phase IIB trial of adjunctive rosuvastatin for rifampicin-susceptible TB treatment

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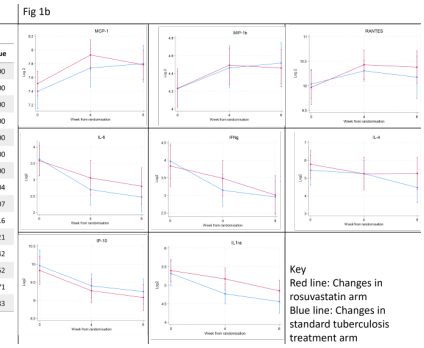
Background: We report results from a sub-study investigating changes in plasma cytokine levels within the phase 2b ROSETTA trial. Participants with rifampicin-susceptible tuberculosis were randomised to receive standard treatment with or without adjunctive 10mg rosuvastatin over the intensive phase of treatment.
Design/Methods: Plasma was collected (at randomisation, week 4 and 8 post-randomisation) and analysed for 41 cytokines/chemokines using a Luminex bead assay.
A linear mixed effects model was used to detect differences in cytokine levels between the adjunctive rosuvastatin and control arms, over the 8-week intensive treatment phase.
Results: Eighty trial participants (40 in each arm) recruited from Uganda (54%), Vietnam (26%) and Philippines (21%) had plasma analysed. 76% were male, 18% had diabetes mellitus, and 2 were PLHIV (on treatment). Baseline disease burden was high; 80% of participants had cavitation, 34% had smear grade of ≥2+, 94% were culture positive.
A significant difference in Tumour growth factor a (TGF-a) levels was observed between arms (p=0.03). However, upon applying the Benjamini-Hochberg (BH) procedure with a false-discovery rate (FDR) of 5% (multiplicity test), the observed difference did not surpass the BH critical value (0.0012).
No differences between arms were seen in the remaining 40 cytokines. Analysing the cohort collectively, significant changes (post BH multiplicity testing) were observed over the 8-week period in 15 cytokines (Fig 1a).
Of these, MCP-1, MIP-1b and RANTES increased (Fig 1b), whilst the remaining 12 cytokines decreased on TB treatment. Greater than 0.5 Log^2 drop was seen in IL-6, IFNg, IL-4, IP-10 and IL-1ra (Fig 1b).

Fig 1a

Cytokine	Log^2 change Baseline to Week 8 (95% CI)	P-value
IFNg	-0.92 (-1.27, -0.58)	0.0000
IP-10	-0.73 (-0.95, -0.52)	0.0000
IL-1ra	-0.65 (-0.83, 0.47)	0.0000
MCP-1	0.34 (0.20, 0.48)	0.0000
MIP-1b	0.26 (0.13, 0.39)	0.0000
IL-8	-0.37 (-0.51, -0.22)	0.0000
IL-6	-0.97 (-1.19, -0.74)	0.0000
RANTES	0.28 (0.03, 0.52)	0.0004
IL-15	-0.24 (-0.36, -0.11)	0.0007
GCSF	-0.24 (-0.45, -0.04)	0.0016
TGF-a	-0.23 (-0.47, 0.01)	0.0021
IL-4	-0.75 (-1.26, -0.24)	0.0142
TNF-a	-0.32 (-0.55, -0.10)	0.0162
IL-9	-0.20 (-0.35, -0.06)	0.0171
IL-7	-0.35 (-0.60, -0.11)	0.0183

Fig 1b



Conclusions: A dose 10mg of rosuvastatin may be insufficient to observe differences in cytokines responses. Changes in cytokine levels that occurred with TB treatment, in particular IL6, IP-10 and IFNg, have been previously identified as correlating with the effectiveness of TB treatment response, have potential as biosignatures of treatment efficacy, and should be explored further.

EP03-621-13 Host-directed therapies for Tuberculosis; what does data from clinical trials and meta-analyses tell us?

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Background: Drugs that work to restore or enhance host immune function to clear mycobacteria or reduce immunopathology are termed host-directed therapies (HDT).
Design/Methods: We conducted a literature review to identify HDT for tuberculosis that have entered clinical trials. We identified articles published between 1 January 1995 through 1 March 2024 that described the use of HDT in clinical trials of tuberculosis. Articles in English were included. PubMed and clinicaltrrials.gov was searched using the terms "tuberculosis", "immunotherapy", "host-directed therapy", individual drugs names or therapeutic classes.
Bibliographies of the articles were reviewed for additional relevant publications. We reviewed clinical trials, meta-analyses and excluded case reports, case-control, or cohort studies.
Results: Table 1 summarises HDT in TB which have entered clinical trials, divided into 3 categories; Cytokine modulation as HDT, HDT that alters host or microbe metabolic pathways, and replacement of micro and/or macronutrients as HDT.
Of those reviewed, HDT candidates that had substantive supporting pre-clinical data and/ or supporting data from clinical trials suggesting a benefit in TB were identified.

Adjunctive IL-2 shows benefit in chronic, treatment resistant disease. Adjunctive aspirin, steroids and TNF inhibitors may have specific benefit for TB meningitis.
Adjunctive metformin and statins may have benefit based on early phase clinical trials, but dose optimisation is needed to improve efficacy and tolerability. It remains unclear whether any macro or micronutrient supplementation enhances immune responses and subsequent mycobacterial clearance.

Group	Pathway	Drug(s)	Finding
Cytokine Modulation	Type 1 IFN	IFNa	Two underpowered RCTs showed increased bacterial clearance, but effect was not sustained. Preclinical data suggests supplementation with IFNa could promote mycobacterial replication and contribute to disease pathology in TB. No listed trials
	IL-2	IL-2	Multiple RCTs and meta-analyses. Increased bacterial clearance in drug-resistant TB (dr-TB) disease, but not rifampicin susceptible TB (rs-TB). Should be re-examined in the context of more effective dr-TB treatments now available. One planned clinical trial (NCT04766307).
	IL-4 inhibitor	pascolizumab	Single phase I, dose-escalation RCT showed increased rate of time to positivity in TB culture with use of pascolizumab. Supporting preclinical data. Should be examined in Phase II. No listed trials
	mTOR inhibition	everolimus	Single RCT. No change in bacterial clearance, improvement only in FEV1. No pre-clinical data to support use. No listed trials.
	PDE4 inhibition	CC-11050 pentoxifylline	One RCT each testing pentoxifylline and CC-11050; neither showed changes in bacterial clearance. CC-11050 improved FEV1. No supporting preclinical data available. No listed trials
	TNF inhibition	etanercept corticosteroids	Single phase 1 non randomised CT of etanercept improved SCC. 1 planned trial using adalimumab in TB meningitis (TBM) (NCT 05590455). Multiple RCTs and meta-analyses show clear evidence of benefit in TBM, and potential benefit in TB pericarditis and pleural disease. Higher dose may have an impact sputum culture conversion (SCC), but tempered by safety concerns at these doses. Genotype-based benefit currently investigated in an ongoing trial (NCT03100786). 1 other planned clinical trial (NCT03092817).
	COX inhibition	aspirin ibuprofen celecoxib	Multiple RCTs in TBM show adjunctive aspirin plus steroid reduce risk of morbidity and mortality. Planned Phase III trial of aspirin in TBM ongoing (NCT04145258). Poor quality data from trial of aspirin for in PTB. Phase I data for NSAIDS show no benefit. 1 planned trial testing ibuprofen and aspirin for PTB (NCT04575519).
Changing Metabolic pathways	AMPK activation	metformin	Epidemiological studies and meta-analyses suggest metformin is protective against TB disease. Improved SCC and improved clinical disease indicators with adjunctive metformin in one RCT, but treatment was poorly tolerated. Lower doses and longer durations being trialled at present (NCT04930744, NCT05215990).
	Cholesterol metabolism	rosuvastatin atorvastatin pravastatin	Two RCTs suggest statins may have an impact on SCC, with no data available on relapse free cure. One dose-finding trial (pravastatin) stopped early because of safety concerns. Larger trials using atorvastatin in progress (NCT06199921, NCT04147286). Choice of statin important because of drug-drug interactions with rifampicin.
Micro and Macronutrient supplementation		Vit D Multivitamin Macronutrients	Multiple RCTs and meta-analysis of Vit D in TB. No evidence of benefit, although some suggestion of improved SCC in those with drug-resistant disease, or in those with active PTB who have Vitamin D deficiency. No planned Vit D trials. Multiple other micronutrient trials with no clear evidence of benefit. Single RCT of micro and macronutrient supplementation shown to prevent TB infection and reduces mortality in those with microbiologically proven disease. Unclear whether benefit is through a direct impact on microbiological, radiologic, and clinical outcomes, or specifically TB-related deaths. No planned clinical trials.

Table 1.

Conclusions: Conceptually HDT holds promise, based on the use of drugs repurposed from other clinical fields. A few candidate HDT agents warrant larger-scale clinical trials to validate the efficacy and safety. The identification of specific immune and metabolic targets in the host coupled with drug-discovery could move the HDT approach further, ultimately enhancing the armamentarium against TB and improving patient outcomes.

EP03-622-13 Impact of isoniazid preventive therapy on M. tuberculosis-specific T-cell responses in comorbid TB and Type 2 diabetes mellitus

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Background: Efforts to eliminate tuberculosis (TB) are threatened by diabetes mellitus (DM), which confers a greater than a 3-fold TB disease risk. Both TB and DM are accompanied by marked immunologic changes, however, the effect of Isoniazid preventive therapy (IPT) on *Mtb*-specific T-cell functional responses remains poorly characterised.
We determined the impact of IPT on the function and phenotype of *Mtb*-specific $CD4^+$ and $CD8^+$ T cells in DM with latent TB (LTBI).
Design/Methods: This exploratory nested-cohort was conducted in Uganda between January and December-2019. Peripheral blood mononuclear cells were processed and stimulated with ESAT-6/CFP-10 peptide pools for 48 DM-LTBI participants at baseline [m-00]) and 6 months [m-06]) after IPT. *Mtb*-specific $CD4^+$ and $CD8^+$ T cell phenotype (CD45RA/CCR7), activation (HLA-DR), exhaustion (PD-1), homing (CXCR5) and cytokine (interferon [IFN]-γ, interleukin (IL)-13 and IL-17A) profiles were characterised by flow cytometry.
Data were analysed using FlowJo v.10.10.0 and Prism v.10.1.1. Multiple paired t-tests with Holm-Sidak multiple comparisons were performed.
Results: Effector memory $CD4^+$ and $CD8^+$ T cells were significantly decreased from m-00 to m-06 (mean: 16.9:12.1; p=0.044 / 31.6:24.2; p=0.08 respectively). $CD4^+$ and $CD8^+$ CXCR5 expression was markedly upregulated from m-00 to m-06 (16.0:18.3; p=0.017 / 2.1:2.7; p=0.009). PD-1 expression on both $CD4^+$ and $CD8^+$ T cells was significantly downregulated from m-00 to m-06

(32.86:26.04; p=0.028 / 28.01:24.70; p=0.032). The $CD4^+$ IL-17A and $CD8^+$ IL-13 production was upregulated from m-00 to m-06 (0.55:1.10; p=0.005) and (0.62:1.19; p=0.038) respectively.
Conclusions: In this study, IPT decreased effector memory responses, indicating modulation towards a less-activated state or differentiation into other subsets. This could have implications for long-term immunity and protection against TB reactivation. The downregulation of PD-1 and upregulation of CXCR5 expression post-IPT indicates decreased T-cell exhaustion and improved homing, possibly enhancing T-cell effector functions. Upregulated IL-17A and IL-13 production may contribute to better *Mtb* infection control.

EP03-623-13 A composite peptide vaccine targeting M. tuberculosis and gram-positive and gram-negative bacteria may provide useful strategies to combat TB and sepsis, and mitigate antimicrobial resistance

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Background: Bacteraemia causes sepsis, an uncontrolled inflammatory response that leads to multiple organ dysfunction and death. Dominance of multi-drug resistant bacterial pathogens such as *Mycobacterium tuberculosis* (MTB) has contributed to the global threat of antimicrobial resistance (AMR). Non-antibiotic therapies such as vaccines and monoclonal antibodies (mAbs) have emerged as alternate preventative strategies. Peptide vaccines comprising epitopes specific to MTB and common to gram-positive and gram-negative bacteria could provide novel approaches to combat tuberculosis, sepsis, and AMR. In this study, we demonstrate that an unconjugated composite peptide vaccine comprising lipopolysaccharide (LPS), peptidoglycan (PGN), and lipoteichoic acid (LTA) epitopes, and a universal T-cell epitope, generated broadly reactive serum antibodies to various bacteria, including mycobacteria.
Design/Methods: ICR mice were immunized subcutaneously on days 0, 21, and 35 with 20 μg of LPS.PGN.LTA05 peptide, formulated with AddaVax™ adjuvant. Serum IgG1 responses to purified LPS from *Escherichia coli* and *Klebsiella pneumoniae*, ultrapure PGN from *Staphylococcus aureus*, purified LTA, and whole bacteria (*Staphylococcus aureus*, *Staphylococcus epidermidis*, *Mycobacterium smegmatis* (SMEG), *Escherichia coli*, *Bacillus subtilis*, *Streptococcus agalactiae* and killed MTB) were determined using live and fixed bacteria ELISA. Opsonophagocytic killing activity (OPKA) against SMEG was determined using a granulocytic cell line, HL-60.
Results: Robust and broad IgG1 serum antibodies to LTA, LPS, PGN, and various live and fixed gram-positive and gram-negative bacteria, including mycobacteria, were induced. Significant OPKA was observed against SMEG.
Conclusions: An unconjugated composite peptide vaccine comprising LPS, PGN, and LTA epitopes, generated broadly reactive opsonic antibodies to various bacteria, including mycobacteria. Ongoing studies include mAb development. Composite peptide vaccines targeting epitopes specific to MTB and common to gram-positive and gram-negative bacteria could provide novel preventative options for tuberculosis and sepsis and play an important role in mitigating AMR. Synthetic composite peptides that target multiple pathogens may provide a cost-effective, easily scalable approach for vaccine design.

EP03-624-13 Evaluation of novel host serum biomarker-based tools as diagnostic candidates for active TB and monitoring of the response to TB treatment

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Background: There is an urgent need for new tools to improve the diagnosis of TB, and monitoring of the response to anti-TB treatment. Several candidate biomarkers have to date been identified, but these have not been validated. We aimed to validate select host serum protein biomarkers as tools for the diagnosis of TB and the monitoring of the response to anti-TB treatment. We also evaluated the utility of a newly developed TB test (ImmiPrint TB, ProteinLogic, UK) and present the interim findings. Our study is ongoing and we anticipate that it will be completed prior to the Union conference.
Design/Methods: In addition to the newly developed ImmiPrint TB test, we evaluated the concentrations of 15 additional biomarkers selected from the literature, based on their potential shown in prior studies, as TB diagnostic or treatment monitoring candidates. We used serum samples collected from patients that presented with symptoms consistent with a diagnosis of TB and requiring further investigation in Cape Town, South Africa, who received a final diagnosis of TB or other respiratory disease (ORD) using microbiological tests. Participants provided samples at baseline, and at months 2 and 6 following TB treatment initiation, if diagnosed with TB. Biomarkers were analyzed using the Meso Scale Discovery platform.
Results: Out of 107 study participants evaluated to date, 42(39,3%) were diagnosed with TB, and 65(60,7%) with ORD. Of the 15 additional biomarkers evaluated, CC3,

CRP, I-309, IL-2Ra, MCP-4, SAA, and sICAM-1 showed strong diagnostic potential, regardless of HIV status. Individually, CRP, I-309, IL-2Ra, and SAA diagnosed TB with AUROC >81%. The concentrations of these biomarkers as well as pentraxin3 and IL-12p40 changed significantly during TB treatment.

Conclusions: We validated select host biomarkers as TB diagnostic and treatment monitoring candidates. Further analysis, including data on the performance of the Immi-Print TB test, is ongoing.

EP03-625-13 Sensitivity and specificity of LF-LAM among outpatients with advanced HIV disease: Preliminary results of a multi-center study

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Background: The WHO guidelines highlight paucity of evidence regarding lateral flow urine lipoarabinomannan assay (LF-LAM) accuracy among people living with HIV (PLHIV) in outpatient settings, particularly those without TB signs and symptoms and those with CD4 counts ranging from 100–200 cells/mm³, ≥200, or unknown. We evaluated LF-LAM performance among advanced HIV disease (AHD) outpatients, stratified by TB symptoms and CD4 count.

Design/Methods: Since September 2023, we are implementing an AHD package of care in 30 health facilities in Cote d'Ivoire. The package includes offering the Alere Determine™ LF-LAM to all AHD clients irrespective of TB symptoms and CD4 count, both in inpatient and outpatient settings. Xpert® MTB/RIF Ultra is provided to AHD clients with TB signs and symptoms or a positive LF-LAM result who can produce sputum sample. We measured LF-LAM sensitivity and specificity against Xpert Ultra as a reference standard among AHD outpatients who received both tests.

Results: Up to February 2024, we enrolled 633 AHD patients, 546 (86%) had a LF-LAM done, 143 (23%) had an Xpert done, and 129 were outpatients with both tests results available. The overall sensitivity of LF-LAM was 62% and increased with lower CD4 counts, at 75% for patients with CD4<200 versus 43% for those with CD4≥200 or unknown (P=0.023). The specificity of LF-LAM overall was 64% and remained consistent across groups. Sensitivity and specificity were similar among outpatient PLHIV with CD4<100 or TB symptoms, and among those with CD4<200 or TB symptoms, at 65% and 64% respectively.

Group	Category	LF-LAM positives among Xpert positives	LF-LAM sensitivity (95% confidence interval)	LF-LAM negatives among Xpert negatives	LF-LAM specificity (95% confidence interval)
Overall N=129		33/53	62% (48%-75%)[a]	49/76	64% (53%-75%)[a]
By TB signs and symptoms	With N=90	27/39	69% (52%-82%)	31/51	61% (46%-74%)
	Without N=24	0/2	0% (0%-80%)	18/22	82% (59%-94%)
	Unknown N=15	6/12	50% (25%-75%)	0/3	0% (0%-69%)
By CD4 (cell/mm³), four categories	<100 N=48	15/19	79% (54%-93%)	18/29	62% (42%-79%)
	[100-200[N=37	9/13	69% (39%-90%)	16/24	67% (45%-84%)
	≥200 N=25	5/9	56% (23%-85%)	11/16	69% (41%-88%)
	Unknown N=19	4/12	33% (11%-65%)	4/7	57% (20%-88%)
By CD4 (cell/mm³), dichotomized	<200, N=85	24/32	75% (57%-89%)	34/53	64% (50%-77%)
	≥200 or unknown, N=44	9/21	43% (22%-66%)	15/23	65% (43%-84%)
By combinations of CD4 and TB signs and symptoms	CD4<100 or TB signs and symptoms[b] N=103	28/43	65% (49%-79%)	38/60	63% (50%-75%)
	CD4<200 or TB signs and symptoms[c] N=115	31/48	65% (49%-77%)	43/67	64% (51%-75%)

[a] WHO reported a sensitivity of 31% (18-47%) and a specificity of 95% (87-99%) among unselected PLHIV in outpatient settings.

[b] Group eligible to receive LF-LAM based on WHO recommendations.

[c] Group who would receive LF-LAM in most AHD programs, especially in settings where CD4 count is replaced by rapid qualitative CD4 count systems, with cut-off of 200 cells/mm³.

NOTE: These preliminary analyses were conducted while data collection is still ongoing. We plan to reanalyze the data with a larger sample.

Conclusions: Until more accurate tests become accessible, LF-LAM is beneficial for outpatient AHD clients with TB symptoms or CD4 <200 as an add-on to clinical judgement and other tests.

Employing the CD4 threshold of <200 holds promising implications to simplify implementation of AHD care programs, particularly with the introduction of rapid qualitative CD4 count systems.

EP03-626-13 MPT70: A new virulence factor of the M. tuberculosis complex

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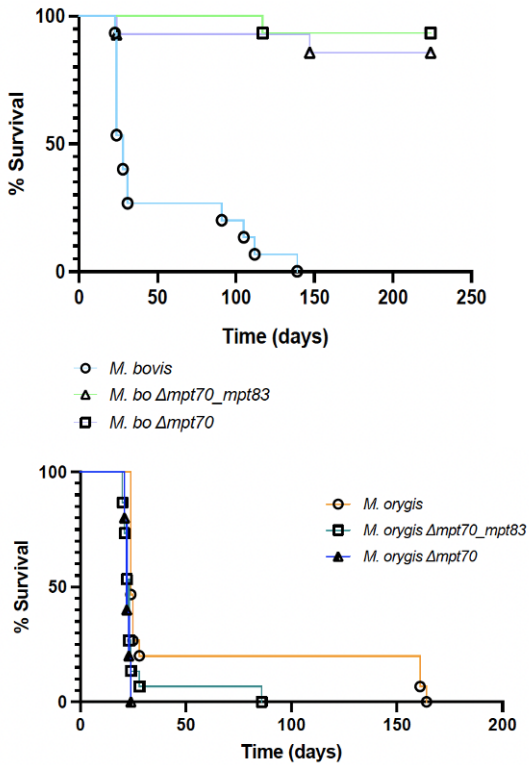
Background: The Mycobacterium tuberculosis complex (MTBC) comprises the human pathogen, *Mycobacterium tuberculosis* (*M. tb*) along with agents of zoonotic TB (zTB), such as *M. bovis* and *M. orygis*.

Prior research has indicated that *M. orygis*, like *M. bovis* and some strains of BCG, upregulates the production of the secreted protein MPT70 (*mpt70*) however its role during infection has yet to be determined.

Design/Methods: Deletion mutants of several MTBCs have been generated using the ORBIT system. *In vivo* experiments using a murine infection model have been done to determine the consequences of MPT70 disruption after infection, by measuring survival (as a function of *mpt70* presence) and bacterial burden. Subsequent *ex vivo* studies have been done to test whether MPT70 has a cell-autonomous role, namely testing the impact of mpt70 disruption on the outcome of macrophage infection.
Results: Disruption of *mpt70* in *M. bovis* reverses *in vivo* mortality and results in near complete bacterial clearance after 52 weeks of infection. Curiously, this was not observed in *M. orygis*, where early mortality was still observed, even when *mpt70* was disrupted. When macrophages were infected with *M. bovis* vs. *M. bovis* disrupted for *mpt70* and another antigen, *mpt83*, there was no difference in infection, but a significant decrease in production of MIP-1, MCP-1 and RANTES. Complementation studies are underway, along with studies testing whether the same macrophage profile is observed with *M. bovis* BCG disrupted for only *mpt70*.



Conclusions: Our study identifies MPT70 as a non-canonical virulence factor. Further investigation into the immunomodulatory properties of MPT70 may provide valuable insights into host-pathogen interactions within the MTBC, across various host species, and inform the development of novel strategies for tuberculosis prevention and control, including zoonotic forms of TB.

EP04 Innovations in TB diagnosis

EP04-627-13 Evaluation of self-collected dry oral swab sample for the early diagnosis of M. tuberculosis in Karu

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Background: Tuberculosis (TB) is one of the leading causes of death worldwide, with an estimated 1.5 million people dying from TB in 2020. Most current diagnostic tests for TB rely on sputum sampling from symptomatic individuals. Sputum collection procedure involves expectoration of potentially infectious aerosols which pose safety risks to health care Workers, hence an easier, safer, non-invasive, non-aerosol, and more effective alternative approach is warranted.
This study evaluated the effectiveness and diagnostic yield of self-collected dry oral swab (SC-DOS) in detecting MTBC.
Design/Methods: A cross-sectional comparative design was used in evaluating SC-DOS for early diagnosis of TB. Two samples comprising first an early morning SC-DOS, and sputum were collected from each consented participant at intervals of 30 minute. SC-DOS and sputum were transported immediately to the laboratory at room temperature and cold chain respectively. Xpert MTB/RIF Ultra assay was performed on both specimens and the results documented.
We calculated the sensitivity and specificity of SC-DOC and threshold values' graph was plotted for sputum and SC-DOS.
Results: This study enrolled 419 participants of which 266 (63.5%) were male and 12 (2.8%) were ≤14 years. Of the 419 participants 36 (8.6%) were positive with 3 (8.3%) Rifampicin resistant. Using the sputum Xpert as gold standard, the sensitivity and specificity of the SC-DOS were 97.2% and 99.7% respectively. As shown in the figure, SC-DOS showed a high yield of TB compared to sputum sample.
Conclusions: The self-collected dry oral swab has shown high sensitivity and specificity, and potentially easier, safer, non-invasive, non-aerosol and effective in detecting TB.
Although further research is warranted, our findings show that SC-DOS can serve as an alternative sample for early detection of pulmonary tuberculosis.

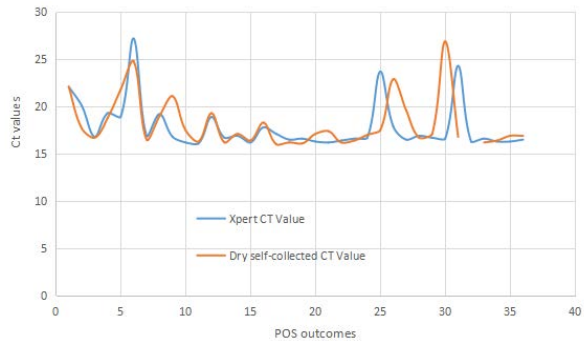

Figure 1. Comparison of the Ct values of sputum and SC-DOS Xpert results.

EP04-628-13 Multi-gene plasma cell-free M. tuberculosis assay: An innovative approach for enhanced TB detection

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Background: Existing tuberculosis (TB) diagnostic tests are tailored for sputum specimens, yet collecting sputum from all TB patients can be difficult. Here, we investigate a plasma cell-free *Mycobacterium tuberculosis* (cfMTB) DNA-based real-time PCR (qPCR assay) for diagnosing pulmonary TB (PTB).
Design/Methods: This cross-sectional diagnostic study included individuals diagnosed with PTB, individuals with latent TB infection (LTBI), and healthy controls. PTB cases were diagnosed using sputum GeneXpert, culture, and clinical diagnosis, while LTBI was diagnosed with QuantiFERON®-TB Gold Plus test. Primers and probes targeting *IS6110*, *cyp141*, and *devR* genes were designed, and plasma cfMTB DNA was tested using qPCR for these genes. Sensitivity was estimated using GeneXpert and/or culture and clinical diagnosis. Specificity was calculated based on cfMTB DNA qPCR results from controls.
Results: Among 106 pulmonary TB (PTB) cases, 92 (86.8%) were bacteriologically confirmed, with the remaining 14 (13.2%) diagnosed clinically. Controls (n=60) included 30 LTBI-positive and 30 negative individuals. The sensitivity of the plasma cfMTB_qPCR assay, considering all three genes, was 71.7% for all TB cases. This sensitivity increased to 78.3% for bacteriologically confirmed cases, while remaining at 28.6% for clinically diagnosed cases. The specificity based on all three genes stood at 91.7%. Individually, *IS6110* and *cyp141* qPCR showed sensitivities of 65.2% for bacteriologically confirmed cases, with specificity of 93.3% and 95%, respectively. However, their sensitivities dropped for clinically diagnosed TB cases, with *cyp141* at 28.6% and *IS6110* at 21.4%. *devR* exhibited a moderate sensitivity of 53.8% across all TB cases, rising to 57.6% for bacteriologically confirmed cases and falling to 28.6% for clinically diagnosed cases while maintaining a specificity of 98.3%.
Conclusions: Our study indicates that targeting multiple genes for cfMTB DNA-based TB diagnosis improves assay sensitivity. Further large-scale research, including genes linked to drug resistance, is necessary to fully assess the clinical utility of plasma cfMTB DNA in TB diagnosis.

EP04-629-13 Genomic analysis of drug resistance in M. tuberculosis isolates from Almaty, Kazakhstan

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Background: Kazakhstan is experiencing a high percentage of drug-resistant tuberculosis (TB) cases, as recognized by the World Health Organization (WHO). Almaty, Kazakhstan's largest city with a moderate risk of TB infection due to its dense population.
This study aims to conduct a comprehensive genomic analysis of drug resistance, lineage composition, and possible transmission patterns in *M. tuberculosis* (*Mtb*) clinical isolates using whole genome sequencing (WGS) techniques, addressing a significant gap in the literature concerning TB in Kazakhstan.
Design/Methods: A purposive sampling method was used to collect 120 *Mtb* clinical isolates from TB-positive patients on both MGIT culture and Xpert MTB/Rif. Samples were collected in 2023 from patients upon their admission to the National Scientific Center of Phthisiopulmonology (NSCP) in Almaty, Kazakhstan, with prior informed consent obtained. WGS was performed using MiSeq platform. Genomic data was processed with TB-Profiler and MTBseq bioinformatic pipelines.
Results: The majority of studied isolates were characterized as L2/Beijing lineage (n=79; 65.8%). Other *Mtb* isolates were categorized as L4/Euro-American (n=40 33.3%), and La1/BCG lineage (n=1; 0.9%). Genotypic prediction of drug resistance revealed that a quarter of samples had RIF resistance (n=29; 24.2%), bearing S450L

(24/29), H445Y (2/29), L430P (2/29) or L452P mutations in the *rpoB* gene. INH resistance was observed more frequently (n=46; 38.3%), where the S315T (45/46) mutation in *katG* gene was predominant. Two samples had S94A and G154A mutations in the *InhA* gene along with previous mutations, and one sample exhibited the C15T mutation in the *fabG* gene.

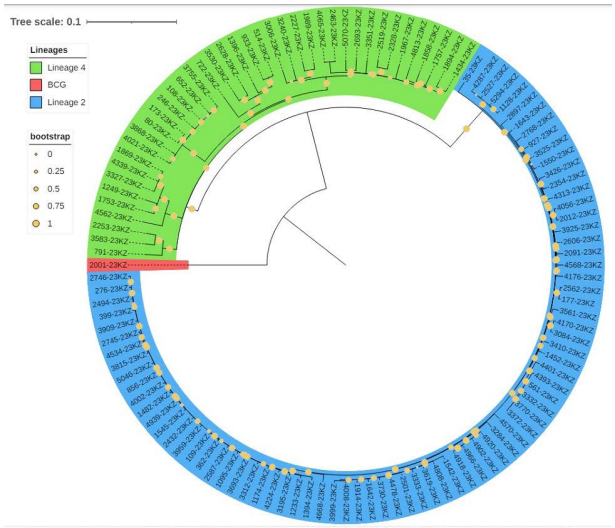

Figure 1. Maximum likelihood tree of 120 Mtb whole-genome sequences. The population structure of the samples is represented by three genetic lineages: L2/Beijing, L2/LAM and La1/BCG.

Conclusions: The study sheds light on *Mtb* genomic characteristics in Kazakhstan, emphasizing the dominance of the L2/Beijing lineage from China. This underscores cross-border TB epidemiology, necessitating collaborative efforts to control transmission. Urgent actions are required to address significant resistance to RIF and INH, safeguarding public health in this high-burden setting. The study was conducted as part of the ISTC project.

EP04-630-13 Surveillance of multidrug-resistant TB in Taiwan

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Background: Drug-resistant tuberculosis (DR-TB) is one of the global major public health concerns and remains a challenge to the End TB program. To understand the extent and trend of DR-TB under an enhanced management program, we conducted a population-based cohort study of 1,728 multidrug-resistant TB (MDR-TB) cases confirmed from 2008 to 2022.
Design/Methods: Information on case characterizations was obtained from the TB Registry. *Mycobacterium tuberculosis* complex isolates were subjected to phenotypic drug susceptibility testing (DST) using the agar proportion method or the Bactec MGIT 960 system. Genotypic DST was performed by sequencing drug-resistance associated genes.
Results: Of the 1,728 MDR-TB cases, 1,114 (64.5%) were new cases, 525 (30.4%) were previously treated, and 89 (5.2%) had an unknown treatment history. The ratio of males to females was 2.82. The majority of the MDR-TB cases were in the ≥65 (38.1%) and 55-64 (21.4%) years old age groups. We observed significant decrease of new and previously treated MDR-TB cases with annual percentage change (APC) of -2.73% and -11.45%, respectively.
The rates of MDR-TB resistance to ethambutol, pyrazinamide and streptomycin were 45.0%, 28.5% and 40.0%, respectively, whereas the rates of resistance to fluoroquinolones (FQs) and second-line injectable drugs (SLIDs) were 5.5-6.1%, 4.2-7.1%; and the rate of extensively DR-TB was 2.0%, respectively. Furthermore, we observed a decreasing trend of resistance to FQs (APCs -0.30% to -4.72%) and SLIDs (APCs -2.10% to -5.93%) in MDR-TB cases.
Besides, bedaquiline (BDQ) and clofazimine (CFZ) were tested during 2020-2022 and 2016-2022, the rates of MDR-TB resistance to BDQ (4/217) and CFZ (11/620) were both 1.8%. We have not observed any cases of linezolid-resistant MDR-TB since 2013.
Conclusions: Our surveillance data revealed the declining trend of MDR-TB and resistance to second-line drugs. Continuous surveillance of drug resistance is crucial for programmatic management of DR-TB and effective responses for TB elimination.

EP04-631-13 Prediction of individual unfavorable TB treatment outcomes in Brazil and India using machine learning

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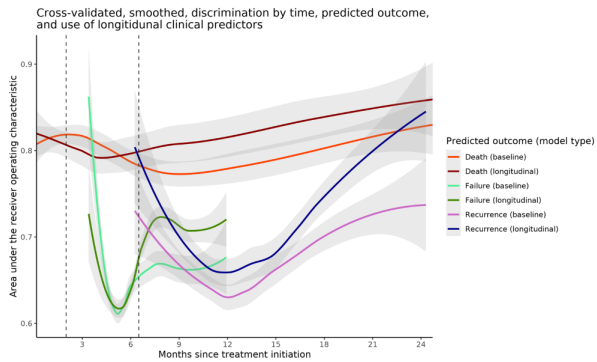
Background: Unfavorable treatment outcomes (treatment failure, recurrence, on-treatment loss to follow up, and death) frequently occur among those with pulmonary tuberculosis (PTB). Existing analyses of unfavorable treatment outcomes mostly report composite outcomes and use traditional statistical techniques.

Design/Methods: We report the prediction of unfavorable outcomes for adults (age > 15 years) with drug-susceptible PTB enrolled in Regional Prospective Observational Research for Tuberculosis (RePORT) Brazil and India cohorts (2014-2019).
Baseline and longitudinal demographics, comorbidities, symptoms, body mass index (BMI), radiology features, and laboratory tests were considered as predictors. Random forest survival models were fit to individually predict treatment failure, recurrence, and death. Longitudinal features were assessed at baseline and reassessed at treatment month 2 and 6. Patients were censored when lost to follow up or no longer at risk for a model's unfavorable outcome.
Model discrimination was assessed longitudinally, reported as the area under the curve (AUC) of the receiver operating characteristic using 10-fold cross-validation. Relative variable importance was determined by permutation importance.
Results: Among 2,530 patients considered (Brazil n=1,026; India n=1,504), unfavorable outcomes occurred in 560 (22%) participants including death (n=106; 4%), treatment failure (n=175; 7%), on-treatment loss to follow up (n=187; 7%), and recurrence (n=92; 4%). There was variability among features of greatest importance to baseline models predicting death (hemoglobin, BMI, and age), failure (BMI, age, and days to a positive culture), and recurrence (BMI, age, and HIV status).
Longitudinal clinical features after 2 months of treatment were among top predictors of models predicting death (percent weight change at 2 months), failure (culture positivity), and recurrence (fever at 2 months). Models using longitudinally updated clinical features demonstrated improved performance.



Conclusions: We used multinational TB treatment data to create models that predict individual unfavorable treatment outcomes for PTB. The most important variables for predicting unfavorable treatment outcomes changed over time and by outcome.

EP04-632-13 High accuracy RIF and INH resistance detection of M. tuberculosis based on open-system real-time PCR in Indonesia

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Background: Multidrug-resistant tuberculosis (MDR-TB) remains a public health crisis due to its existing gaps in diagnosis and treatment. In 2019, it was reported that 60% of MDR-TB cases were undetected in Indonesia, leading to low rate of treatment success. Rapid detection of Rifampicin (RIF) and Isoniazid (INH) resistant is needed to avoid risk of misdiagnosis and poor treatment outcome. The current approved rapid MDR-TB detection method offers Real-Time PCR based closed-system testing platform. While they are more user-friendly and high-throughput on detecting mutations, the closed-system platform is rather rigid and requires a dedicated instrument. Alternatively, developing an open-system method with the same abilities would accommodate more flexible testing in existing facilities, improving the treatment management for TB.
Design/Methods: A Multi-Fluorescence Real-Time PCR (MF-RT-PCR) assay was designed to detect gene region *IS6110*, *rpoB*, *katG*, and *inhA* of *Mycobacterium tuberculosis* (MTB). The limit of detection of this assay was tested on H37Ra, S531L, S315T, and –C15T bacterial isolates.
The assay was performed on sputum specimens from 52 patients with presumed TB who visited Balai Besar Kesehatan Paru Masyarakat Bandung and 49 archived samples provided by RC3ID Universitas Padjadjaran, Indonesia.
These specimens were also assessed using acid fast bacillus (AFB) smear microscopy, MTB culture drug susceptibility testing (DST), and GeneXpert assay. The assay performance was then analyzed using Fisher's exact test (χ^2).
Results: The sensitivity and specificity of MF-RT-PCR assay for detecting MTB were 100.00% and 95.74%, respectively, compared to culture with Kappa value of 0.96.
Compared to DST, the sensitivity and specificity of PCR assay to detect RIF-resistance were 97.56% and 100.00%, and for INH-resistance were 79.41% and 100.00%, respectively.

		DST (Culture)			
		Rifampicin		Isoniazid	
		Resistant	Susceptible	Resistant	Susceptible
MF-RT-PCR	Resistant	37	0	27	0
	Susceptible	1	15	4	22
		Sensitivity = 97.37% (95%CI 86.19 - 99.93) Specificity = 100.00% (95%CI 78.20 - 100.00) PPV = 100.00% (95%CI 90.51 - 100.00) NPV = 93.75% (95%CI 68.44 - 99.95)		Sensitivity = 87.10% (95%CI 70.17 - 96.37) Specificity = 100.00% (95%CI 84.56 - 100.00) PPV = 100.00% (95%CI 87.23 - 100.00) NPV = 84.62% (95%CI 68.79 - 93.21)	

Table 1. Performance of MF-RT-PCR assay for the detection of MDR-TB using DST as reference.

Conclusions: MF-RT-PCR assay demonstrated an efficient and reliable method to detect RIF- and INH-resistance to support effective treatment for MDR-TB.

EP04-633-13 Utilisation and performance of GeneXpert MTB/RIF Ultra Assay for TB diagnosis and rifampicin resistance detection in people with presumptive TB in Mombasa, Kenya (2024)

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Background: Tuberculosis (TB) remains a significant public health concern in Mombasa, Kenya, with a high burden of 320 cases per 100,000 populations. In 2017, the county adopted GeneXpert technology as the primary diagnostic tool for TB.
This study aims to evaluate the implementation and effectiveness of the Xpert MTB/RIF Ultra assay in diagnosing TB and detecting rifampicin resistance among presumptive TB patients in Mombasa during the year 2023.
Design/Methods: Data analysis was conducted by reviewing the GeneXpert laboratory registers across the nine testing sites in Mombasa County; including samples analysed. Demographic information such as gender and age distribution, as well as HIV status, were assessed. The performance of the Xpert MTB/RIF Ultra assay in diagnosing TB and detecting rifampicin resistance was evaluated.
Results: A total of 20100 samples analyzed, 96% (n=19,286) were sputum, 1.8% (n=376) were stool, and 2.2% (n=438) were other samples. Males accounted for 55% (n=11,090) of the samples, females 40% (n=8,048), and 5% (n=962) were unspecified in terms of gender. The positivity rate for Mycobacterium tuberculosis (MTB) was 9.9% (n=1,992), with 68% (n=1,354) males, 26% (n=516) females, and 6% (n=122) unspecified in gender. Among those co-infected with HIV (8.2%, n=1,654), the positivity rate was 9.4% (n=155).
Additionally, 2.2% (n=43) of the positive samples exhibited resistance to rifampicin, with 70% (n=30) males, 14% (n=6) females, and 16% (n=7) unspecified in gender. Among HIV co-infected individuals, resistance was observed in 0.6% (n=1) of cases.
Conclusions: The Xpert MTB/RIF Ultra assay demonstrated effectiveness in diagnosing TB and detecting rifampicin resistance among presumptive TB patients in Mombasa, Kenya, in 2023. The assay's utilization contributed to the efficient diagnosis and management of TB cases, supporting the county's efforts in combating the TB burden. Continued investment in diagnostic technologies and strengthening laboratory networks is crucial for improving TB control programs in high-burden settings like Mombasa.

EP04-634-13 Feasibility of stool-based testing for TB and contribution to childhood TB notification: Case study from Karonga district, Malawi

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Background and challenges to implementation: Childhood TB is underdiagnosed and Malawi contributed only 9% in 2021. Due to difficulties in collecting specimens and negative test results for the paucibacillary nature of the disease. In 2020, the World Health Organization (WHO) recommended in its rapid communication, the use of stool as non-invasive primary diagnostic samples for testing with Expert Ultra for TB diagnosis among Children. In Malawi, chest X-rays, careful history, and clinical examination are the main supportive diagnostic tools for pediatric TB.
Intervention or response: Karonga District Hospital started testing using stool TB in November 2022 following training of laboratory officers, clinicians, nurses and TB officers. All children aged 0-14 years with signs and symptoms suggestive of TB at OPD and wards were documented in the presumptive register and they were asked to submit stool samples, which was processed with a simple one-step (SOS) method and tested with Expert MTB/Ultra cartilages. Onsite supportive supervision and mentorship by the national and zone supervisors were periodically being conducted to laboratory officers, clinicians, nurses and TB officers.
Results/Impact: The results in Table 1; show 4,245 children that were screened from November 2022 to June 2023 and 237 were identified as presumptive and tested on stool. Out of these,38 children were diagnosed with TB and 4 were identified with rifampicin resistance.

Indicator	Males	Females	Total
Number screened for TB	2,013	2,232	4,245
Number screened positive	111	126	237
Number tested stool	111	126	237
Number positive on stool	21	17	38
Number diagnosed with Rifampicin Resistance (RR-TB)	2	2	4

Table 1. Pediatric TB through stool-based Expert method.

Conclusions: Stool test has shown that it's one of the innovative diagnostic methods as it is feasible to diagnose TB and rifampicin resistance in children using stool as a way of reducing childhood illness and death. This pediatric TB patients would have been missed. Therefore, it has to be accessible to all the patients to improve case notification in children.

EP04-635-13 Analysing the TB positivity rate from stool sample referral in children: A data analysis of 2023 trends in Imo State, Nigeria

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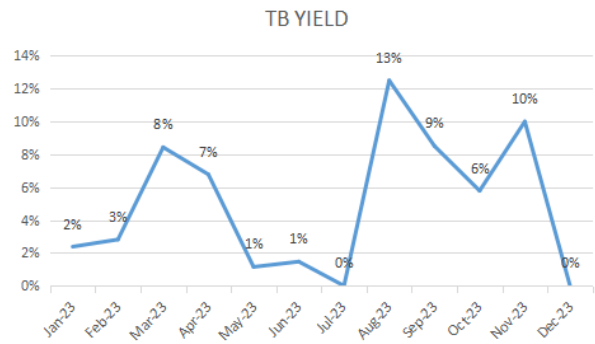
Background and challenges to implementation: Diagnosing tuberculosis in children using stool sample is an auspicious strategy towards combatting childhood tuberculosis in Nigeria. KNCV Nigeria through the TB LON project have advocated for stool-based tests in improving tuberculosis case detection in children. A study to determine the impact of the strategy was conducted in Imo state by focusing on total children stool sample referred and tested using Xpert MTB/RIF assay and its subsequent tuberculosis case yield. The study centred on data from the TB LON project in Imo state for the period of January to December 2023.
Intervention or response: The data for study was extracted from the database of the TB LON project with attention on total children stool sample referred, tested and its positivity rate from the Xpert MTB/RIF assay platforms in Imo state from January to December 2023.
Results/Impact: 894 stool sample from children were referred and tested, 50 mycobacterium tuberculosis were detected with a positivity rate of 6% observed.



Conclusions: The result adds credence to the promising strategy of diagnosing tuberculosis in children using stool. More sensitization and advocacy of the advantages of stool test using Xpert MTB-RIF assay is recommended with the impression that it will boost children tuberculosis case detection rate in Imo state.

EP04-636-13 Identification of recent M. tuberculosis exposure using plasma proteome profiling: A pilot study

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Background: Recent infection with Mycobacterium tuberculosis (M.tb) poses a higher risk of progressing to active tuberculosis (TB), in contrast to individuals with pre-existing remote infection.
The objective of this study was to evaluate the potential of plasma proteomic signatures in identifying individuals recently exposed to TB, thereby serving as a proxy indicator for newly acquired infection.
Design/Methods: Mass spectrometry (MS)-based proteomics workflow with data-independent acquisition scheme was employed to capture plasma protein expression profiles. These profiles were compared among individuals at high risk (26 TB household contact persons) and low risk (26 LTBI cases identified through routine health check-up) of recent TB exposure.
The differences between these LTBI and active TB cases (n=26) were also examined. Proteins with fold-change >1.5 and false discovery rate adjusted p-value < 0.05 were filtered as differentially expressed proteins (DEPs). Random Forest algorithms were employed to identify significant features. Model performance was assessed by evaluating receiver operating characteristic (ROC) curves using the support vector machine algorithm.
Results: Over 2,000 human proteins were quantified in the participants. Pairwise comparisons among all three groups identified 38 DEPs, enriched in pathways related to phagosomes, gap junctions, and motor proteins.
When combined with machine learning, a protein panel consisting of semaphorin-4B (SEM4B), integrin beta-2 (ITB2), integrin beta-5 (ITB5), and serine/threonine-protein kinase OSR1 (OXSR1) as the most discriminating features, was sufficient to classify exposure risk and disease state.
ROC analysis showed that this combination of protein biomarkers achieved an AUC value of 0.983 (95% CI = 0.871-1.000) in discriminating different risks of recent TB exposure, with AUC values exceeding 0.9 in distinguishing LTBI from active TB cases.
Conclusions: These findings reveal the prospective utility of blood-based protein signature as biomarkers for identifying individuals with recently acquired LTBI, providing a rationale for risk stratification to enhance the targeting of interventions for LTBI.

EP05 Progressing towards TB elimination

EP05-637-13 Enhanced TB notifications and positivity rates with AI-based screening in remote Mon District of Nagaland, India: A post-deployment study

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Background and challenges to implementation: Mon District, located in the northeastern state of Nagaland, India, bears the third highest burden of TB in the region, however it lacks a radiologist. Despite challenges related to geographical constraints, access, and limited healthcare services, Mon District Hospital treats approximately 600 TB patients every year through its District TB centre.
Intervention or response: The artificial intelligence software, qXR for chest X-ray interpretation, and the Qure care coordination application were deployed at the hospital starting from January 2022 to aid with TB case finding. Images of chest X-ray films were uploaded and analysed by qXR to detect radiological signs of TB, in addition to sputum samples being collected from presumptive TB patients for microbiological confirmation using GeneXpert or AFB smear test. As per the national TB guidelines, TB treatment was further initiated for patients confirmed as TB-positive and followed by clinical evaluation by district TB officer.
Results/Impact: Between January 2022 and December 2023, a retrospective analysis of chest X-rays from 900 patients was conducted, and qXR flagged 500 patients (55.5%) as presumptive TB cases. Sputum samples were collected from 483 (97%) of these patients, and 313 (65%) were confirmed positive for TB and initiated on treatment. Following AI deployment, case notifications increased by 22% in 2022 and by 18.1% in 2023 compared to the baseline notifications in 2021.
Using final TB diagnosis as the ground truth, the negative predictive value (NPV) and positive predictive value (PPV) of qXR were found to be 0.97 (95% CI: 0.94-0.98) and 0.63 (95% CI: 0.58-0.67), respectively.
Conclusions: The increase in TB notifications post AI deployment validates the clinical utility of AI in resource constrained environments where no radiologist is present. AI can act as a clinical aid to physicians for improved TB case finding.

EP05-638-13 Machine learning models for pleural TB diagnosis

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Background: Artificial intelligence and machine learning methods are increasingly used in medicine. Very few machine learning models are available to predict the diagnosis of extrapulmonary forms of tuberculosis (TB). The aim of this study was to develop and validate machine learning models to predict the diagnosis of pleural TB.
Design/Methods: Data from patients followed up at Jamot Hospital in Yaoundé and Polymere Medical Center in Yaoundé from May 2018 to June 2022 (50 months) for exudative non-purulent pleural effusion were used.
Machine learning algorithms tested were random forest (RF), gradient boosting (GB), logistic regression (LR), k-nearest neighbors (KNN). The average F1 score over the two categories of target variable (TB or not TB) and AUC-ROC were used as the main criteria for selecting the best models.
Results: Of the 302 patients included, 174 (57.6%) were male and their median age (25th-75th percentiles) was 46 (34-61) years. A total of 178 (58.9%) participants had pleural TB and 124 (41.1%) had another cause of non-purulent exudative pleurisy including 48 (15.9%) pleural metastasis.
Variables significantly associated with pleural TB were age, HIV infection, body mass index, cancer history, pleural protein level, pleural lactic dehydrogenase (LDH) level and pleural C-reactive protein (CRP) level. Of the machine learning algorithms tested, logistic regression and random forest performed best, with average F1 scores of 0.77 and 0.74 respectively (corresponding to a recall of 81% and 76% respectively) in the test set. The Area Under the Receiver Operating Characteristic Curve (AUC-ROC) was 0.82 for all the models tested (Figure 1) except for k-nearest neighbor (0.71) in the test set.

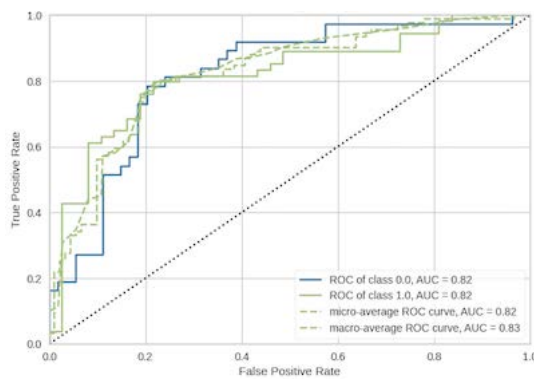

Figure1: ROC curves for logistic regression.

Conclusions: Machine learning methods, in particular logistic regression and random forest , can help improve the diagnosis of pleural TB.

EP05-639-13 Analysis of the health system delay among people with pulmonary TB in Namibia: A cross-sectional preliminary study

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Background: Prospective Sequencing (PROSEQ) is an ongoing surveillance study focusing on sequencing all rifampicin-resistant (RR) cases in Namibia. Namibia integrated GeneXpert into the tuberculosis (TB) diagnostic algorithm in 2017. Namibia utilises Laboratory Information systems on MEDITECH EMR software and eTB Manager desktop-based tool to manage RR cases. Delays within the health systems exacerbate TB outcomes, leading to drug-resistant strains, community transmission, and worsening prognosis. Health system delay (HSD) is defined as the time interval (number of days) between the first consultation at a formal healthcare facility to the time of treatment initiation. We aimed to analyse regional differences in the HSD in Namibia.
Design/Methods: We conducted a cross-sectional study using EHR from MediTech and eTB Manager for the PROSEQ study. Quantitative data analysis was performed using R statistical software.

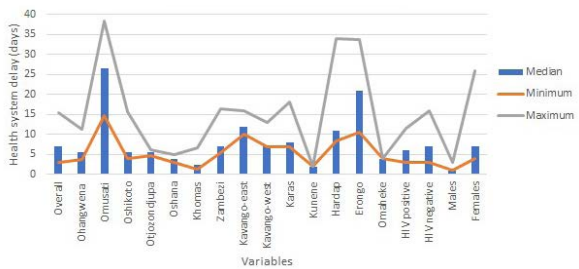

Figure. Health system delay in Namibia.

Results: Analysis of 200 RR pulmonary TB patient records from January 31, 2019, to January 11, 2021, revealed a median age of 39 years, with 45.5% males and 54.5% females. HIV status distribution was 34.0% positive, 52.5% negative, and 13.5% unknown. The HSD for the country was 7 (IQR: 3-15.5) days. Regional variations in HSD were observed, with Omusati and Kunene recording the highest and lowest HSD at 26.5 (IQR: 14.8-38.2) days and 2 (IQR: 2-2) days, respectively. HSD for females was seven times higher than males, at 7 (IQR: 4-26) days and 1 (IQR: 1-3) days, respectively.
Conclusions: We hypothesise that women may prioritize domestic responsibilities over healthcare-seeking. Future investigations will delve into elucidating the determinants behind regional and gender disparities in TB HSD and to further develop tailored strategies to effectively address these disparities.

EP05-640-13 Use of the Lung Flute ECO to assist in sputum collection for TB detection among people attending health facilities: A randomised crossover trial

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Background: The Lung Flute ECO is a self-powered, portable, low-cost device that assists in the collection of sputum and is well tolerated. We aimed to evaluate whether the use of the Lung Flute ECO increased the detection of TB among people with TB symptoms attending health facilities.
Design/Methods: This randomized, two-period crossover trial was conducted at ten hospitals in Cameroon from August 2022 to June 2023. In intervention A, participants received 3 minutes of video instruction on sputum collection for TB testing. In intervention B, participants were provided with the Lung Flute ECO device together with video instruction. Participants were randomised 1:1 to sequence A-B or sequence B-A; after each intervention, the collected sputum was tested for TB. The primary outcome was the proportion of people who tested positive on the Xpert MTB/RIF Ultra assay.
Results: A total of 9,250 people were enrolled. In an interim analysis of the first 4,670 participants, 481 (10.3%) had TB detected on the Xpert MTB/RIF Ultra assay. Among people in whom TB was detected in only one sputum specimen, TB was detected from a greater proportion of the participants after use of the Lung Flute ECO versus after video instruction only (82/4,670 (1.8%) vs 54/4,670 (1.2%)); TB was detected in both sputum specimens collected from 345 (7.4%) participants.
Conclusions: Preliminary results suggest that use of the Lung Flute ECO device to assist in sputum collection may help to increase the detection of TB among people to be

evaluated for TB as compared to video instruction alone. Full analyses of the diagnostic outcome and costing and cost effectiveness assessments are ongoing.

EP05-642-13 Performance of a stool quantitative polymerase chain reaction assay for pediatric TB detection

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Background: Children have paucibacillary tuberculosis and cannot provide expectorated sputum. Invasive specimen collection, by gastric aspiration or sputum induction, has a low diagnostic yield.
In this study, we aimed to evaluate the diagnostic performance and additive yield of a novel stool-based assay in children diagnosed with tuberculosis in sub-Saharan Africa.
Design/Methods: We conducted a prospective case-control study from October 7, 2020 to June 26, 2023 in Eswatini, Mozambique, and Tanzania. All children under 15 years old and enrolled as tuberculosis cases completed clinical examination, chest radiography, sputum culture, sputum Xpert Ultra, stool Xpert Ultra, and stool-based quantitative polymerase chain reaction (stool qPCR) assessment. Sensitivity of the stool qPCR was calculated against sputum culture, a composite microbiological reference standard, and a clinical reference standard. Specificity was calculated in a control population of healthy, TB disease-free, child household contacts of tuberculosis index cases.
Results: The study included 456 children, 232 diagnosed with TB and 224 controls. Stool sample collection was achieved in 95.6% of children. The qPCR was positive in 17.2% (40/232) of clinically diagnosed participants. In the same population, the test positivity was 8% (13/162) for culture, 13.4% (27/202) sputum Xpert Ultra, and 14.8% (33/223) stool Xpert Ultra.
When compared to a microbiological reference standard consisting of any positive test among culture, sputum Xpert Ultra, stool Xpert Ultra, and urine lipoarabinomannan (LAM) among children living with HIV, the sensitivity of stool qPCR was of 35.6% (21/59).
The specificity in the control population was 95.6% (195/204). The additive yield of qPCR when all tests were performed was of 8.7%.
Conclusions: This novel stool qPCR assay can increase the microbiologic confirmation of tuberculosis in pediatric populations from TB high-burden settings.
It may be particularly useful where resource limitations or clinical capacity impedes diagnostic specimen collection via sputum induction or gastric aspiration.

EP05-643-13 Bridging clinical TB diagnosis gaps with XMAP platform and portable digital X-ray machines: The KNCV Nigeria perspective

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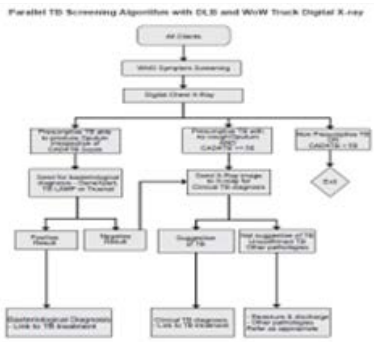
Background and challenges to implementation: Tuberculosis (TB) remains a significant global health challenge, particularly in regions with limited healthcare infrastructure such as Nigeria. Despite advancements in diagnostic technologies, TB diagnosis still faces substantial gaps, especially in resource-constrained settings where laboratory facilities and trained personnel are scarce.
In response to these challenges, KNCV Nigeria, a leading organization in the fight against TB, has implemented innovative strategies in Nigeria to bridge clinical TB diagnosis gaps, leveraging the XMAP platform and portable digital X-ray machines.
The aim of this study is to showcase the rationale behind clinically driven TB diagnosis and the pivotal role of technology in enhancing detection rates, with a focus on the KNCV Nigerian context.
Intervention or response: Machines were designed to be user-friendly and operatable by trained healthcare personnel, even in remote or resource-limited settings. Based on the PDX parallel algorithm for screening with AI, all sputum results from clients that were TB negative using rapid molecular diagnostic tool and including those clients that could not produce sputum were sent to the XMAP digital reporting platform where clinician provides outcome within a shorter turnaround time compared to other methods of clinical TB diagnosis

STATES	# Screened	# Presumptive	Unable to produce sputum	# presumptive Evaluated with GENXPERT, TB LAMP, TRUENAT ETC	# Diagnosed with GENXPERT, TB LAMP, TRUENAT ETC	Referred to XMAP	#Diagnosed from XMAP
Benue PDX	20449	1339	2	1337	115	1224	251
Cross River PDX	12334	1749	29	1720	40	1709	100
Delta PDX	14325	1419	0	1419	125	1294	166
Kano PDX	46000	2795	3	2792	747	2048	183
Katsina PDX	12563	621	0	621	67	554	114
Nasarawa PDX	10183	1518	0	1518	128	1390	168
Total	115854	9441	34	9407	1222	8219	982

Table. Clinical TB yield by states PDX machines.



Results/Impact: A one-year results across 6 states shows that of the 8,219 X-ray films sent to XMAP for review, a total of 982 clients thought to be initially missed of TB were clinically diagnosed through the XMAP system. The table below shows the results and workflow.
Conclusions: Leveraging innovative diagnostic technologies such as XMAP, alongside existing molecular diagnostic methods, can significantly contribute to improving TB diagnosis rates and enhancing TB control efforts across Nigeria. Efforts should focus on expanding access to XMAP, strengthening healthcare worker capacity, and optimizing referral systems to maximize its impact in diagnosing TB cases and ultimately reducing the burden of TB in the country.

EP05-644-13 Low Xpert Ultra specificity for rifampicin resistance in a nationwide diagnostic confirmation study benefits from isoniazid resistance testing

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Background: The rollout of Xpert MTB/RIF Ultra (Ultra) in Rwanda, starting February 2022, aimed to enhance sensitivity for tuberculosis (TB) detection and improve specificity of rifampicin-resistance (RR) detection over its predecessor, Xpert MTB/RIF.
Design/Methods: We conducted a nationwide observational study from December 2021 to February 2024 involving patients enrolled on RR-TB treatment. We repeated Ultra and used *rpoB* Sanger and whole genome sequencing alongside phenotypic drug-susceptibility testing to ascertain the final susceptibility status for rifampicin and other drugs, including INH.
Results: Among 153 patients enrolled on RR-TB treatment, 129 were initially diagnosed with RR-TB by Ultra. Repeat Ultra testing re-classified only 41 of 129 cases (32%) as RR-TB. Of these 41 cases, 36 had reference test results available, all confirmed as true-RR . Among the other 88 patients (68%) not showing as RR-TB upon Ultra retesting, 57 had reference method results available. Of these 57, seven (12%) were true-RR, including five with very-low bacillary load that had additional INH resistance. Conversely, 50 (88%) of these 57 patients were rifampicin susceptible by a reference method, hence falsely identified as RR by the initial Ultra. Notably, 45 (94%) had very-low bacillary loads. INH resistance testing, conducted for 35 of these 45 very low, false-RR cases, identified 34 (97%) as INH-sensitive. This indicates a high potential of INH susceptibility reliably ruling out false-RR diagnoses in patients exhibiting very-low bacterial loads alongside discordant repeated Ultra results, with a specificity of 97% (CI:85-95%).
Conclusions: Our study reveals that Ultra yields concerningly high false-RR rates, particularly in paucibacillary samples, challenging its expected improvement in specificity. This finding underscores the need to refine diagnostic protocols and avert unnecessary RR-TB treatments. In Rwanda, most RR are INH-resistant, with demonstrated high accuracy in identifying true RR among patients with very-low bacillary loads and inconsistent or unconfirmed repeated Ultra results.

EP05-645-13 Two-tier ensemble transfer learning method for pulmonary TB detection based on chest radiograph

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Background: Deep Learning (DL) is now extensively used to create Artificial Intelligence (AI) tools for interpreting image data from chest radiographs (CXR). However, it is an evolving technology with scope for substantial improvement in the accuracy of existing tools. Transfer Learning (TL) is a promising approach to address the substantial data volume demands inherent in DL. This methodology leverages the knowledge acquired by a model that has been pre-trained on a comprehensive general-purpose dataset and applies it to a new domain

with a smaller, domain-specific task dataset. In this context, we introduce a two-tier ensemble Transfer Learning method tailored for the detection of pulmonary tuberculosis (PTB) using CXR images.

Design/Methods: In the first tier of our proposed method, we conducted experiments with an ensemble of classifiers trained on features extracted from various intermediate layers of a pretrained model (PTM). Subsequently, models built from each intermediate layer were amalgamated to obtain the final classification outcome in the second tier. We assessed the accuracy of our approach using two publicly accessible TB radiology datasets: the Montgomery County (MC, n=138) and Shenzhen (SZ, n=662). We used four variants of EfficientNets (B0, B1, B2, and B3) as classifiers. To gauge the performance of our proposed method, we measured accuracy using 5-fold cross-validation.

Results: Compared to the conventional direct usage of a PTM with various EfficientNets' architectures, our proposed two-tier ensemble TL method consistently demonstrates superior accuracy results (all > 91%) across both the MC and SZ datasets (Table 1).

EfficientNets	Direct Method		Proposed Ensemble Method*	
	MC	SZ	MC	SZ
B0	80.42	84.59	92.03	91.39
B1	90.58	86.55	92.80	91.39
B2	85.56	85.95	92.83	91.54
B3	88.44	85.34	93.54	92.45

Table 1. Accuracies of direct versus proposed methods (5-fold cross-validation)
**Proposed method: ensemble models extracted from three intermediate layers.*

Conclusions: This novel two-tier ensemble TL method applied to DL improves the accuracy of AI interpretation of CXRs for the detection of PTB.

EP05-646-13 AI-supported screening for pulmonary TB using cough sounds and symptoms: Initial findings from India under National TB Elimination Program

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Background and challenges to implementation: As per Global and India TB Reports 2023, 3.1 million (29.2%) and 0.36 million (13%) persons with TB were not diagnosed globally and in India, respectively, primarily due to limited accessibility and availability for screening and diagnostic tools in resource-limited settings. Paper-based information flow and subjective communication on symptomatic screening yield suboptimal case detection, leading to continued transmission of infection.

Intervention or response: The Cough Against TB (CAT) was developed using data from 15,687 patients in 2022, with further enhancements in 2023, and performed with a 90% sensitivity and 67% specificity for identifying diagnosed TB cases.

After obtaining approval from NTEP, health personnel were trained on CAT, which involves recording three solicited cough sounds, background noise, and relevant symptoms to generate a risk score expressed as either „Presumptive" or „Non-Presumptive" based on predefined thresholds. Persons with presumed TB are then directed by NTEP staff for confirmatory tests and physician consultations.

Results/Impact: From April 2023 to March 2024, the CAT was implemented in selected geographies across five states/Union Territories. During this period, 93,884 patients in healthcare facilities or individuals in the community underwent screening, identifying 11,916 (13%) as presumptive cases.

Despite facing numerous challenges, 4,273 (35%) underwent testing, leading to diagnosis of 160 (4%) persons with TB. Without the CAT, conventional screening methods would have detected only 135 cases, indicating a 19% increase in identification with the use of the CAT.

Conclusions: AI holds significant promise in improving the efficiency of healthcare systems through the provision of streamlined, point-of-care solutions. Large-scale adoption of the CAT could improve TB screening and diagnosis, ultimately reducing the disease's burden. However, several issues must be addressed for widespread deploy-

ment, including gaining broader acceptance, optimizing costs, and making necessary modifications to existing guidelines,

EP06 Active case finding: Experiences from across the world

EP06-647-13 Evaluating the yield and impact of an active case finding intervention for TB in ethnic minority and remote communities in Vietnam

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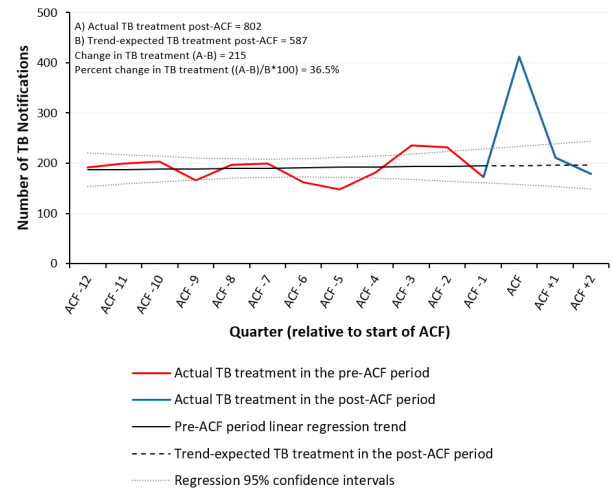
Background: Ethnic minority communities and people living in remote areas of Vietnam often face barriers when trying to access healthcare, resulting in delayed and/or missed TB diagnoses. These barriers were intensified by social distancing restrictions during the COVID-19 pandemic.
Design/Methods: 146 active case finding (ACF) events for TB were organized across five provinces of Vietnam between December 2021 and March 2023. Community members were screened using chest X-rays (CXRs), which were interpreted by an on-site radiologist. Participants with abnormal CXRs were tested with the Xpert MTB/RIF Ultra or Truenat MTB Plus assay, and those diagnosed with TB were linked to care. TB treatment initiation data were collected from the intervention District TB Units (DTUs) for 12 quarters before ACF and were used to establish a linear trend regression, with 95% confidence intervals, which estimated the expected levels of TB treatment post-ACF. Actual treatment data during the post-intervention period were compared against the trend-expected estimates to assess improvements in TB treatment coverage.
Results: A total of 40,513 people were screened by CXR, resulting in the detection of 2,463 (6.1%) participants with an abnormal CXR result. 2,357 (95.7%) participants were then tested and 287 (12.2%) had an MTB-positive result. An additional 85 participants were clinically diagnosed with TB after the ACF events, bringing the total number of those diagnosed with all forms of TB to 372 (detection rate = 918 per 100,000 screened); 346 (93.0%) people with TB were linked to appropriate treatment. These ACF events resulted in a 36.5% increase in actual TB treatment at the intervention DTUs compared to trend expectations.



Conclusions: Community-based ACF can improve TB detection and linkage to treatment in ethnic minority and remote settings in Vietnam. Further studies may consider assessing TB treatment success rates for people detected at ACF events and the cost effectiveness of this intervention.

EP06-648-13 Augmenting TB contact investigation in the Kulob region of Tajikistan with engagement of civil society

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Background and challenges to implementation: Tuberculosis Contact Investigation (TBCI) provides a crucial opportunity for an integrated early TB and TB infection (TBI) detection and case management system, and interruption of transmission.
However, stigma associated with TB, challenges in access to symptom screening and chest X-ray (CXR), and coordination required between different layers of the health system often cause delay in implementing quality TBCI interventions.
Intervention or response: The USAID End TB Tajikistan Activity engaged eight Civil Society Organizations (CSOs) to support NTP across the country in effectively implementing TBCI. One of the engaged CSOs, SVON Plus, received comprehensive training on TB, and is working in five districts of the Kulob region. They support all key stakeholders – the State Sanitary and Epidemiology Service, Primary Health Care and TB centers on the ground to enhance TBCI by improving access for systematic eval-

uation of contact persons. Ultra-portable X-ray systems with Computer Aided Detection - Artificial Intelligence are deployed for CXR screening of contact persons.

Results/Impact: Between April and December 2023, 4,530 contacts were screened with CXRs in the five districts of Kulob region of Tajikistan and 180 individuals with presumed TB were tested with GeneXpert.

Overall, TB was detected in 89 people (2% of the screened contacts), including two with drug-resistant TB. TBI was identified in 47 individuals (by Mantoux skin test). All 89 (100%) individuals with TB and 47 (100%) individuals with TBI were initiated on appropriate treatment regimens. These efforts resulted in a 12% increase in total TB notifications from April-December 2023 in comparison to the same period of 2022 in the targeted five districts.

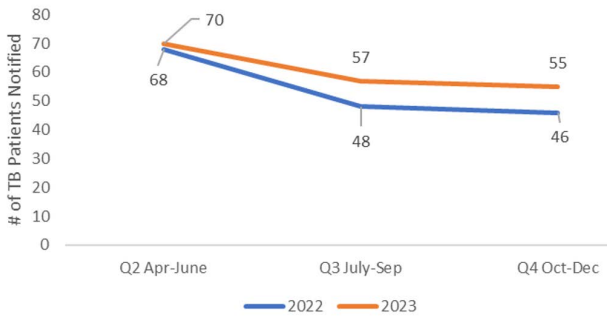

Figure. TB notification in five districts of the Kulob region, quarters 2-4, 2022-2023.

Conclusions: TBCI has proven an effective TB and TBI case finding intervention in Tajikistan. CSOs played a critical role in providing field implementation support to the key health departments which resulted in overcoming the barriers for an enhanced implementation of TBCI in the Kulob region.

EP06-649-13 Cough syrup surveillance: An innovative intensified TB case finding intervention in Himachal Pradesh, India

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Background and challenges to implementation: Intensified Tuberculosis case finding (ICF) is an essential strategy under the National Strategic Plan to end TB in India. A high volume of cough syrups is dispensed in public health facilities; hence a novel strategy of cough syrup surveillance was devised to carry out opportunistic screening for TB.

The study aims to assess the impact of this strategy on TB case finding in the state.

Intervention or response: Under cough syrup surveillance, the state directed pharmacy officers in every public health facility to record and report details of the people to whom cough syrups were dispensed, name of the cough syrup, and the quantity supplied.

Additionally, among the persons consuming cough syrup, verbal screening was carried out by pharmacy officers and those with prolonged (>2 weeks) productive cough were to be tested for TB at the TB detection centers (TDC). The study has quantitatively assessed the i) coverage of this intervention, ii) diagnostic yield, and iii) contribution to the state's presumptive tested.

Results/Impact: Between October 2023 to March 2024, over 129044 cough syrups were dispensed to people in public health facilities of the state, out of which 59360 (46%) had prolonged (>2 weeks) productive cough, among them 50456 (84%) were tested in TDCs for TB.

The presumptive tested through this intervention significantly contributed to 13.3% of the state's presumptive tested for TB. Those diagnosed as a result of this ICF contributed to 254 (3.7%) of the state's TB notification.

Conclusions: Cough syrup surveillance facilitates an opportunistic screening for TB among the population with a high TB burden (203 Persons with TB per 100,000 in 2023). It is an effective intensified TB case-finding intervention and is scalable at all levels including private chemists and drug retailers selling cough syrups to accelerate the achievement of end-TB goals in resource-constrained geographies.

EP06-650-13 Contribution of community health workers in strengthening community system to recover the ignificant gap through enhancing case finding with the support of C19RM funding

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Background and challenges to implementation: During the emerging threats of COVID-19, the overall burden of Tuberculosis (TB), Malaria and HIV increased because of significant decline in testing compared to the previous years. The activities of national programs for these diseases were adversely impacted due to disruption in regular outreach activities such as active case finding, contact investigation for TB, Long Lasting Insecticidal Nets (LLIN) distribution for Malaria; and condom promotion for HIV. Despite the services provided by the public and private sector, it became a crucial need to reinforce the community health system to fight against TB, Malaria and HIV as well as COVID-19 to mitigate the evolving gap.
Intervention or response: Addressing the crisis during the pandemic, BRAC recruited Community Health Workers (CHWs) under the COVID-19 Response Mechanism (C19RM) funding between 2021 and 2023 to provide integrated people centered services for TB, Malaria, HIV and COVID-19 with a more cost effective and efficient approach. CHWs were provided training for prompt and effective efforts in identifying presumptive, ensuring sputum transportation, referral and testing to overcome the existing gap through household visit, mobilization and raising health awareness among community people including vulnerable and marginalized groups.
Results/Impact: From 2021 to 2023, a total number of 17119, 13090 and 29659 TB cases were contributed by the CHWs in the national program. Number of COVID-19 positive cases were 351, 239 and 37 which significantly decreased in the last three successive years. Moreover, there were significant contribution in malaria case detection from 2021 to 2023.

Year	Number of CHWs	Number of TB Presumptive identified by CHW	Number of TB cases detected	Number of HIV screening done among TB patients	Referred for COVID-19 Test	Number of COVID-19 test done	Number of COVID-19 positive cases	Number of Malaria Suspects tested	Number of Malaria cases identified and treated
2021	554	340579	17119	1195	17676	10571	351	5482	45
2022	661	432142	13090	3076	27795	14382	239	19277	70
2023	1109	799483	29659	13135	19935	6725	37	28420	81

Conclusions: Being the people of the same community, CHWs can play a pivotal role even amidst of social stigma, fear and economic instability to reach the community people to ensure health care and mitigate the existing crisis of the national programs left by the deadly pandemic.

EP06-651-13 Reaching the unreached through social media CareConnect Chatbot: Experiences from Myanmar

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Background and challenges to implementation: Myanmar prioritizes finding missing people with TB due to its high TB burden. Stigma and lack of awareness about TB contribute to delays in diagnosis and treatment, hindering efforts to find missing TB patients. Since 2020, in-person active case findings have been limited by COVID-19 and local security laws, leading to a significant decrease in TB case notifications nationwide, impacting PSI/Myanmar's TB implementation areas.
Intervention or response: To overcome this challenge, PSI is reaching people through online social media platforms and TB self-screening chatbot started in April 2023. Through PSI's own Facebook page, PSI/Myanmar reached clients who might need essential services for TB and launched TB self-screening chatbot, namely "CareConnect".
The aim of this pathway is to identify presumptive TB and provide personalized and comprehensive support. Consumers with limited digital literacy may reach out via the hotline service. Providing TB knowledge, screening TB symptoms, and referring presumptive clients to the nearest TB facilities and assisted refer of outreach workers are services included in CareConnect platform.
Results/Impact: From April 2023 to March 2024, 963 clients visited the platform for general TB information, with 725 seeking TB screening services through the affiliated hotline and completing the TB self-check Chatbot. Among those seeking TB symptoms screening services, 311 had TB symptoms and were referred for further diagnosis and treatment. Among them, 77 patients had successfully done TB evaluation and 16 confirmed TB patients received TB treatment and care.
Conclusions: Clients who were unable to be reached for in-person service and care benefited from the PSI's social media platform, which provided quality comprehensive care on time.
As a result, this creative and novel approach not only contributes to the identification of the presumptive TB but also coordinates and adapts to the requirements of the beneficiaries by increasing their knowledge and confidence in managing their health and treatment.

EP06-652-13 Who are the missing people with TB in Cambodia?

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Background and challenges to implementation: Finding TB cases in Cambodia is one of the key challenges. The national program has reported that an estimated 35% of TB cases have not yet been identified. The disease's prevalence may rise as the country's population matures due to a lack of quality TB diagnosis tools, health care management, and accessibility of TB service providers.
Intervention or response: Community Mobilization Initiatives to End Tuberculosis (COMMIT) is a five-year USAID-funded project that implements a multi-prong approach using locally generated solutions and community engagements to improve TB case finding, TB prevention, linkage to diagnosis, and treatment support in Cambodia.
It has adopted various effective models of TB case-finding programs by placing services closest to the point of need. The elderly aged 55 or older, close contact with pulmonary TB, diabetes, and everyone who has TB symptom(s) have been screened by chest X-ray and Xpert MTB/RIF.
Results/Impact: In the 12-month period of intervention, the number of all-form TB cases and bacteriologically confirmed cases increased by +315% (674) and +324% (340) compared to the same period in 2022 (214 and 105), a year before intervention, respectively. In 2022, 70.1% of the total cases are self-referral, 25.2% are by community, and 4.7% are from others.
The percentage has changed during the intervention period. 26.3% by self-referral, 30.7% by community, and 42.4% by active case finding (ACF). More than 69% of the people tested were aged 55 or older, and 60% of all age TB cases were men.
Conclusions: Putting quality TB services closest to the point of need was able to increase TB diagnosis, treatment initiation, and treatment outcomes in a key population with high TB prevalence.

EP06-653-13 Impact of an innovative community-based active case finding intervention on TB screening and diagnosis: A practical experience for Malawi

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Background and challenges to implementation: Malawi still has a 29% gap in TB case notification (Global TB Report, 2022) and is categorized as one of the highest TB/HIV burden countries in Africa. The National TB Elimination Program is closing the gap by implementing creative active TB case-finding (ACF) interventions. To aid in early TB diagnosis, the World Health Organization recommends utilization of chest X-ray (CXR) screening on TB patients who are asymptomatic. In light of these, Malawi piloted the use of artificial intelligence-powered mobile digital X-rays for tuberculosis ACF in four major cities in 2018. The intervention targeted high-risk populations and is being scaled up nationwide based on the lessons discovered during the first year(2018) of implementation.
Intervention or response: The intervention used CXR and TB symptom screening questionnaires for all clients targeted under this intervention. Individuals aged 15 years and above with either fever, weight loss, cough and night sweats of any duration or with a CAD4TB score of >60 were considered TB presumptive. An Xpert MTB Rif Ultra was used onsite to test each sample. All diagnosed with TB were linked to treatment facilities.
Results/Impact: From March 2018 to December 2023, routine program quantitative data was analyzed (Figure 1); 628,822 (Males = 338,557; Females = 290,265) clients were screened for TB; 69,458 (Males = 41,805; Females = 27,653) Presumptive TB cases were found; presumptive categories included; 29,880 with symptom positive only, 21,756 with abnormal CXR only, and 17,822 with both abnormal CXR and symptom positive. Of the cases detected, 6,381 (Males =4,507; Females =1,874) had active tuberculosis, and 96% of them started treatment.

TB Screening Outcomes	Male	Female	Total
Clients screened for TB	338,557	290,265	628,822
Total presumptive TB Cases	41,805	27,653	69,458
Pres.TB (Symptom screening only)	17,738	12,142	29,880
Pres.TB (CXR Screening only)	13,155	8,601	21,756
Pres. TB (both CXR & Symptom screening)	10,912	6,910	17,822
Proportion of Pres.TB with Xpert Test	79%	78%	79%
Bact. Confirmed TB cases(MTB+ Rif -)	1,826	581	2,407
Bact. Confirmed TB cases(MTB+ Rif +)	20	10	30
Clinically Diagnosed TB Cases	2,661	1,283	3,944
All TB cases diagnosed	4,507	1,874	6,381
Yield per 100,000	1,331	646	1,015
Number Need to Screen (NNS)	75	155	99

Figure 1. TB screening outcomes and yield for high-risk population (Yr. 2018-2023).

Conclusions: The intervention is ideal and feasible for implementation at the community level, which includes hard-to-reach places and is very efficient in identifying

missing TB cases among high-risk populations, including men. It is highly recommendable for replication in the region and across the world.

EP06-654-13 Community health workers are instrumental in access to quality TB care and services: Active case finding in community TB hotspots in Amref Tanzania

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Background and challenges to implementation: According to WHO TB Global Report (2023); Tanzania is among the 30 high burden countries in the world with 78% TB treatment coverage which leaves about 32% of the estimated TB cases undiagnosed. Amref Health Africa Tanzania's in collaboration with NTLP through Afya Shirikishi project is implementing community-based TB services aiming at finding missing people with TB among vulnerable, underserved and at-risk population for TB.
Intervention or response: The project trained 735 community health workers (CHWs) to find missing people with TB disease in the community. From October 2022 to September 2023, twice a week, CHWs conducted Active Case Finding (ACF) among key and vulnerable populations (KVP) for TB. The KVP included miners, people who use drugs (PWUDs), children, the elderly, fishing communities and from other places such as commercial motorcycle drivers (bodaboda), bus stands, coffee kiosks, charcoal and brick production sites, hair cutting and beauty salons, etc. The CHWs used a standardized TB screening questionnaire to screen individuals for TB and collected sputum samples on the spot from those who were presumed to have TB. The samples were then transported to diagnostic facilities for investigation. Those diagnosed with TB were then initiated into TB treatment.
Results/Impact: A total of **317,429** individuals were screened for TB. Of these, **116,018** were presumed to have TB and **111452** were referred for TB testing. Of those referred, **105,267**were tested for TB and **10,449(10%)** were confirmed TB cases. All confirmed TB cases were initiated on treatment.
Furthermore, among hotspots TB cases contribution about 36% were identified through a house-to-house and the least TB cases were from schools/universities.
Conclusions: The provision of appropriate training and incentives for community health workers serve as a crucial link in identifying missing persons with TB disease in the community, thus increasing access to quality TB care and services.

EP06-655-13 Exploring existing potential to improve TB case finding amongst Nomadic populations in security-challenged areas of Bauchi State

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Background and challenges to implementation: Nomadic populations are a highly mobile population – moving from one location to another in search of greener pastures for their herds, thereby making it difficult to assess health care services consistently – especially TB which was made worse by the recent up-surge in banditry and kidnapping for ransom activities in Bauchi state of Nigeria.
Intervention or response: KNCV engaged the services of a sub-recipient (Janna Health Foundation) to strategically provide TB services among the underserved nomadic populations in Bauchi state in collaboration with Bauchi state TB Control Programme. Locals residing among the nomadic populations were identified and trained to conduct house-to-house TB screening using their good knowledge of security situations and happenings within the localities. They always took advantage of peaceful period to conduct house-to-house TB screening within communities that are considered safe and using the early hours of market days to conduct sensitization and TB screening and ensuring they left the market early. Sputum cups and cold boxes were provided for them and collected samples are moved to the nearest laboratory for evaluation, and diagnosed positive TB cases are placed on treatment at the nearest health facilities.
Results/Impact: Over the period of 6 months - a total of 12,255 people were screened, 3,289(27%) presumptive TB were identified, 3,217(98%) of the presumptive were evaluated, 240(7%) TB Cases were diagnosed (amongst them 1 DR-TB) and all were enrolled on TB treatment.
Conclusions: The study demonstrates the improvement in TB case finding using community volunteers. This can be scale-up to other states with similar security challenges to improve TB case finding in the country.

EP06-656-13 Improving TB case finding in primary health care setting: Experience from the TB Surge initiative in Nigeria

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Background and challenges to implementation: Primary Health Centres (PHCs) play an important role in providing preventive medicine and health care services to many people. PHCs numbering as high as 14,667, account for about two-thirds of the total DOTS centres in Nigeria. In light of the high burden of TB in Nigeria, improving TB case-finding in PHCs is crucial to bridging the TB treatment coverage gap. The USAID-funded TB LON project led by KNCV introduced the TB Surge initiative in PHCs. The strategy aims at increasing TB case-finding and stopping TB spread in primary healthcare settings.
Intervention or response: The impactful facility-based intensified case-finding initiative was implemented in 33 PHCs across 14 states in Nigeria using a hub and spoke model. The key interventions include mapping the PHCs (spokes) to diagnostic facilities (hub) for specimen transport logistics and diagnostic evaluation; advocacy to site management; site sensitization, establishment of site surge coordinators, appointment and training of TB screening focal persons. Systematic symptom-based TB screening was conducted daily using the WHO Four Symptom Screen across all service delivery points and clinics by designated focal persons. Presumptive TB clients identified were evaluated using the WHO-recommended molecular diagnostic tools and confirmed TB patients were placed on treatment. The intervention efficiency was assessed using TB yield and contribution to case notification.
Results/Impact: Between January and December 2023, a total of 261,167 persons were screened for TB. Of these, 13,757 presumptive TB were identified and evaluated for TB resulting in the diagnosis of 1,461 TB patients, representing a 10.6% TB yield. In all, 1,377 patients were put on treatment. The average quarterly TB case notification in the intervention PHCs increased by 266.2% compared to the baseline (Figure 1).

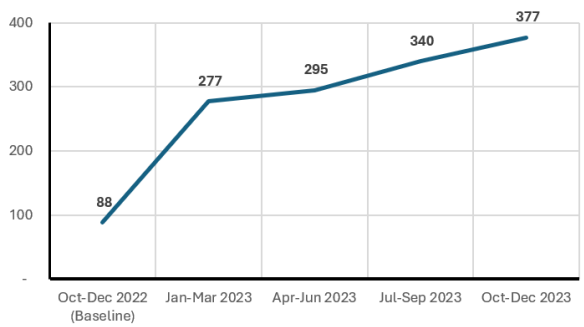

Figure 1. TB case notification in the 33 intervention PHCs across 11 states.

Conclusions: The Surge initiative improved TB case detection rapidly in the PHCs. This strategy should be scaled to other PHCs in Nigeria to improve the overall TB case-finding.

ABSTRACT PRESENTATIONS THURSDAY 14 NOVEMBER 2024

ORAL ABSTRACT SESSION (OA)

OA12 Innovative approaches for TB prevention and care

OA12-194-14 Pixels to predictions: How use of artificial intelligence at radiology centres enhanced TB detection in Chikkaballapur, Karnataka, India

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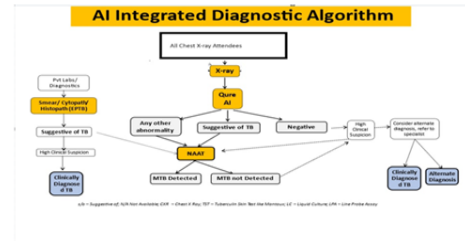
Background and challenges to implementation: Chest X-rays are pivotal in tuberculosis (TB) screening, with greater sensitivity (85%) compared to prolonged cough of >= 2 weeks (42%). Presumptive TB includes individuals with symptoms like prolonged cough, fever, weight loss, haemoptysis, or chest X-ray abnormalities. In Chikkaballapur district, Karnataka, Artificial Intelligence(AI) assisted screening of all chest X-rays was conducted at facility-based radiology centers, from July 2021 to September 2022. The objective was to enhance confirmation through Nucleic Acid Amplification Testing (NAAT) by increasing the positive predictive value.
Intervention or response: The intervention took place in five Government Taluk Hospitals and one District Head Quarter Hospital, where NAAT and radiology services were co-located. All individuals visiting the radiology department underwent chest X-ray with AI (Qure AI), regardless of TB symptoms. Those with abnormal chest X-rays or identified as TB presumptive underwent on-site NAAT testing. An AI-integrated TB diagnostic algorithm was developed to identify microbiologically confirmed or clinically diagnosed TB cases and distinguish other lung abnormalities (Figure 1). Enrolled presumptive TB cases were tracked in NIKSHAY (web based, case based digital surveillance tool of India's TB program) for further monitoring and management.
Results/Impact: 1.Out of 4497 X-rays screened using AI, 1876 (41.7%) were identified as TB Presumptive, all of which were flagged as abnormal by the AI system.
2.Specificity of AI was low owing to manual upload of X-rays using mobile camera.
Figure 1: The integrated diagnostic algorithm developed for the intervention along with the sensitivity and specificity analysis of TB diagnosis with NAAT following AI based X-ray screening during July 2021 to September 2022 in Chikkaballapur, Karnataka along with sensitivity analysis of AI.



		Microbiological confirmation		
		NAAT Positive	NAAT Negative	Total
AI Interpretation of chest X-ray	TB Presumptive	176	1680	1856
	TB Negative	40	2581	2621
	Total	216	4261	4477
Sensitivity-176/216=81%, Specificity-2581/4261=61%				
AI Interpretation of chest X-ray	Abnormal	212	3759	3971
	Normal	4	502	506
	Total	216	4261	4477
Sensitivity=212/216=98%, Specificity=502/4261=12%				

Conclusions: AI-assisted chest X-ray screening in radiology departments, irrespective of TB symptoms effectively identified TB presumptive cases, with a notable 10% microbiological confirmation rate. This approach holds promise for improving efficiency of early TB diagnosis.

OA12-195-14 Responsible AI framework for TB screening: Enhancing transparency and trust in AI integration

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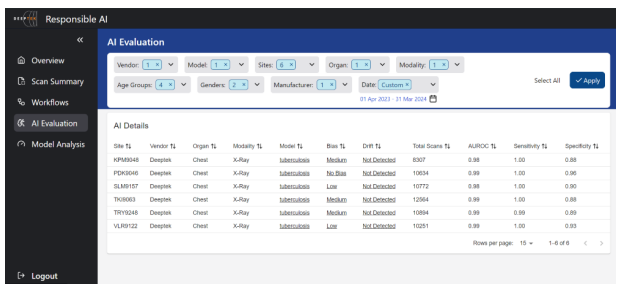
Background: TB screening constitutes a vital component of public health initiatives, yet it faces substantial challenges stemming from resource constraints and diagnostic complexities. While AI augments TB detection

efficiency, concerns persist regarding its seamless integration into screening workflows. DeepTek's Responsible AI (RAI) addresses these by providing tailored solutions for TB screening, mitigating risks of bias and ensuring performance monitoring.

Design/Methods: The study encompassed real-time monitoring of TB screening models deployed across six districts of Tamil Nadu, India (April 2023 to March 2024). Metrics such as Sensitivity, Specificity, NPV, and AUROC were employed to gauge AI model efficacy across diverse settings. DeepTek's RAI platform meticulously scrutinized model performance at each site, accounting for confounding variables including patient demographics and imaging modalities, while also leveraging advanced drift detection mechanisms to track temporal variations in model performance and potential biases stemming from variations in different performance metrics across multiple confounding factors, such as age groups, genders, etc.

Results: The analysis revealed consistently high sensitivity (>99%) and AUROC (>97%) values across all sites, underscoring the robustness of the integrated models in detecting TB cases effectively. Specificity consistently exceeded 88% across all sites, surpassing the WHO's TPP benchmarks for TB detection. Notably, drift phenomena were absent in all sites, indicating sustained model performance stability throughout the study period. The observed biases, varying from low to medium, indicate slight deviations from ideal performance standards, which generally fall within acceptable limits. Monitoring bias in model performance across different sites over time offers valuable insights into potential deviations and opportunities for adjustments.



Conclusions: RAI emerges as a pivotal tool in the realm of TB screening, bridging the gap between AI technology and responsible practice. Its innovative approach to bias detection, drift monitoring, and performance tracking instills confidence in healthcare professionals to embrace AI as an ally in the fight against TB.

OA12-196-14 Impact of predictive AI and NTEP interventions on adverse TB outcomes in India: Early multi-state learnings from India

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Background and challenges to implementation: With approximately 2.6 million tuberculosis (TB) cases reported annually, India faces a critical challenge in ensuring patients' treatment adherence and completion. In 2021, 2.6% of patients on drug-susceptible TB(DS-TB) treatment were lost to follow-up (LFU), and 4.2% died, significantly impacting India's goal of TB elimination by 2025. To address this, an artificial intelligence (AI) model capable of predicting patients at high-risk of LFU or death was developed and deployed in several Indian states.

Intervention or response: A novel AI model, developed and trained on over 5.5 million TB patient records from Ni-kshay (2019-2022), processed longitudinally to generate individual risk scores for LFU/death at treatment initiation, classifying patients as „high" or „low" risk. Retrospectively, the model correctly flags 70% of patients reporting adverse outcomes while targeting the top 35% highest scoring patients. Healthcare workers received training on a linked mobile app to identify these patients, and proactively intervene with regular follow-up (phone calls or home visits) and intensified public health interventions.

Results/Impact: Deployment revealed challenges like delayed data uploads and low mobile app usage due to high staff workload. Additionally, staff faced difficulties providing timely interventions to high-risk patients.

Total healthcare staff trained	634
Total patients on TB treatment enrolled for risk assessment	80970
Out of the total patients on TB treatment, patients who were flagged as High-risk	22,988
High-risk patients followed up (Calls/Home visits)	7,989 (35%)
Patients on TB treatment offered HIV screening (within 15 days of treatment initiation)	14,604 (52%)
Patients on TB treatment offered Diabetes Mellitus screening	21,716 (94%)
Patients on TB treatment offered Rifampicin testing (within 15 days of treatment initiation)	17,856 (78%)

Data as of March 15, 2024

Despite these challenges, early findings are promising. The AI model effectively identified high-risk patients initiated on treatment between April 2023 and February 2024, identifying 58% of patients who later experienced LFU/death. This 12% decline from the model's retrospective performance aligns with the relative decline in LFU/death observed in deployed areas (16%), which is a relative increase from the previous years' 7% decline. Future work aims to draw a causal link between the solution and the increased decline.

Conclusions: These results suggest that predictive AI can potentially improve TB treatment outcomes. Integrating it with the existing Ni-kshay portal and addressing deployment challenges could significantly benefit India's goal of TB elimination.

OA12-197-14 Double-up your yield of ACF by decentralising diagnostic tools to the doorsteps: A project in three districts of Gujarat, India

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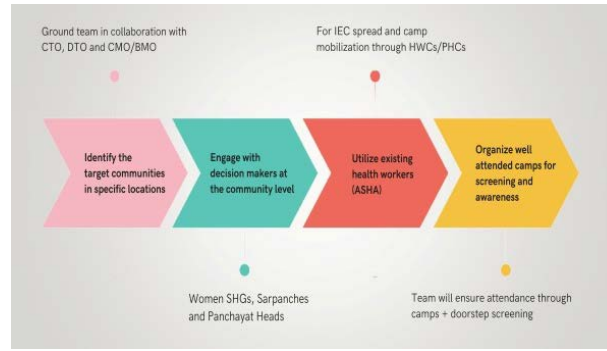
Background and challenges to implementation: High risk groups (HRGs) for TB disease like those with previous history of TB, contacts of TB patients, tribal population, comorbidities such as Diabetes and HIV, needs to be proactively screened for early identification of disease and using higher sensitive tool for diagnosis. Conventional methods of Active Case Finding (ACF) may have limitations in systematic screening of these populations due to challenges such as access to molecular diagnostics, X-ray services and often the identified presumptive cases drops-out as they need follow-on testing.

Intervention or response: A systematically planned ACF was conducted in 3 districts of Gujarat with broader objective of improving TB case finding by focusing on vulnerable HRGs for TB. Uniqueness of this ACF was decentralizing molecular diagnostics and x-ray services using mobile van. Firstly, HRGs were mapped by districts using a scoring sheet. This was followed by conducting ACF using mobile diagnostic van equipped with NAAT & X-ray. All the HRGs were offered X-ray and those with abnormal X-ray were offered NAAT. Individuals diagnosed with TB were referred to a nearby health facility for treatment initiation and public health actions.



Results/Impact: Under this project, which was done in 4Q23, a total of 28,024 individuals were screened, 1460 (5.2%) presumptive cases were identified and of them 93 (6.4%) TB patients were diagnosed. When compared with ACF done in 4Q22 which did not use upfront NAAT & X-ray, a total of 69,532 individuals were screened, of which only 1821 (2.6%) presumptive cases were identified and of them 59 (3.2%) TB patients were diagnosed.

Conclusions: By providing doorstep delivery of screening and molecular diagnostic tools through mobile medical vans, this intervention demonstrates enhanced TB case finding in HRGs compared to traditional approaches. Early detection can break the chain of transmission and contribute to long-term TB incidence reduction in Gujarat.

OA12-198-14 Redesigning Uganda's health system to achieve and sustain high-quality TB patient outcomes

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Background and challenges to implementation: Universal Health Coverage (UHC) with high-quality care is a cornerstone of Sustainable Development Goals. In 2018, Uganda's treatment success rate (TSR) was 69.2%, the case detection rate (CDR) was 63%, the drug-resistant-TB (DR-TB) TSR was 64%, and the CDR at 20%. TB preventive therapy (TPT) in people living with HIV (PLHIV) at 14%. To overcome the 10-year performance stagnation and attain higher performance levels, we needed a system redesign.

Intervention or response: During 2018 – 2022, the USAID Defeat TB project worked with the national TB program and stakeholders to redesign TB systems using quality improvement (QI). Macrosystem redesigns included data reporting through DHIS2, community data

through TB info, institutionalizing virtual problem-solving meetings between the national TB leaders and high-burden districts, weekly TB surveillance, strengthening TB community-led models, access to molecular tests, and electronic-based surveillance systems. The microsystem redesigns at the frontline included a patient appointment system, same-day follow-up phone calls, differentiated TB/HIV services, locator forms, data reviews, multidisciplinary QI teams, and cross-learning. In September 2022 the project transitioned to a USAID local partner.

Results/Impact: Functional systems improved TSR from 69.2% in 2018 to 87% in 2022 to 91% in 2023. The CDR improved from 63%in 2018 to 106.1% in 2022 to 110% in 2023. The DRTB TSR improved from 64% in 2018 to 80% in 2022 and 87% in 2023, and the DR TB case finding improved from 20% in 2018 to 41% in 2022 and 57% in 2023. The TPT for PLHIV initiation improved from 16.3% in 2019 to 85.4% in 2022.

Conclusions: Redesigning macro and microsystems is important to achieve sustainable multiple patient outcomes at the facility, subnational, and national levels accelerating the movement towards UHC. Countries with poor treatment outcomes could redesign systems to accelerate and sustain multiple TB outcomes and UHC.

OA12-199-14 Incentivising care: Transformative approach under NTEP in Rajasthan, India

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Background and challenges to implementation: Rajasthan, a high-burden state for Tuberculosis in India, the engagement of the private sector in the National Tuberculosis Elimination Program (NTEP) was expedited through the JEET project, employing a Patient Provider Support Agency (PPSA). This agency served as a conduit between NTEP and the private healthcare system, offering comprehensive TB services to patients. These services encompassed provider mapping, notification, linking with free diagnostics and treatment, counselling, comorbidity screening, universal drug susceptibility testing, follow-up, contact investigation, and long-term care. However, the PPSA model was deemed unsustainable due to its reliance on external funding and high costs.

Intervention or response: In August 2020, Rajasthan introduced the innovative ‚Patient Provider Incentive Scheme (PPIS)‘ to directly engage private providers within NTEP. PPIS aims to collaborate with all Private Health Facilities to ensure quality diagnostics, medication, and treatment for TB patients. Unlike traditional approaches like the PPSA, PPIS incentivizes private providers directly, prioritizing patient care in TB treatment cycles. Providers receive rewards based on their achievements in critical TB care milestones, including case notifications, patient support, diagnostics, and successful treatment outcomes reporting. Moreover, the PPIS model is sustainable and cost-effective compared to the PPSA approach.

Results/Impact: Comparing the achievements under PPIS and PPSA reveals significant differences. The number of active health facilities notifying TB cases has increased by 21.8%, along with an increase in the notification of Bacteriologically confirmed TB cases from 22% to 32% and an increase in Bacteriologically confirmed TB patients with valid rapid DRT results for Rifampicin from 44% to 75%. Moreover, the percentage of patients with known HIV status has increased from 66% to 99%. Remarkably, the investment under the PPIS model is 20% less in comparision to PPSA model.

Conclusions: The PPIS model emphasizes patient-centred tuberculosis treatment cycles and has proven to be more effective and sustainable than the previous PPSA approach.

OA12-200-14 Impact of electronic stock cards on circumventing stock out of TB commodities in USAID TB LON 3 supported states (Ogun, Oyo, Osun, and Lagos), Nigeria

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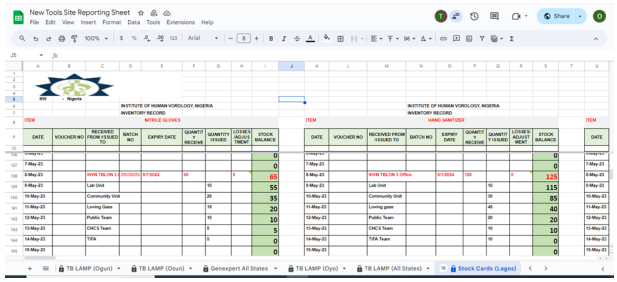
Background and challenges to implementation: Events of stock out of TB commodities like medicines, personal protective equipment, sputum cups etc. have serious implications on TB control program and infection control. Traditionally, hard copies of stock cards used to keep records of commodities in the store have shortcomings in meeting the demand of intensify TB case finding (ICF) activities. USAID TB LON 3 project implemented by Institute of human virology Nigeria (IHVN) supply chain and logistic team introduced a real time electronic stock tracking platform to monitor consumption of commodities in real time, to prevent stock out in any of the project supported states.

Intervention or response: The traditional hard copy stock cards were converted to electronic stock cards and were hosted on Google sheet for all commodities and a

summary sheet was created to track consumption. This platform was piloted for one month and corrections were made based on the pilot outcome. In January 2023, the system was rolled out and it has been in use till date. The platform can be accessed from any location and on Android phones, iPhones and other IOS devices due to its user friendliness.

Results/Impact: A total of 19 commodities E-Stock cards have been hosted on the platform from January 2023 till date and the stock status of all these commodities are tracked in real time hence, we have not experienced stock out of any of these commodities since introduction of this platform because commodities at emergency order points are quickly replenished to prevent service interruption. Quantification and forecasting are done using summary sheet to reduce lead time.



Conclusions: The use of E-stock cards has been a game changer in preventing stock out of commodities and improving supply chain performance on the project and other low- and middle-income countries (LMIC) can adopt this platform to overcome bottlenecks associated with stock outs in supply chain.

OA12-552-14 Expanding the availability of TB laboratory trainings to the private sector: augmentation of certified Xpert MTB/RIF Ultra trainers in the Philippines

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Background and challenges to implementation: Current Xpert MTB/Rif Ultra certified trainers from the National TB Reference Laboratory-Research Institute for Tropical Medicine (NTRL-RITM) and Department of Health prioritize capacity building of government-affiliated TB laboratories.

Private sector institutions thus have limited access to accredited TB laboratory trainings, and mostly learn through mentorship. Mentoring, unlike duly recognized trainings provided by accredited institutions with certified trainers, is an informal strategy to teach untrained staff specific laboratory examinations.

Intervention or response: While mentored staff can learn how to perform laboratory tests, providing them with formal training is necessary to ensure that they're correctly following standard procedures for each TB laboratory test. With limited resources, and priority given to public institutions, developing private-sector certified trainers will greatly expand the availability of formal trainings within the private sector. Four participants from private sector were selected and provided a supplemental training which encompassed two distinct phases: a comprehensive 2-day virtual lecture series on Xpert MTB/Rif Ultra, followed by two days of hands-on practical exercises. Following the training, participants underwent three-day face-to-face preceptorship training, where they conducted a training and were supervised and evaluated based on the standards set by NTRL-RITM.

Results/Impact: Participants achieved an average score of 78% on baseline pretests administered on the first day. Knowledge improved after supplemental training with participants scoring an average of 96% ($p=0.07$ using Wilcoxon signed-rank test). During the preceptorship training assessment and evaluation, participants received an average score of 89.8%, indicating that they passed and became Xpert MTB/Rif Ultra certified trainers. Private sectors can now tap them help rapidly expand Xpert MTB/Rif Ultra testing.

Conclusions: Providing capacity-building to private sector Xpert technicians can enhance their knowledge and skills to oversee and deliver the standard Xpert MTB/Rif Ultra Assay training. Proper training can improve the accuracy of results released and enable patients to access quality-assured TB diagnostic services across healthcare sectors.

OA13 Airborne infection control and safety

OA13-201-14 Parameters for optimal ventilation beyond air changes per hour (ACPH) for planning interventions to reduce air-borne infection risk: Experiences from India's drug-resistant TB centres

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Background and challenges to implementation: As countries move towards achieving of End TB Target, preventing air borne infection transmission is critical. Optimizing ventilation is a key strategy that significantly reduces particle concentration, controls transmission routes, and augments environmental control in healthcare settings. A critical measure of ventilation is ACPH and WHO recommends ACPH ≥12 in high-risk settings.

Intervention or response: India's National TB Elimination Program with support of FIND and WHO conducted systematic risk assessments from Sep'22 to Jun'23 in 94 institutions with nodal DRTB centres covering TB wards, outpatient departments, waiting areas, registration areas, TB laboratories, bronchoscopy rooms and radiology waiting areas.

Along with ACPH, parameters like, footfall/bed occupancy; room size and height; air flow direction and obstructions; feasibility for civil infrastructure modifications; climatic conditions; and local ventilation practices were reviewed.

Interventions include:

a. Renovations such as creating windows, waiting areas and segregated sputum collection booth, and adding mixing/exhaust fans and;

b. Installation of upper room germicidal ultraviolet (GUV) disinfection systems where ventilation cannot be otherwise improved.

Institutions were also encouraged for triage, fast tracking, strengthening administrative measures and monitoring.

Results/Impact: The table below shows that out of 784 sections assessed, 488 (62.3%) sections had ACPH ≥12. Interventions were proposed in 83.6% sections having ACPH <12 as well as in 47.5% sections with ACPH ≥12. Overall, interventions were planned in 431 (55.0%) sections.

In some sections with ACPH ≥12, interventions were proposed to overcome wrong seating arrangements, practice of closing windows in night and winter/rainy season.

Additional waiting areas were suggested for decongesting crowded sections. Well-ventilated covered sputum collection booths are proposed for patients to cough out sample. Mixing/exhaust fans were planned to improve ventilation. GUV were not proposed in rooms with height <9 feet irrespective of ACPH.

Sections of 94 institutions with nodal DRTB centres	Total sections assessed	ACPH ≥ 12		ACPH < 12		ACPH not measured as closed rooms	
		Total	Interventions N (%)	Total	Interventions N (%)	Total	Interventions N (%)
DRTB Wards	184	140	90 (64.3)	36	31 (86.1)	8	5 (62.5)
DSTB Wards	81	59	30 (50.8)	20	18 (90.0)	2	2 (100.0)
Bronchoscopy	53	20	10 (50.0)	2	2 (100.0)	31	21 (67.7)
Registration/ Waiting area	90	50	16 (32.0)	17	14 (82.4)	23	14 (60.9)
OPD/ Waiting area	230	142	52 (36.6)	42	39 (92.9)	46	29 (63.0)
TB Lab	107	68	31 (45.6)	9	5 (55.6)	30	6 (20.0)
Radiology/ Waiting area	39	9	3 (33.3)	8	3 (37.5)	22	10 (45.5)
Total	784	488	232 (47.5)	134	112 (83.6)	162	87 (53.7)

Conclusions: Multiple parameters including ACPH should be analyzed to plan airborne infection control interventions while constructing/modifying health care facilities.

OA13-202-14 TB infection prevention and control practices at healthcare settings in high HIV/TB burden Indian states

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Background and challenges to implementation: The COVID-19 pandemic highlighted the need for strong infection prevention and control (IPC) measures at all healthcare facilities (HCFs), including high-risk settings (HRS) that care for people living with HIV (PLHIV), tuberculosis (TB), and COVID-19.

We report lessons learned from a public health intervention to strengthen TB IPC practices at HRS in high HIV/TB burden states in India.

Intervention or response: In the states of Andhra Pradesh, Karnataka, Manipur, Telangana, and Maharashtra, compliance was measured using a standardized IPC indicators checklist based on national IPC guidelines. We trained hospital infection control (HIC) teams on national IPC guidelines, then mentored them to implement

baseline and two on-site follow-up (FU) appraisals of the HRS: anti-retroviral therapy center, drug-resistant TB center, integrated counseling and testing center, TB lab, TB treatment centers, and isolation wards.

Results/Impact: We conducted cascade training for 284 HIC members from 5 states. Between July 2022–February 2023, we conducted baseline appraisals at 21 HCFs with HRS. Compliance to the standard IPC indicators was measured during FU1 (November 2022–June 2023) and FU2 (March 2023–September 2023). By FU2, 100% (21/21) HRS were located away from other general wards and outpatient departments, avoiding mixing of attendees; waiting areas were well-ventilated and patient-segregated, i.e., not shared by other persons with respiratory symptoms; an improvement from 95% (20/21) at baseline. Most facilities (86%; 18/21) met the air changes per hour requirement (ACH>12).

From baseline to FU2, fast-tracking of persons with respiratory symptoms using 4-symptom screening improved from 76% (16/21) to 90% (19/21) and use of N95 respirator by HRS staff improved from 62% (13/21) to 90% (19/21).

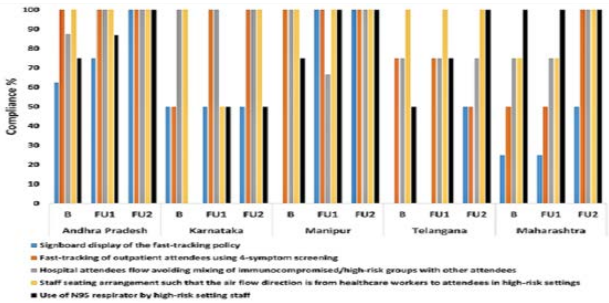

Figure. State wise compliance of TB infection prevention control indicators at high-risk settings, India.

Conclusions: Training and regular FU of IPC compliance play an important role in improving and sustaining the TB IPC measures at the high-risk HCFs. This will help build health systems to respond to future pandemics.

OA13-203-14 Impact of mentorship and support practices on strengthening infection prevention and control in healthcare settings in Zimbabwe during COVID-19 pandemic

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Background and challenges to implementation: Infection prevention and control (IPC) is a critical component of public health programs. During the COVID-19 pandemic, the Biomedical Research and Training Institute supported the Zimbabwe Ministry of Health and Child Care to strengthen COVID-19 response and IPC, including IPC for TB (TBIC), in 105 healthcare facilities. We report improvement of IPC programs in the targeted facilities after the intervention.

Intervention or response: In June 2021, at the beginning of the project period (June 2021-September 2022) provincial and district mentors were trained on standard and transmission-based precautions. The training included competency assessments for hand-hygiene (HH), environmental cleaning (EC) and use of a risk assessment tool and indicators' checklist.

Mentors then conducted IPC/TBIC trainings at facilities during the site support visits and district health management meetings.

Results/Impact: We found an increase in use of IPC guidelines and standard operating procedures by 17% (from 58% before to 68% after the intervention), improved demonstration of key IPC materials in patient waiting areas for hand hygiene by 86% (from 30% to 56%), masks use by 35% (from 66% to 89%) and respiratory hygiene by 28% (from 72% to 92%). Screening of patients with respiratory symptoms and area ventilation improved by 20% both (from 74% to 89%) and (from 79% to 95%), respectively.

Adherence to TBIC measures improved by 19% during TB diagnosis (from 64% to 72%) and by 33% during TB treatment (from 75% to 100%). Competency assessments of HH and EC demonstrated 17% (from 58% to 68%) and 34% (from 38% to 51%) improvement, respectively. The median IPC performance score of 105 facilities increased by 8% (from 64% to 69%).

Conclusions: Our results demonstrated substantial improvement in IPC/TBIC measures in the targeted facilities after the intervention. Combined IPC mentorship and support practices were effective in strengthening IPC/TBIC measures in Zimbabwe.

OA13-204-14 Effectiveness of workplace TB program in managing TB in global operations at an oil and gas company

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Background and challenges to implementation: The World Health Organization (WHO) quantifies TB risk using cases per 100,000 persons per year with the cut-off for high being 20 /100000. ExxonMobil (EM) is a global company with mobile workers with some in congregate settings including camps and offshore installations. WHO estimated that a quarter of the world's population has latent tuberculosis infection (LTBI) with the South-East Asia, India, China, and Africa having the highest prevalence. EM workers located in high-risk settings, are required to be enrolled in the company TB Control Program (TBCP) which includes awareness training, screening, case management and contact tracing. The objective of the workplace program is to have zero workplace TB transmission.
Intervention or response: Awareness for the eligible population is done with mandatory computer and in-person trainings. Workers in the TBCP go through screening which includes questionnaire and testing with a skin test, chest X-ray or preferably a blood test using Interferon Gamma Release Assays (T-SPOT or QuantiFERON), every 2 years. All newly tested positive for TB are further investigated to rule out active TB disease. About 5–10% of people infected with TB will eventually get symptoms and develop TB disease. Early screening enables us to detect and manage latent TB infections promptly to prevent progression to active TB.
Results/Impact: From 2012, 126 active TB cases were identified in our global locations. With a transmission rate compared to 1 active TB case leading to 10 new cases per WHO, over 1260 cases have been averted with no workplace transmission. A key element to a successful workplace TB program includes return to work guidelines that ensures the workers are no longer infectious when they return.
Conclusions: In conclusion, the successful EM's TBCP is targeted and scalable approach to mitigate the spread of TB among workers in increased risk setting at workplaces around the world.

OA13-205-14 The heterogeneous evolution of the L2 major lineage MTB in urban agglomerations along the Yangtze River Basin in China

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Background: Urban agglomerations constitute a highly unified regional configuration that integrates considerations of population, culture, economy, and transportation. The rapidly developing transportation network has enhanced population mobility, but it hasn't led to a homogenized prevalence of Mycobacterium tuberculosis across the nation.
Understanding the heterogeneity in the evolutionary characteristics of MTB among urban agglomerations is essential for developing more targeted monitoring and treatment strategies.
Design/Methods: The Yangtze River Basin represents a crucial economic and cultural zone in China. In this area, we selected strains from each urban agglomeration (n=4) using a constant number (n=200) of repeated random sampling methods to establish a representative strain library.
Subsequently, phylogenetic analyses based on Bayesian and maximum likelihood methods and statistical analyses based on genetic characteristics were conducted for each strain library.
Results: The ancestral strains of the four urban agglomerations likely originated between 1446-1529 AD, with different expansion periods introducing dominant lineages to the urban agglomerations.
In Xizang Urban Agglomerations, the predominant lineage is L2.2 (64.5%), which was introduced during the first population expansion in 1667 AD. For Chengyu Urban
Agglomerations, the dominant lineage is L2.3 (65.6%), introduced during the second population expansion in 1802 AD. Urban agglomeration in the middle reaches of the Yangtze River is L2.3 (90.7%), introduced during the first population expansion in 1786 AD.
In the Yangtze River Delta Urban Agglomeration, the dominant lineage is L2.3 (87.2%), introduced during the first population expansion in 1693 AD (Figure A,B,C).
We have identified genes in each urban agglomeration with strong positive selection signals, primarily functioning in host immune system evasion, DNA repair to counteract host defense mechanisms, and enhanced infectivity and survivability (Figure D).
Conclusions: MTB exhibits heterogeneous evolution within urban agglomeration, developing dominant lineages. These may account for the differences in strain monitoring and treatment efficacy.

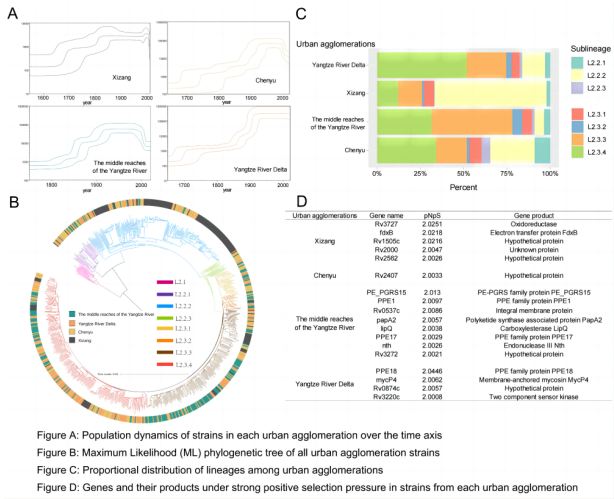

Figure A: Population dynamics of strains in each urban agglomeration over the time axis
Figure B: Maximum Likelihood (ML) phylogenetic tree of all urban agglomeration strains
Figure C: Proportional distribution of lineages among urban agglomerations
Figure D: Genes and their products under strong positive selection pressure in strains from each urban agglomeration

Figures A-D

OA13-206-14 Neonatal BCG vaccination does not prevent M. tuberculosis transmission within households

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Background: Early clinical trial evidence suggests that a BCG 'booster' during adolescence may prevent *Mtb* infection. However, there is little evidence of whether BCG vaccination may also prevent *Mtb* transmission, which could enhance the population-level health impact of a booster program. Using two large case-contact person cohort studies from high-burden settings, we investigated Mycobacterium tuberculosis (*Mtb*) infection and disease among contact persons of index cases that were and were not vaccinated with BCG.
Design/Methods: We used data from tuberculosis contact person tracing consortium of 49 cohort studies. Individual-level participant data for the characteristics of the index case and exposed contact persons were requested from authors. We evaluated outcomes of tuberculosis (prevalent and incident) and interferon-gamma release assay [IGRA] positivity at baseline. We estimated adjusted odds ratios (aORs) using logistic regression with study-level random effects and adjusting for index case age and sex.
Results: 2,381 contact persons were recruited from two cohorts; 1,507 (63%) from India and 875 (37%) from Colombia. The median age of index cases was 27 (IQR, 20–39) in India and 36 (IQR, 25–46) in Colombia. BCG vaccination among contact persons was similar regardless of index vaccination status (79% vs 80%) but was higher in Colombia compared to India (86% versus 76%). We found slightly higher odds of tuberculosis (aOR, 1.15; 95% CI, 0.69–1.90) and IGRA positivity (aOR, 1.07; 95% CI, 0.88–1.30) among contact persons of BCG vaccinated index cases than unvaccinated index cases, but neither estimate was statistically significant. Including contact person BCG vaccination status in the model did not alter estimates.
Conclusions: While neonatal BCG vaccination does not appear to prevent transmission within households, further studies should evaluate whether BCG vaccination of older age groups prevents transmission, thus providing community as well as individual benefits of a BCG booster.

OA13-207-14 Strengthening TB infection control among healthcare workers during the COVID-19 pandemic in Zimbabwe

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Background and challenges to implementation: The risk of exposure of healthcare workers (HCW) to *M. tuberculosis* remains a public health concern worldwide. Data collected in 2018 in Zimbabwe showed a high TB incidence among HCW (528/100,000). During the COVID-19 pandemic, the Biomedical Research and Training Institute supported the Ministry of Health and Child Care to strengthen infection prevention and control (IPC) practices in 105 healthcare facilities (HCF). TB infection control (TBIC) was incorporated into the intervention strategy. We report how this intervention strengthened TBIC among HCWs.
Intervention or response: Our strategy, implemented from June 2021–September 2022, included blended IPC mentorship training, competency assessments, and use of a standardized risk assessment tool for progress monitoring. For training purposes the project developed 8 practical problem-solving IPC modules that included occupational health . Trained mentors conducted bi-monthly site support visits (SSV), used a checklist to track compliance and assessed competencies of HCW at the targeted facilities. Facility-based risk assessment was conducted three times during the project implementation.
Results/Impact: During the intervention period 1,865 HCW from 105 facilities were trained. As a result, availability, and appropriate use of personal protective equipment (N95 respirators) improved by 49% (from 63% at the start to 94% at the end of the intervention) and 42% (67% to 95%), respectively. The proportion of HCF with designated area for sputum collection increased by 43%

(from 68% to 97%). The proportion of HCF that screened HCW for TB increased by 42% (from 52% to 74%) with 3,761 HCW screened during the project period. Among these, 14 HCW were diagnosed with TB and referred for care. TB incidence rate among HCW decreased to 373/100,000 after the intervention.

Conclusions: Training, mentorship, and regular SSV strengthened TBIC measures, improved TB screening practices, and reduced TB incidence rate among HCW in Zimbabwe. Healthcare programs would benefit from maintaining improved practices for TBIC in the country.

OA14 Signature mapping for TB

OA14-208-14 A urinary biomarker study of TB immunopathology in ART naïve PLWHA

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Background: Our group previously identified elevations in ten urine metabolites in a mostly HIV-negative population of patients with pulmonary TB. Here, we sought to test if these metabolites were also elevated in a cohort of treatment-naive patients living with HIV/AIDS (PLWHA) and pulmonary TB (PTB).

Design/Methods: We analyzed 304 urine samples from SDART-TB trial participants from Haiti using high-performance Liquid Chromatography – Mass Spectrometry. The cohort included 76 PTB patients and 228 matched controls (by age and sex). All participants were newly diagnosed with HIV infection (ART-naïve) presenting PTB symptoms. We first stratified patients by disease class and CD4 count. We then stratified PTB into clinically and microbiologically-confirmed cases. Log10 metabolite abundances were adjusted for covariates in a regression model considering p-values<0.05 significant.

Results: Levels of three metabolites—ureidopropionic acid, unknown 1 (mz 115.0498), and hydroxykynurenine—were significantly higher in PLWHA with PTB than those without PTB. The highest median levels of these metabolites were in patients with PTB and CD4< 200 cells/mm^3.

Levels of ureidopropionic acid and unknown 1 were significantly higher in microbiologically-confirmed cases than in PLWHA controls, while hydroxykynurenine was higher in clinically-diagnosed PTB cases (negative sputum tests) than in controls. Serum C-reactive protein (CRP) levels, an innate immune response marker, also differed significantly between the control and PTB groups (CRP levels 2.6, 27.9, and 49.9, respectively, in the control, microbiological, and clinical-PTB groups).

Median* [Q1, Q3] by group	Ureidopropionic acid	Unknown 1	Hydroxykynurenine	CRP (mg/L)
Control CD4>200 cells/mm^3 (n=85)	0.67 [0.43, 1.13]	0.72 [0.49,1.15]	0.19 [0.10, 0.36]	2.18 [0.58, 6.91]
Control CD4<200 cells/mm^3 (n=140)	0.68 [0.46,1.15]	0.75 [0.53, 1.11]	0.17 [0.09, 0.33]	5.56 [1.37, 19.60]
PTB CD4>200 cells/mm^3 (n=40)	0.75 [0.50, 1.25]	0.80 [0.54, 1.18]	0.16 [0.09, 0.58]	22.79 [4.05, 72.72]
PTB CD4<200 cells/mm^3 (n=33)	**0.98 [0.64, 1.78]**	**1.04 [0.69, 1.59]**	**0.36 [0.17, 0.93]**	**29.17 [6.44,84.27]**

Regression model variables†	ES (CI)	*p*	ES (CI)	*p*	ES (CI)	*p*	ES (CI)	*p*
(Intercept)	0.04 (-0.23 – 0.31)	0.793	0.07 (-0.17 – 0.31)	0.569	-0.56 (-1.01 – -0.10)	**0.017**	0.58 (-0.06 – 1.22)	**0.076**
Microbiological PTB	0.11 (0.01 – 0.21)	**0.027**	0.1 (0.01 – 0.18)	**0.033**	0.11 (-0.06 – 0.27)	0.214	0.61 (0.37 – 0.84)	**<0.001**
Clinical PTB	0.14 (-0.03 – 0.31)	0.096	0.12 (-0.03 – 0.27)	0.107	0.35 (0.07 – 0.63)	**0.016**	0.89 (0.50 – 1.29)	**<0.001**
Age (years)	0 (-0.01 – 0.00)	0.085	0 (-0.01 – 0.00)	0.064	0 (-0.01 – 0.00)	0.626	0 (-0.01 – 0.01)	0.973
Sex [female]	-0.01 (-0.09 – 0.07)	0.839	0 (-0.07 – 0.07)	0.927	0.07 (-0.07 – 0.20)	0.326	0.02 (-0.17 – 0.21)	0.82
BMI (kg/m^2)	0 (-0.01 – 0.01)	0.651	0 (-0.01 – 0.01)	0.574	0 (-0.02 – 0.01)	0.652	-0.01 (-0.03 – 0.02)	0.494
CD4 [< 200 cells/mm^3]	0.06 (-0.01 – 0.14)	0.107	0.05 (-0.02 – 0.12)	0.129	0.08 (-0.05 – 0.21)	0.223	0.33 (0.15 – 0.51)	**<0.001**

Table: Metabolites and CRP abundance medians according to the different stratified groups and regression analysis results. Three patients were excluded because their urinary osmolality was below 150mOsm/H_2O, and three lacked CD4 count data. **ES:** estimate, CI: confidence interval. * Metabolite abundance medians are quality control (QC) normalized. † Analysis was performed with Log_{10} transformed metabolite abundances.

Conclusions: Previously identified urinary biomarkers of TB in a mostly HIV-negative population were only partially validated in PLWHA. Immune defense against Mtb in PLWHA relies less on CD4 cells and CD4-derived IFN gamma-mediated immunity and more on other pathways such as IL-6, which regulates CRP, and other potential triggers of indoleamine 2,3-dioxygenase activity.

These findings showcase PTB as a diverse immunopathologic entity rather than a discrete microbiologic infection, suggesting that inflammatory markers may vary across patient cohorts.

OA14-209-14 Self-powered rapid antigen-specific T cell response assay for M. tuberculosis infections

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Background: The role of antigen-specific T-cell responses is critical in diagnosing infectious diseases, including tuberculosis (TB), a major global health menace that claims approximately 1.6 million lives each year. Traditional diagnostic tools, such as interferon-gamma release assays (IGRA) face significant challenges in resource-limited settings due to their stringent requirements for sample handling, trained personnel, consumable costs, and specialized equipment.
More critically, IGRA's efficacy is compromised in detecting immune responses among anergic individuals, who constitute about 25% of TB patients.
Design/Methods: We have developed a new antigen-specific T-cell response assay (ASTRA) assay platform that detects these two CD4 T-cell in-depended biomarkers 4-1BB and OX-40, using a streamlined procedure that requires less time, infrastructure, and expertise than standard IGRAs. We have designed a self-powered microfluidic chip to integrate all IGRA steps for ASTRA provideseing robust results within four hours, versus the 24-48 hours required by conventional IGRAs, and employs fingerstick whole blood micro samples and integrates all assay steps for point-of-care use without requiring additional equipment or technical expertise.
Results: M.tb Antigen-specific T-cell response dynamic was observed in NHP models with ASTRA. ASTRA also emerges as a superior diagnostic alternative by analyzing 167 diverse samples at blinded mode, demonstrating ASTRA's exceptional sensitivity and specificity in identifying *Mycobacterium tuberculosis* (*M.tb*)-specific T cells. This superiority extends to populations with compromised immune systems, such as individuals co-infected with HIV and TB, achieving a sensitivity increase from 62% to 93% in the HIV-TB co-infected cohort, and up to 92.8% in HIV-negative individuals, with a specificity of 100%.
Conclusions: Advances of ASTRA represent a notable leap over traditional IGRA, particularly in detecting M.tb infection among anergic patients and those battling HIV co-infection. The introduction of ASTRA, a portable, self-powered device, marks a significant advancement in TB diagnosis, aligning with global efforts to combat the TB epidemic more effectively.

OA14-210-14 Delineating host-pathogen interactions along the TB spectrum in human tissues

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Background: The advancement of tuberculosis (TB) interventions is hindered, in part, by our incomplete understanding of host-pathogen interactions that occur in human tissues. Initiation and orchestration of adaptive immunity against pulmonary bacterial infections largely occurs in lung-draining lymph nodes. Therefore, lymph nodes have emerged as major determinants in the outcome of *Mycobacterium tuberculosis* infection. Our primary objective is to gain a better understanding of how immune responses against *Mtb* are orchestrated in human lymph nodes.
Design/Methods: We accrued a cohort of recently deceased individuals with various clinical presentations along the TB spectrum, ranging from healthy individuals who died of trauma with no other signs of TB pathology, to those with confirmed TB pathology. With consent from next-of-kin, post-mortem tissue samples were collected during forensic autopsies, including thoracic lung-draining lymph nodes, non-thoracic lymph nodes, and blood. *Mtb* was quantified using droplet digital PCR, and immune response profiles and transcriptomic signatures in human lymph nodes and blood were characterized by single-cell RNA sequencing (scRNAseq).
Results: In a cohort of 58 decedents, 11 exhibited confirmed (n=10) or possible (n=1) TB pathology, while 47 had no TB pathology detected at autopsy. Of the 47 without visible TB pathology, *Mtb* nucleic acid was detected in 29 individuals (~62%), within lung-draining thoracic

lymph nodes (n=5) or non-thoracic lymph nodes (n=6), or both thoracic and non-thoracic lymph nodes (n=18). Preliminary findings from scRNAseq data demonstrate marked differences in immune cell composition and functional gene expression profiles across anatomical locations, offering insights into the tissue immune landscape during *Mtb* infection.
Conclusions: Our results emphasize the elevated prevalence of *Mtb* in the general population in a high TB-burden setting, and underscore the importance of lymph nodes in understanding TB pathogenesis, potentially informing the development of more effective TB interventions.

OA14-211-14 Validation of host protein signatures dually associated with TB pathogenesis in blood and lung

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Background: Tuberculosis is a treatable and curable infectious disease yet remains a major health problem globally. Therefore, there is a need of new biomarkers, tests that will serve as more accurate diagnostics to help in early detection of the *Mtb* and stratify the latently infected (LTBI) and active TB. Using a combination of Mas-spectrometry, and multiplex quantitative real-time PCR (qRT-PCR), 7 protein candidates including MNDA, MYOF, NCF1, NCF2, KCDT12, CD64 and GBP5 were shortlisted based on their increased abundance/expression in blood of active TB participants compared to healthy and LTB infected participants. The candidate proteins were hypothesized to be potential signatures of tuberculosis disease risk.
The work aims to validate the host protein signatures dually associated with TB pathogenesis in blood and lung.
Design/Methods: Validation in blood was done by western blotting and qPCR using PMCs and cDNA respectively.Proteomic validation in tissue was performed using immunohistochemistry and immunofluorescence to check for co-localization of candidate proteins with inflammatory signatures.
Results: The expression of MYOF and NCF2 were significantly increased in blood of active TB participants when compared to healthy and LTBi participants.Immunohistochemistry and immunofluorescence demonstrated an increased in expression of NCF2 around the border of the caseum in TB induced granulomas. Interestingly, neutrophils showed to be intact in the cellular region of the lung tissue releasing NCF2, however around the boarder of the caseum there was an abundance of NCF2 released by neutrophils that have undergone NETosis.
Conclusions: We hypothesize that NETosis may aid in the formation of the cavity in the inner region of the granuloma, and that NCF2 may be a marker of TB disease. Further troubleshooting is being done on other candidate proteins in exploration of them as potential markers.

OA14-212-14 Overlooked inborn errors of IFN-γ immunity in adults with recurrent and/or disseminated mycobacterial infections: A retrospective study in a tertiary hospital in China

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Background: Current management of mycobacterial infections in adults without HIV infection primarily focuses on anti-mycobacterial regimen, often overlooking the crucial role of host immunity.
Design/Methods: We conducted a retrospective study of patients (18-65 years, without HIV infection) diagnosed with recurrent and/or disseminated mycobacterial infections who underwent whole exome sequencing (WES) in a tertiary hospital in Shanghai from January 2021 to December 2023. We analyzed WES data to identify mutations in causative genes associated with IFN-γ-related inborn errors of immunity (IEI). The genetic, clinical and immunological features were compared between patients with and without IFN-γ-related IEI gene mutations.
Results: Of 26 patients included, we identified 4 (15.38%) patients with IFN-γ-related IEI, 8 (30.77%) carriers of IFN-γ-related IEI mutations. Patients with IFN-γ-related IEI gene mutations had an earlier onset of infection and were more likely to have disseminated infection with nontuberculous mycobacteria (NTM) and multifocal lymphadenopathy. Among 7 cases (58.33%) with NTM infection, *Mycobacterium intracellulare* were isolated from 3 cases, *Mycobacteroides abscessus*, *Mycobacterium colombiense*, *Mycobacterium kansasii* and *Mycobacterium tilburgii* was detected in one case each. T cell, B cell and NK cell lymphocytopenia were common during recurrent and/or disseminated mycobacterial infections. The response to anti-mycobacterial treatment was less favorable, and all cases required prolonged treatment. Notably, one case with IL-12 receptor β1 deficiency and another case with IFN-γ receptor 1 deficiency showed improvement after IFN-γ supplement therapy.

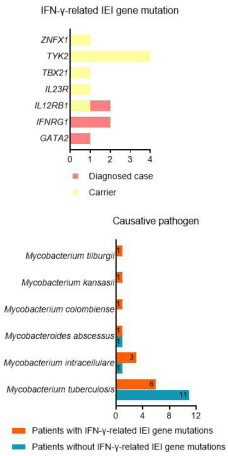

Table 1. Clinical and immunological features of patients with recurrent and/or disseminated mycobacterial infections

Parameter	Patients with IFN-γ-related IEI gene mutations (n = 12)	Patients without IFN-γ-related IEI gene mutations (n = 14)	*P value*
Gender (M/F)	7/5	11/1	0.16[§]
Age at infection onset (year)[#]	19.6 ± 8.6	35.4 ± 15.5	< **0.01**
Duration of infection (year)[##]	4.5 (1.3-8.5)	2.0 (0.9-4.8)	0.15
Causative pathogen			0.12[§]
NTM	7 (58.33%)[*]	3 (21.43%)	
M. tb	6 (50%)	11 (78.57%)	
Disseminated infection	9 (75.00%)	11 (78.57%)	>0.99[§]
Multifocal lymphadenopathy	11 (91.67%)	7 (50.00%)	**0.04**[§]
Treatment response			0.34[¶]
Complete resolution	2 (16.67%)	6 (42.86%)	
Partial resolution	8 (66.67%)	6 (42.86%)	
Irresponsive/died	2 (16.67%)	2 (14.29%)	
T cell lymphocytopenia	6 (50.00%)	5 (35.71%)	0.69[§]
CD4+ lymphocytopenia	8 (66.67%)	8 (57.14%)	0.70[§]
CD8+ lymphocytopenia	5 (41.67%)	6 (42.86%)	>0.99[§]
B cell lymphocytopenia	4 (33.33%)	6 (42.86%)	0.70[§]
NK cell lymphocytopenia	8 (66.67%)	6 (42.86%)	0.70[§]
Hypogammaglobulinemia	2 (16.67%)	5 (35.71%)	0.39[§]

[*] NTM and *M. tb* were simultaneously isolated in one case. [#] Data described in mean ± standard deviation, and statistical significance assessed by unpaired *t* test. [##] Data described in median (25% percentile-75% percentile), and statistical significance assessed by Mann-Whitney test. [§]Statistical significance assessed by Fisher's exact test. [¶] Statistical significance assessed by Chi-square test. IEI, inborn errors of immunity; M, male; F, female; NTM, nontuberculous mycobacteria; *M. tb*, *Mycobacterium tuberculosis*.

Conclusions: IFN-γ-related IEI should be taken into consideration in individuals with disseminated mycobacterial infections that response poorly to standard treatment. Accurate diagnosis of IEI could benefit patients by guiding appropriate immunotherapy and extension of antimycobacterial treatment.

OA14-213-14 Blood transcriptomic signatures predict treatment outcomes in persons with drug-susceptible pulmonary TB

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Background: Tuberculosis (TB) patients who are deemed cured on completion of TB chemotherapy remain at risk of recurrent disease. There are currently no rapid, non-sputum biomarkers in clinical practice for monitoring response to TB treatment, predicting cure, risk of treatment failure, or recurrent TB.
Design/Methods: We evaluated 20 previously published, parsimonious blood transcriptomic signatures as treatment response biomarkers and predictors of failure, recurrence (including relapse vs reinfection), and death in adults with microbiologically-confirmed, drug-susceptible pulmonary TB in three clinical studies.
These included sub-studies of
1. The treatment-shortening trial S31/A5349 (NCT 02410772),
2. An observational cohort from RePORT-Brazil, and;
3. Participants in the H56:IC31 Vaccine for Prevention of Recurrent Tuberculosis.
Blood was collected in PAXgene tubes at baseline, month 2, at end of TB treatment (EoT). Treatment failure was defined as culture positivity at EoT. Participants were followed after EoT for TB recurrence. Transcriptomic signatures were measured by microfluidic RT-qPCR.
Results: Among 4,113 TB patients enrolled, we evaluated transcriptomic signatures in 737 (278 from S31/A5349, 336 from RePORT-Brazil and 123 from H56-POR). 35 of these 737 experienced poor treatment outcome, 11 had TB-related deaths, and 58 had recurrent TB. Signature scores for all signatures were markedly lower through M2 and EoT compared to baseline for patients who experienced cure. Signature scores were highly correlated and several signatures (such as Gliddon4, Roe3, and Thompson5) performed similarly in differentiating patients with poor treatment outcome from those with cure at baseline and month 2. Thompson5 performed best predicting death. The XpertHR signature performed best at EoT to predict subsequent TB relapse, but not reinfection TB.
Conclusions: Our results suggest that several signatures have potential for biomarker-guided treatment shortening, or to determine poor treatment response and need for adherence support, or treatment lengthening or optimization.

OA14-214-14 Novel subunit TB vaccine delivered by flagellin elicits protective humoral and cellular immunological responses in vivo

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Background: Despite years of mass vaccination with Bacillus Calmette-Guérin (BCG), Tuberculosis (TB) is still regarded as the one of the deadliest infectious diseases. Consequently, novel, effective vaccines are required to reach end the global TB epidemic by 2035 goals. Protein subunit vaccines, which have the desired characteristics of a vaccine, such as specificity, safety, and ease of production, are among the most promising approaches due to their ability to induce protective immune response. This study aimed to investigate the designed novel subunit TB vaccine's ability to elicit protective immunological response when fused with *Salmonella Typhimurium* flagellin (FliC) as a delivery platform. Flagellin has an effective adjuvant activity to enhance antigenic immunogenicity and promote the induction of protective local and systemic immune responses when simultaneously delivered with an antigen.
Design/Methods: Nine HLA-E restricted *Mycobacterium tuberculosis* (*Mtb)* protein peptide sequence construct were fused with *S. typhimurium* flagellin (FliC) to make self-adjuvant novel TB vaccine (Star_MTBV). Immunological responses to candidate TB vaccine in subcutaneously vaccinated BALB/c mice was analyzed by ELISA and flow cytometry.
Results: Star_MTBV-FliC elicited significantly higher antigen-specific immunoglobulin G (IgG) in mice serum, indicating enhancement of humoral antibody response. Furthermore, the vaccine candidate showed to elicit strong cellular immune responses, as evidenced by the T-cells producing key cytokines such as IFNγ and TNFα.

Conclusions: These findings highlight the potential effectiveness of our flagellin-adjuvanted subunit TB vaccine as a promising candidate for further development and evaluation in preclinical and clinical studies.

OA15 How could we improve TB services?

OA15-216-14 Evaluating targeted strategies for declining TB burden in Kashmir, India

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Background and challenges to implementation: Kashmir is the first region of India to achieve more than 80% decline in tuberculosis (TB) incidence in three out of its six districts (2023 levels vis-à-vis baseline year 2015) assessed through District Level Annual Survey (DLAS) conducted with support from Government of India. The study aims to explore the targeted strategies adopted to achieve this reduction and to replicate these models in similar geographies.
Intervention or response: Kashmir adopted a two-pronged strategy of early TB detection and long-term post-treatment follow-up of persons with tuberculosis (PwTB) through the following interventions (i) multiple rounds of intensive house-to-house case finding campaign (popuarly known as *Har Ghar Dastak)* (ii) six-monthly post-treatment follow-up of PwTB for two years (iii) multisectoral engagement to spread awareness. In addition to the above, trends in drugs sales and utilization data were analyzed and corroborated with program records from Ni-kshay (India's digital TB surveillance system). Data was analyzed on SPSS ver21 for following impact indicators (i) TB notification (ii) testing of persons presumed with TB (iii) number of tests needed to diagnose one person with TB (NNT), (iv) TB Score (a composite index of TB care cascade).
Results/Impact: Despite intensive case finding efforts, there was 24% overall reduction in TB notification from the year 2015 onwards. Presumptive tuberculosis testing increased by two-fold (3288), with a logarithmic escalation of 10 per 1,000 in Budgam and 20 per 1,000 in Anantnag and Pulwama districts. TB Score increased consistently from 71 to 86. Logarithmic increase of NNT in Anantnag, Pulwama, and Budgam was found to be 0.64, 1.27, and 1.91 per 1,000,000 respectively.
Conclusions: Two-pronged strategy adopted by Kashmir disrupted the chain of TB transmission. It showed a significant impact on the TB program outcomes signifying it's replication in similar geographies.

OA15-217-14 Evaluating the yield from TB diagnostic referrals from private pharmacies in Vietnam

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Background and challenges to implementation: Vietnam's pharmaceutical market is in a growth phase, prompting numerous drug outlets and pharmacy chains to emerge and grow, which reinforces health-seeking behaviors that render pharmacies as the first point of contact for people who feel unwell. Therefore, pharmacies play a vital role in providing proper care for people presumed to have tuberculosis (TB).
Intervention or response: From January 2020 to December 2023, a private sector engagement scheme was established across 15 provinces of Vietnam which engaged private providers for TB diagnostic referrals. Private pharmacies were asked to verbally screen their clientele and refer those with clinical symptoms suggestive of TB to a designated radiography site for a subsidized chest X-ray (CXR) and if eligible, free sputum testing with the Xpert MTB/RIF Ultra assay. Data were recorded via electronic tools in conjunction with paper referral vouchers. Screening, CXR, test results and treatment linkage data were abstracted from the project's database to assess the yield of this engagement strategy.

Process Indicator	Output
Private pharmacies engaged	1,889
Pharmacies making ≥1 diagnostic referral	161 (8.5%)
Pharmacies making ≥50 diagnostic referrals	13 (0.7%)
Total number of diagnostic referrals from pharmacies	5,091
Referrals resulting in a CXR screen	4,818 (94.6%)
CXR abnormal results	1,730 (35.9%)
Tested with the Xpert/Ultra assay	1,550 (89.6%)
All forms TB detected	532
Linked to appropriate treatment	481 (90.4%)

Results/Impact: A total of 3,155 private providers were engaged by the project including 1,889 (59.9%) pharmacies. A total of 5,091 diagnostic referrals were made from 161 (8.5%) pharmacies; just 13 (0.7%) pharmacies that made ≥50 referrals. 4,818 (94.6%) of those referred

received a CXR screen and 532 were eventually diagnosed with TB (detection rate = 11,042 / 100,000). 481 (98.8%) people diagnosed with TB were linked to treatment, with the vast majority (98.8%) deciding to take treatment in public healthcare sector.
Conclusions: Despite the large number of pharmacies engaged, less than 10% made at least one referral. However, these participants yielded outstanding results, suggesting their potential in improving TB detection efficiency and reducing missed cases. Yet, further evidence on acceptability and cost-effectiveness, along with strategies to identify enablers, is crucial for sustainability and policy consideration.

OA15-218-14 Linking non-TB diagnostic to TB-diagnostic health facilities leads to improved TB cure rate in rural settings: Case study of Karamoja Region-Uganda

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Background and challenges to implementation: Background: Karamoja region had an annual TB notification of about 2500 Bacteriologically confirmed cases in 2020. However, the percentage of those declared cured was 33% against a WHO target of 90%. We explored the benefits of linking peripheral health centre IIs (HC II), which did not have microscopes, to health facilities with microscopes to perform sputum smear microscopy testing during patient treatment monitoring in Karamoja region, Uganda.
Intervention or response: In January 2020, the USAID Program for Accelerated Control of Tuberculosis (PACT) in Karamoja activity identified health facilities which had functional microscopes and attached them to peripheral lower-level HCIIs without functional microscopes. Health care workers at health facilities without functional microscopes were trained and mentored continuously on sputum sample collection, packaging and transportation, and then supported monthly to go to the health facilities of their attachment to perform sputum smear microscopy testing. Clinic visits of patients at health facilities without microscopes were aligned to the schedules of the laboratory personnel.
Results/Impact: By December 2022, the cure rate (the proportion of patients with negative sputum smears at months 2 or 5 and 6 of treatment) at peripheral HC IIs that were part of the intervention increased to 70% (Figure 1). The overall treatment success rate of the bacteriologically confirmed cases improved significantly during the intervention compared to the time before introduction of the above approach. The capacity of the participating laboratory personnel was also built. In addition, the quality assurance of the smear slides that were made by the peripheral HC IIs met the >95% national target for pass rate.
Conclusions: Linking peripheral HC IIs to health facilities with microscopes steadily improved cure rate in Karamoja. We recommend the above approach to peripheral HC IIs in settings like Karamoja.

OA15-219-14 Understanding the TB-disability linkages: Preliminary findings from a pilot in India

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Background and challenges to implementation: TB is a complex issue, affected by clinical and social vulnerabilities. The impact of TB needs to be understood from the lens of people living for years with their vulnerabilities, disability being one of them. Understanding this perspective and identifying disability as an outcome of TB is important to strengthen long-term comprehensive care and physical and social rehabilitation for TB survivors.
Intervention or response: In 2023, the first national-level assessment on TB and Disability, by REACH, outlined the complex intersections and the need for strategies to provide better quality of care to people with disabilities. Recommendations included making healthcare centres more accessible, addressing disability-related data gaps and prioritising person-centred care for individuals with disabilities diagnosed with TB. As a follow-up, 240 TB Champions in four states were trained to understand types of disability and ways to provide support to people with TB and disability. TB Champions administered a Comprehensive Assessment Tool among people with TB to identify their challenges in terms of disability and provided supportive services.
Results/Impact: Between July 2023 - March 2024, 10620 people with TB were interviewed out of which 328 reported a disability. Of this, 71% reported having a pre-existing disability and 29% reported developing a disability during their TB treatment. TB Champions supported people with TB and disability to travel to the health facility and move

within the facility, explained their disability to healthcare providers, addressed stigma, facilitated linkage to disability cards and social security schemes. In Odisha, Kalinga TB Survivors Network set up a grocery shop for the family of a person with TB and severe disability so they could have a source of income.

Total screened (July 2023 - March 2024)	10620		
Number of people with TB identified with disability	328		
Type of disability	Locomotor disability	Visual impairment	Hearing impairment
No. of cases (out of 328)	112	80	91
Number of people with TB reporting developing a disability during TB treatment	96		
Type of disability	Locomotor disability	Visual impairment	Hearing impairment
No. of cases (out of 96)	23	34	36
Number of people with TB reporting a pre-existing disability	232		
Type of disability	Locomotor disability	Visual impairment	Hearing impairment
No. of cases (out of 232)	89	46	55

Conclusions: For treatment and long-term care of people with TB and disabilities, there is need for data on disability, developing comprehensive systems for supporting them, addressing stigma and educating communities on TB and vulnerabilities.

OA15-220-14 Factors associated with TB treatment initiation among bacteriologically negative individuals evaluated for TB: An individual patient data meta-analysis

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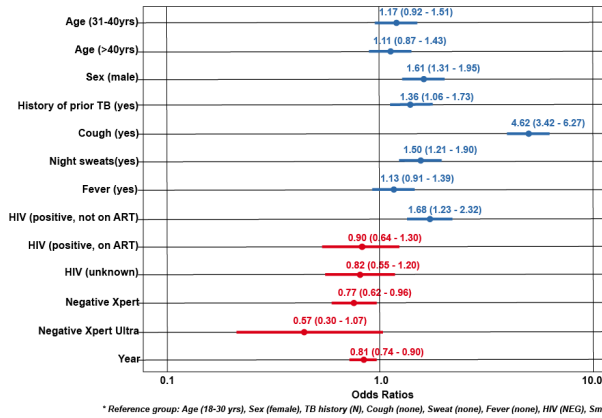
Background: Globally, over one-third of pulmonary tuberculosis (TB) disease diagnoses are made based on clinical criteria after a negative diagnostic test result. Understanding factors associated with clinicians' decisions to initiate treatment for individuals with negative test results is critical for predicting the potential impact of new diagnostics.
Design/Methods: We performed a systematic review and individual patient data meta-analysis using studies conducted between January/2010 and December/2022 (PROSPERO: CRD42022287613). We included trials or cohort studies that enrolled individuals evaluated for TB in routine settings. In these studies participants were evaluated based on clinical examination and routinely-used diagnostics, and were followed for ≥1 week after the initial test result. We used hierarchical Bayesian logistic regression to identify factors associated with treatment initiation following a negative result on an initial bacteriological test (e.g., sputum smear microscopy, Xpert MTB/RIF).
Results: Multiple factors were positively associated with treatment initiation: male sex [adjusted Odds Ratio (aOR) 1.61 (1.31–1.95)], history of prior TB [aOR 1.36 (1.06–1.73)], reported cough [aOR 4.62 (3.42–6.27)], reported night sweats [aOR 1.50 (1.21–1.90)], and having HIV infection but not on ART [aOR 1.68 (1.23–2.32)]. Treatment initiation was substantially less likely for individuals testing negative with Xpert [aOR 0.77 (0.62–0.96)] compared to smear microscopy and declined in more recent years.



Conclusions: Multiple factors influenced decisions to initiate TB treatment despite negative test results. Clinicians were substantially less likely to treat in the absence of a positive test result when using more sensitive, PCR-based diagnostics.

OA15-221-14 Boosting TB detection in Cambodia: A quality improvement collaborative approach

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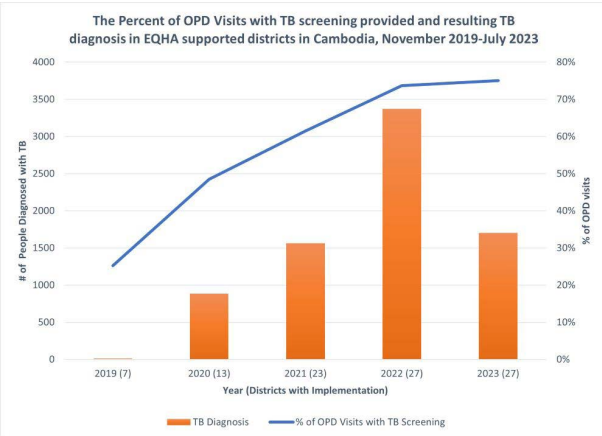
Background and challenges to implementation: Despite ongoing case-finding efforts, an estimated one-third of people with TB in Cambodia go undetected annually. This significantly hinders control efforts and contributes to the spread of TB. Limited access to healthcare, lack of awareness about TB symptoms, and resource constraints at healthcare facilities all contribute to this challenge.

Intervention or response: A Quality Improvement Collaborative (QIC) program was implemented by the USAID Enhancing Quality of Health Care Activity in close collaboration with the MOH and provincial health departments /operational districts (ODs) in 311 health facilities across 30 ODs in Cambodia. Twenty-seven of the ODs chose to focus on TB from November 2019 to July 2023. The QIC focused on implementing standardized processes for screening through recording and reporting tools and building capacity of provincial health department/OD quality improvement (QI) and TB teams. The QIC shared learning experiences focused on TB symptomatic screening and QI methods through data-driven improvement coaching visits, learning sessions, and exchange visits to high performing sites.
Results/Impact: In the 27 ODs 3,242,288 patients received TB symptomatic screening from November 2019 to July 2023. The percentage of patients screened during outpatient department (OPD) visits rose from 25% in 2019 to 75% in 2023. Screening resulted in the identification of 94,888 people with presumed TB cases and the diagnosis of 7,533 TB patients, of whom 99% were initiated on treatment.



Conclusions: Systematic TB screening with QI support significantly increased TB screening, case detection and treatment initiation in Cambodian OPDs, highlighting the value of QICs for TB control. This approach is feasible for routine implementation with health system support.

OA15-222-14 Implementing differentiated service delivery models for TB care to inform national policy in Uganda

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Background and challenges to implementation: Differentiated service delivery (DSD) models aim to adapt health services delivery to clients' preferences and clinical characteristics while reducing burden on health systems. In Uganda, TB DSD models were implemented to mitigate disruptions from the COVID-19 pandemic and inform national efforts to improve TB care.
Intervention or response: Beginning in April 2021, four facility-based and four community-based TB DSD models were implemented in 28 TB clinics in Kampala and Soroti Region (Table). Clients of all ages, clinical, and HIV status in intensive (months 1-2) and continuation (months 3-6) phases were eligible. Client preference and clinician concurrence determined model choice. All models allowed medication dispensing intervals ranging from biweekly to multi-month dispensing (MMD; ≥2 months). Data from TB registers were used to evaluate the intervention. TB treatment outcomes were benchmarked against facilities' pre-pandemic (2018-2019) results.
Results/Impact: Among 1,864 TB clients enrolled from April 2021-March 2022, 1,822 (97.7%) used one or more DSD models; 56 (3.1%) switched models at least once. Overall, 1,284 (68.9%) clients enrolled in at least one facility-based model and 737 (39.5%) in at least one community-based model. Use of community-based models increased during the continuation phase. During intensive phase, the longest medication dispensation interval was biweekly for 50.0% of patients, monthly for 41.3%, and MMD for 8.8%. During continuation phase, the longest interval was biweekly for 0.6%, monthly for 71.7% and MMD for 27.6%. Overall, 84.9% (1,582/1,864) of clients were cured or completed treatment, compared to 72.9% (858/1,177) in 2018-2019. Seven (0.4%) patients failed treatment, 32 (1.7%) were lost to follow-up, 101 (5.4%) died, and 122 (7.6%) were not evaluated, compared to 0.8%, 8.5%, 7.0% and 10.9%, respectively, in 2018-2019.
Conclusions: TB DSD models were successfully implemented, and most TB clients received differentiated services. TB treatment outcomes under DSD were comparable to historical outcomes. Investigating factors affecting MMD use could inform program design.

Model		Description	No/% patients ever enrolled in model* Kampala (n=1,026)	No/% patients ever enrolled in model* Soroti (n=838)
FACILITY	Facility-Based Individual Management	A more intensive model for patients needing in-person review at their drug pick-ups	799 (77.9%)	207 (24.7%)
	Fast-Track Drug Refill/Facility Quick-Pick	Client picks up TB drugs from pharmacy on scheduled appointment date without first seeing clinician	30 (2.9%)	249 (29.7%)
	Refill Alignment with Comorbidities	Client receives TB drugs along with medication for another chronic condition (e.g., HIV); appointment dates are harmonized	0	8 (1.0%)
	Facility-Based Group	Patient attending specialty clinics (e.g., antenatal care) is attended to in that clinic	0	5 (0.6%)
COMMUNITY	Home Delivery	Cough monitors on motorcycles deliver TB drugs to patients' home; health workers may ride along to check on unstable patients	346 (33.7%)	352 (42.0%)
	Community Drug Distribution Points	TB drugs delivered to location convenient to 5+ patients in given area	32 (3.1%)	0
	Community Pharmacy Refills	Patient picks up TB drugs at community retail pharmacy	1 (0.1%)	0
	Community Refill Groups	TB drugs resupply distributed through Community-based support groups	0	24 (2.9%)

Table. Differentiated service delivery models in Soroti and Kampala Region, Uganda¥

** Patients could enroll in more than one model over the course of TB treatment*

¥ Patients not enrolled in any differentiated model were considered to have received the standard of care, which includes bi-weekly drug dispensation during the first month, then monthly dispensation for the remaining five months, in the health facility, with review by a TB clinician at each encounter.

OA15-223-14 Perception of community stakeholders and healthcare providers with using drones for TB diagnosis in Nepal: An exploratory qualitative study

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Background: A drone transport system was established to transport sputum samples to laboratories with GeneXpert MTB/RIF in rural Nepal. This study explored the perceptions of using drones for TB diagnosis among community stakeholders and healthcare providers (HCPs) from communities with (drone-experienced) and without (drone-naïve) programs.

Design/Methods: In December 2019, we conducted focus group discussions (FGDs) in two drone-experienced and three drone-naïve communities. We purposively selected 40 participants:community stakeholders(n=18) and HCPs(n=22). FGDs employed semi-structured questions, which were audio-recorded, transcribed, and translated into English. Codebook thematic analysis was performed and charted using three levels of the socioecological model: individual, community, and health system.
Results: We identified four themes:
(i) Trust in drones underpins successful use for TB diagnosis
(ii) Drone-based sample transport optimised accessibility for people with TB and healthcare providers
(iii) Drones create opportunities to improve community and health systems and
(iv) External factors impede drones use to facilitate TB diagnosis.
The study reported at individual level, people's trust in drones mainly through community-based events. Using drones reduced distance, time, costs and transport-related anxiety for people with TB and providers while accessing care or delivering samples. At community level, drones use create opportunities to increase the skills of local people as drone pilots. At health system level, drone transport increases efficient sputum sample delivery and provides opportunities to transport medicines and other biomedical samples.
Perceived challenges were adverse weather, limitations in skilled human resources, and financial resources to operate drones sustainably.
Conclusions: Community stakeholders and healthcare providers reported high levels of trust in drones and perceived their use for TB diagnosis to substantially benefit people with TB and providers in rural Nepal. The use of drones to facilitate TB diagnosis and treatment in remote rural areas can improve equity of access to advanced diagnostic testing, with potential application to address other health challenges.

OA16 Pregnancy and reproductive health and TB

OA16-224-14 M. tuberculosis infection in pregnancy: A systematic review

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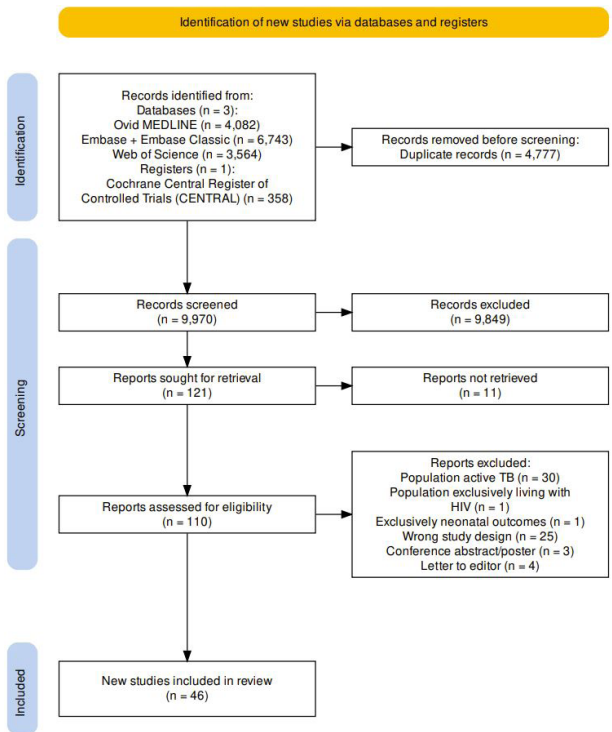
Background: Pregnancy is associated with increased risk of active tuberculosis (TB) disease in those who have been infected with *Mycobacterium tuberculosis* (*Mtb*). The perinatal period could provide opportunities for targeted screening and treatment.
Design/Methods: We searched Ovid MEDLINE, Embase + Embase Classic, Web of Science, and Cochrane Central Register of Controlled Trials (CENTRAL) on October 3, 2023. Studies were included if primary outcomes were prevalence, natural history of progression to TB disease, test performance, cascade of care, or treatment outcomes. Two authors independently screened studies, extracted data, and assessed study quality using an adapted Newcastle-Ottawa scale.



Results: Of 9,970 studies identified, 46 met inclusion criteria. Prevalence of *Mtb* infection ranged from 4.3%-57.0%, and increased with advancing maternal age and ethnicity. Four studies reported increased risk of TB disease in the perinatal period, with incidence rate ratios between 1.3-1.4 during pregnancy and 1.9-2 postpartum. In pregnant women, concordance between Tuberculin Skin Test (TST) and Interferon Gamma Release Assay (IGRA) ranged from 49.4%-96.3%, with k-values of 0.19-0.56. 62.0-100.0% of pregnant women completed antenatal TST screening, and 81.0-100.0% had chest radiography.
TB preventative treatment (TPT) during the perinatal period had no associated serious adverse events in three studies, while one study reported possible association with isoniazid hepatitis (risk ratio 2.5, 95% CI 0.8–8.2) and fatal hepatotoxicity (rate ratio 4.0, 95% CI 0.2–258).
Conclusions: The antenatal period provides an opportunity for targeted screening and treatment for pregnant women with *Mtb* infection. As women from high TB-incidence settings demonstrate highest prevalence and risk of disease, this cohort should be prioritised.
From the limited number of published studies, antenatal TPT appears safe and feasible; however, further studies are needed to optimise benefits, ensuring pregnant and postpartum women can make evidence-informed decisions for effective TB prevention.

OA16-225-14 Burden and outcomes of TB in pregnant women: Insights from Mozambique

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Background and challenges to implementation: Tuberculosis (TB) notification among pregnant women in Mozambique has surged, climbing from 23 cases annually in 2019 to 109 cases in 2023. Understanding the epidemiology and impact of tuberculosis on maternal and child health is critical.
Intervention or response: We conducted a retrospective analysis of 308 TB cases in pregnant women from 2019 to March 2024 across Mozambique's provinces. Data were collected from TB registers and maternity records, with statistical analysis to evaluate TB, HIV status, treatment outcomes, and pregnancy outcomes.
Results/Impact: Most TB cases occurred in women aged 15-34, constituting 73% (n=224) of cases. Sofala, Cabo Delgado, and Niassa had the highest TB notifications. Pulmonary TB accounted for 301 cases, with 95% being new cases and 86% sensitive TB. There were 156 HIV positive pregnant women (51%). Only 65% (n=199) had confirmed microbiological diagnoses, mainly through GeneXpert. Treatment outcomes included 51% cured, 40% completed treatment, and 4% died during treatment.

Among the pregnant women who gave birth, the majority (94%, n=274) had live births, including 35 out of 39 pregnant women with resistant TB, 8 lost their babies, and 16 were still pregnant. Adverse newborn outcomes, including low birth weight and stillbirth, were seen in 21 cases. No significant associations were found between TB history and pregnancy or newborn outcomes (p=0.801, p=0.980), or resistance profile and pregnancy or newborn outcomes (p=0.933, p=0.199). However, significant associations existed between HIV status and pregnancy or newborn outcomes (p=0.008, p=0.030), and between TB treatment outcomes and pregnancy or newborn outcomes (p=0.000, p=0.000).

	Frequency	%
Total	**308**	**100**
Age		
15 - 34	224	73%
35 - 54	80	26%
SI	4	1%
Localization of lesion		
Pulmonary	301	98%
Extrapulmonary	7	2%
Category		
New case	292	95%
Previous TB	15	5%
No info	1	0%
Resistance profile		
Sensitive TB	265	86%
Resistant TB	42	14%
No info	1	0%
HIV status		
Positive	156	51%
Negative	152	49%
Type of diagnosis		
Microbiological confirmation	199	65%
Clinical diagnosis	107	35%
No information	2	1%
Diagnostic Test		
GeneXpert	189	61%
Other lab tests	91	30%
No info	28	9%
Outcomes of treatment		
Cured	143	51%
Treatment completion	114	40%
Death	11	4%
Not evaluated	8	3%
Lost to follow up	4	1%
Transfered	3	1%
Outcomes of pregnancy		
Livebirths	274	94%
Death of foetus (stillbirth, miscarriage)	8	3%
No information	10	3%
Outcome of newborn (N= 274+8)		
Healthy infant	257	91%
Adverse outcome	21	7%

Table 1. Clinical epidemiological profile and treatment outcomes of TB in pregnant women, 2019 to 2024 in Mozambique.

Conclusions: This study highlights the increasing burden of TB in pregnant women in Mozambique and underscores the importance for integrated TB and maternal healthcare services to improve treatment and pregnancy outcomes.

OA16-226-14 TB in vulnerable populations: A case study of pregnant women across nine secondary facilities in Kano, Nigeria

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Background and challenges to implementation: TB remains an important cause of maternal morbidity and mortality in endemic countries and is associated with increased risk of preterm birth, low birth weight, and fetal death. Pregnant and postpartum women are up to two times more likely to develop TB disease compared to their nonpregnant counterparts, and the consequences can be grave for both mother and neonate. We present results of TB screening at antenatal care units in Kano state.
Intervention or response: KNCV Nigeria is implementing Intensified Case finding (ICF) for TB in public facilities under the USAID-funded TB-LON Project across 14 states in Nigeria. In Kano state, the ICF intervention is implemented across nine secondary facilities.
Twenty-seven adhoc staff were trained to screen hospital attendees at different service delivery points to identify presumptive TB , evaluate them for TB and link confirmed TB cases to treatment. Data reported using the Comcare application from June 2020 to July 2023 was collated and analysed.
Results/Impact: One hundred and eighty-nine thousand pregnant women attended ANC across the nine facilities; with 113,864(60%) screened for TB, 5,585 were identified as presumptive TB, and 4,785 of them were evaluated.
Overall TB yield was 3% translating to 128 TB cases diagnosed, 62% of the total cases were bacteriologically diagnosed and 2 among the TB cases were HIV coinfected. Thirty seven percent of pregnant women with TB were aged 21-30 years. The number needed to test to detect one TB case was 58 and the number needed to screen was 889.

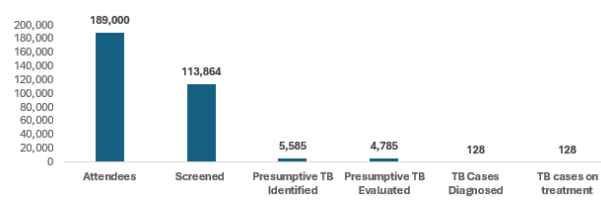

Figure. TB cascade performance for pregnant women across nine secondary facilities in Kano State.

Conclusions: Providing TB screening services to pregnant women seeking antenatal care holds promising results thus, intensifying screening efforts among pregnant women can prevent negative consequences of TB disease to the mother and child.
We recommend scale up of routine active TB screening in other facilities while providing ANC services to the pregnant women across the state and country.

OA16-227-14 TB infection in infertile women: A multi-center study in China (TB-PRIME study)

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Background: Female genital tuberculosis (FGTB) is an important cause of women infertility in high TB burden areas. There is subclinical/latent genital tuberculosis infection as well, defined as the detection of pathogens but asymptomatic. However, guidelines to identify those with female genital tuberculosis or latent tuberculosis in fertility centers are lacking.
Our TB-PRIME study established a multi-center cohort to characterize the epidemiology of TB infection and its impact on pregnancy in Chinese infertile women.
Design/Methods: This is a prospective cohort study. From November 2021 to February 2024, infertile women from 13 reproductive centers were assessed for risk factors for TB infection and eligible participants underwent screening using QuantiFERON-TB Gold (QFT) assay. Participants with positive QFT results underwent further testing for genital tuberculosis (ClinicalTrials.gov: NCT05311423).
Results: This study recruited 2011 infertile women and formed 4 groups (Figure 1).
A total of 543 (27%) participants were QFT positive. Among the QFT-positive patients, the prevalence of genital tuberculosis infection was 5.5% (30/543), among which 12 (2.2%) were recognized as subclinical/latent genital TB infection by positive Xpert MTB/RIF Ultra but negative pathology results of the endometrial biopsy, and 12 (3.66%) were diagnosed as FGTB.
Duration of infertility, previouc gynecological surgeries, previous ART, previous positive IGRA result, chest imaging abnormalities, previous TB history, and non-BCG vaccination were identified as risk factors for QFT positivity (Table 1).
Moreover, the previous positive IGRA results was identified as a risk factor for genital tuberculosis infection in QFT-positive patients.

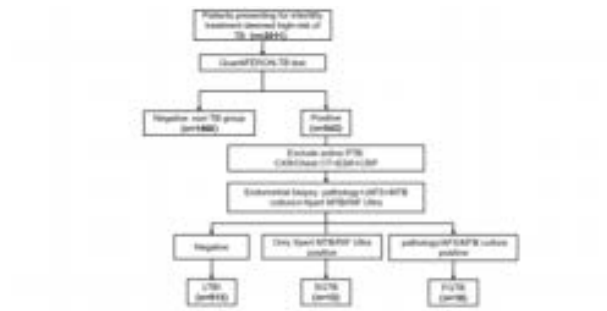

Figure 1 Study flowchart (PTB, pulmonary tuberculosis; CXR, chest X-ray; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; AFS, acid-fast staining; MTB, Mycobacterium tuberculosis; LTBI, latent tuberculosis infection; SGTB, subclinical genital tuberculosis; FGTB, female genital tuberculosis)

Table 1. Risk factors for QFT positive results (using Multivariate logistic regression analysis)

	Variate	OR	95%CI	P value
Basic Information	Infertile duration	1.053	1.012 to 1.095	0.0100
	Previouc gynecological surgeries	1.280	0.9521 to 1.651	0.0575
	Previous ART procedures	1.148	0.8423 to 1.556	0.3775
Tuberculosis History	Previous positive IGRA result	6.835	3.043 to 17.15	<0.0001
	Chest imaging abnormalities	2.858	1.815 to 4.547	<0.0001
	Previous TB infection	12.68	9.468 to 17.11	<0.0001
	Without (BCG) vaccination	2.004	1.481 to 2.706	<0.0001

Conclusions: The prevalence of female genital TB in infertile women in China seems to be high, and this study indicates that all at-risk women seeking infertility care should be screened for TB infection before
infertility treatments are initiated.

OA16-228-14 Perinatal outcomes of TB in pregnant women with in vitro fertilisation: A retrospective multi-centered cohort study

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Background: In-vitro fertilization (IVF) may have an impact on the perinatal outcomes of tuberculosis (TB) in pregnancy. There has been no large-scale assessment of this.
Design/Methods: A multi-centered retrospective cohort study was conducted to assess the perinatal outcomes of pregnancy with TB in three tertiary hospitals in China from June 1st, 2018, to November 30th, 2023.
We enrolled pregnant women hospitalized for active tuberculosis, conducted telephone interviews, and compared perinatal outcomes between those with and those without receiving IVF treatment. Those without a clear history of IVF or denied IVF history were categorized as non-IVF.
Results: The study included 165 pregnant women diagnosed with tuberculosis. Out of these, 41 women (24.8%) had undergone IVF treatment, while the remaining 124 women (75.2%) had no history of IVF treatment. It was found that the IVF group had a lower live birth rate (14/41, 34.1%) compared to the non-IVF group (64/124, 51.6%), P <0.05.

After adjusting for abortion with non-obstetric reasons, the live birth rate was 31.6% (11/35) and 55.5% (61/110) for the IVF and non-IVF groups, respectively, with P <0.05. In addition, the proportion of disseminated TB is higher in the IVF group (87.8% vs. 21.8%, P <0.001).
Conclusions: IVF treatment renders women more vulnerable to active tuberculosis and results in worse perinatal outcomes. This phenomenon needs increased awareness.

OA16-229-14 TB treatment outcomes among pregnant women living with HIV with presumably drug-susceptible TB

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Background: Pregnant women living with HIV and tuberculosis have poor maternal and infant outcomes. Less is known about tuberculosis treatment outcomes among pregnant women with and without HIV. Physiological changes and immunological adaptations during pregnancy, with challenges of managing both HIV and TB, could potentially impact the efficacy and tolerability of TB treatment regimens.
We evaluate factors associated with WHO-defined non-successful treatment outcomes among pregnant women living with HIV with presumably drug-sensitive TB (DS-TB).
Design/Methods: In this secondary analysis, we used multivariable logistic regression to evaluate factors associated with unsuccessful tuberculosis treatment outcomes among pregnant women living with HIV and DS-TB disease enrolled in the Tshepiso cohort study in Soweto, South Africa, from 2011-2014.
Results: We had data on 79 pregnant women living with HIV and presumably DS-TB; 61 (77.2%) had successful treatment outcomes, and 18 (22.8%) had a non-successful treatment outcome (12 treatment failure, 5 lost to follow-up, and 1 died). The only factor significantly associated with unsuccessful TB treatment outcome was having detectable HIV RNA viral load at enrollment (aOR 5.1, 95% confidence interval, 1.1- 25.3, p=0.044).
The presence of extrapulmonary TB (aOR 2.2, 95% confidence interval, 0.4-11.7, p=0.352), bacteriological (positive smear and/or culture) confirmation of TB (aOR 2.1, 95% confidence interval, 0.7-6.7, p=0.211), and anemia (Hb≤10.5 g/dL) at enrollment (aOR 1.0, 95% confidence interval, 0.3- 3.1, p=0.993) were not statistically significant.

Characteristic	Unadjusted OR (95%, CI)	Adjusted OR (95%, CI)
Extrapulmonary TB	2.2 (0.5 -10.5)	2.2 (0.4 – 11.7)
Anemia (Hb <10.5 g/dL)	1.3 (0.4 - 3.6)	1.0 (0.3 – 3.1)
Bacteriological Confirmation (+)*	1.5 (0.5 - 4.4)	2.1 (0.7 – 6.7)
Viral Load Detectable^	4.8 (1.1 - 23.0)	5.1 (1.1 – 25.3)

* Bacteriological confirmation as having a positive AFB smear and/or culture
^ Viral load detectable, as having more than 20 copies/mL of HIV RNA.

Table 1. Multivariable analysis.

Conclusions: The identification of detectable HIV viral load upon enrollment emerges as a critical factor associated with unsuccessful treatment outcomes in pregnant women living with HIV. Additional research is needed to determine factors associated with and interventions to prevent unsuccessful treatment outcomes in pregnant women.

OA16-230-14 TB infection conversion among pregnant women living with HIV: A sentinel screening study at three Ugandan health facilities

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Background: Pregnant women are at an increased risk of tuberculosis (TB). We sought to determine the progression of TB infection and disease among HIV-positive pregnant mothers attending antenatal care (ANC).
Design/Methods: We conducted a longitudinal study between October 2021 to April 2022 at three healthcare facilities in Uganda. Systematic screening for TB involved a symptomatic TB assessment and evaluation for TB risk factors, which included close contact with TB patients, chronic conditions (HIV, diabetes mellitus, or hyperglycaemia), alcohol consumption, and tobacco smoking. We excluded women with TB disease or undergoing TB treatment. Those identified with TB risk factors underwent IGRA testing for TB infection at their first visit during ANC and again three months post-partum.
Results: From 3,735 mothers screened, we analysed data from 3,720, excluding 15 undergoing TB treatment. The median age was 25 years (IQR: 22–29). Prevalent comor-

bidities included HIV/AIDS (13.1%, n=489), prediabetes (1.8%, n=67), hypertension (0.5%, n=17), and diabetes mellitus (0.3%, n=12). Additionally, 6.8% (n=252) reported alcohol use, and 0.3% (n=10) were smokers. TB symptoms were present in 8.0% (n=298) of participants, with 6.0% (n=222) reporting a cough. Of those with a cough, 35.1% (78/222) were productive and all tested negative on GeneXpert. Among the 19.5% (727/3720) identified as having TB risk, 52.1% (n=379) were tested for LTBI at baseline, and 36.1% (n=137) were positive. Post-partum, we repeated IGRA for 55.4% (169/305) participants living with HIV/AIDS. Of these, 61 (36.1%) remained positive for LTBI, 10 (5.9%) reverted to negative, 82 (48.5%) remained negative, and 16 (9.5%) converted from negative to positive.

Conclusions: Our study revealed that close to 1 in 5 pregnant mothers in Central Uganda were at risk of TB. Understanding the clinical and immunological factors associated with IGRA converters in HIV-infected pregnant women will greatly inform strategies for enhanced TB screening and prevention in high-burden regions like Uganda.

OA16-231-14 TB preventive treatment for pregnant women with HIV in South Africa: A modeling analysis of clinical benefits and risks

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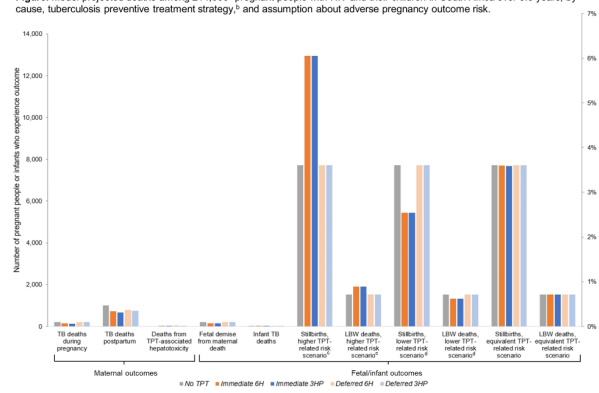
Background: Although prior studies of tuberculosis preventive treatment (TPT) for pregnant people with HIV (PPWH) report conflicting adverse pregnancy outcome (APO) risks, international guidelines recommend TPT for PPWH.

Design/Methods: We used the Cost-Effectiveness of Preventing AIDS Complications microsimulation model to assess potential benefits and risks of five TPT strategies among the 214,000 annual PPWH on antiretroviral therapy in South Africa. Modeled strategies were: 1) *No TPT*, 2) six months of daily isoniazid during pregnancy (*Immediate 6H*), 3) three months of weekly isoniazid-rifapentine during pregnancy (*Immediate 3HP*), 4) postpartum 6H (*Deferred 6H*), 5) postpartum 3HP (*Deferred 3HP*). Primary outcomes were deaths from causes potentially influenced by TPT (maternal TB, maternal hepatotoxicity, stillbirth, low birth weight [LBW], and infant TB). For risks of stillbirth/LBW, TB during pregnancy confers 250%/81% higher risks, and immediate TPT confers either 92%/35% higher risks, 38%/16% lower risks, or equivalent risks compared with no or deferred TPT. We identified maximum TPT-related stillbirth/LBW risks under which immediate TPT would produce fewer overall deaths than deferred TPT.

Results: Immediate TPT during pregnancy would result in the fewest deaths among PPWH (Figure). When TPT confers higher stillbirth and LBW risks, immediate TPT would produce the most combined maternal and fetal/infant deaths, even with low maternal CD4 count and high tuberculosis incidence. If immediate TPT yields a <4% or <20% increase in stillbirth or LBW, immediate TPT would produce fewer combined maternal and fetal/infant deaths than deferred TPT (sensitivity analysis range <2-22% and <11-120%).

Figure. Model-projected deaths among 214,000[a] pregnant people with HIV and their children in South Africa over 3.5 years, by cause, tuberculosis preventive treatment strategy,[b] and assumption about adverse pregnancy outcome risk.



Abbreviations: TB, tuberculosis; TPT, tuberculosis preventive treatment; LBW, low birth weight; 6H, six months of daily isoniazid; 3HP, three months of weekly isoniazid-rifapentine.

[a]Results are scaled to the annual number of pregnant people with HIV on antiretroviral therapy before pregnancy in South Africa (n=214,000) from the South Africa Antenatal Survey 2019. The denominator for both maternal and fetal/infant outcomes is 214,000.

[b] Immediate TPT regimens are taken during pregnancy, and deferred TPT regimens are taken postpartum.

[c]The higher TPT-related risk of adverse birth outcomes scenario reflects data reported in the TB APPRISE trial (Gupta et al., *N Engl J Med* 2019).

[d]The lower TPT-related risk of adverse birth outcomes scenario reflects data reported in an observational cohort study in South Africa (Kalk et al., *Clin Infect Dis* 2020).

Conclusions: TPT during pregnancy would decrease combined maternal and fetal/infant deaths if it does not increase stillbirth and LBW risks beyond identified thresholds. Given uncertainty around isoniazid's impact on APOs, and the low threshold at which APO risks could outweigh benefits from TB deaths averted, studies of newer TPT regimens among PPWH are warranted to inform guidelines and care.

OA17 TB preventative therapy, impediments, challenges and successes

OA17-232-14 Comprehensive evaluation of TB preventive treatment for household contacts in Andhra Pradesh, India

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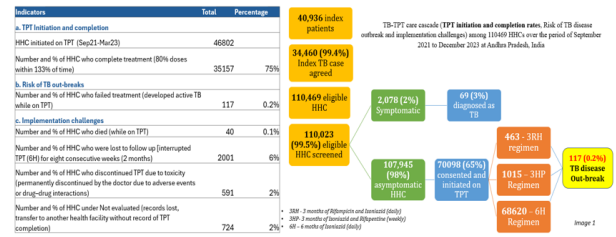
Background: In India, Programmatic Management of TB Preventive Therapy (TPT) envisions to offer TPT to all HHC of index Pulmonary microbiologically confirmed TB patients.
The study was conducted to assess TPT coverage, chances of breakdown to disease and implementation feasibility among 110469 HHCs in AP.
Design/Methods: Following identification of the index pulmonary tuberculosis (PTB) case, their household contacts (HHC) underwent TB evaluation. HHC who were ruled out for active TB were assessed for eligibility and initiated on TB preventive therapy (TPT).
Conversely, those diagnosed with TB will commence anti-tuberculosis treatment (ATT). This explanatory cohort study evaluated the effectiveness of programmatic TPT management in 10 districts of Andhra Pradesh, India (September 2021 - December 2023).
We utilized programmatic data and telephone interviews with index patients' contacts (n=110,023) across public and private sectors.
The study assessed effectiveness through the implemented four stages of the TB-TPT care cascade: contact tracing, screening, TPT initiation, and treatment completion. This comprehensive approach allows identification of gaps and areas for improvement in TPT delivery.
Results:
TPT initiation and completion rates:
As of March 2023, 75% (35,157) of 46,802 HHCs who initiated TPT completed treatment within the expected duration.
TB Disease outbreak:
During TPT, 0.2% (117) of HHCs developed active TB after TPT uptake.
Implementation challenges:
Challenges included drug toxicity (2%), loss to follow-up (6%), and missing records (2%).

Indicators	Total	Percentage
a. TPT Initiation and completion		
HHC initiated on TPT (Sep21-Mar23)	46802	
Number and % of HHC who complete treatment (80% doses within 133% of time)	35157	75%
b. Risk of TB out-breaks		
Number and % of HHC who failed treatment (developed active TB while on TPT)	117	0.2%
c. Implementation challenges		
Number and % of HHC who died (while on TPT)	40	0.1%
Number and % of HHC who were lost to follow up (interrupted TPT (6H) for eight consecutive weeks (2 months)	2001	6%
Number and % of HHC who discontinued TPT due to toxicity (permanently discontinued by the doctor due to adverse events or drug–drug interactions)	591	2%
Number and % of HHC under Not evaluated (records lost, transfer to another health facility without record of TPT completion)	724	2%



Conclusions: Our study proved successful feasibility of contact tracing through home visits followed by optimal initiation and completion rates of TPT with almost insignificant numbers of breakdown to active disease while on TPT.

OA17-233-14 Acceptability of a hypothetical TB preventive therapy regimen among contact persons of multi-drug-resistant TB in high burden countries: A qualitative study

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Background: The WHO Global Tuberculosis (TB) Programme convened a Guideline Development Group (GDG) meeting in December 2023 to consider new evidence on a six-month levofloxacin (6LFX) tuberculosis preventative treatment (TPT) against multidrug-resistant TB (MDR-TB). To support the discussions, we conducted a qualitative study to evaluate the regimen's acceptability among persons exposed to MDR-TB.
Design/Methods: Semi-structured, one-on-one interviews were conducted with 36 participants across five high MDR-TB burden countries: Georgia, India, Indonesia, South Africa, and Viet Nam. Interview topics included: knowledge, attitudes, and experiences around MDR-TB transmission, diagnosis, treatment, and prevention; values and preferences for MDR TPT; and acceptability of a six-month TPT regimen.
Results: Overall, TB preventive treatment was acceptable and had high perceived personal and social value among persons exposed to MDR-TB. Participants favoured a treatment with high efficacy and minimal impact to their

daily routines and quality of life; treatment duration and pill burden were secondary considerations. Participants from all settings strongly wanted to avoid MDR-TB disease.

Although most participants would accept mild to moderate side effects, a long duration of treatment, as well as other TPT requirements (e.g. clinic visits and monitoring), acceptance largely hinged on their own valuation of prevention and the estimated efficacy of TPT. A small minority of participants expressed outright refusal of MDR TPT. Reasons included mistrust surrounding potential side effects due to prior personal or witnessed experience with antibiotics, perceived immunity or low risk of MDR-TB, and general rejection of disease prevention methods such as immunization.

Local context and previous TB experiences also greatly influenced perceived risk, transmissibility, and seriousness of MDR-TB, which in turn shaped decision-making processes around acceptance of MDR TPT.

Conclusions: Education and counselling, socioeconomic support, and minimizing the time, resources, and side effects of TPT, will be important in facilitating acceptability of MDR TPT.

OA17-234-14 Leveraging tele-consultation (E-Sanjeevani) for initiating TB preventive therapy among contacts of people with TB at the community level: A case-study from Manipur, India

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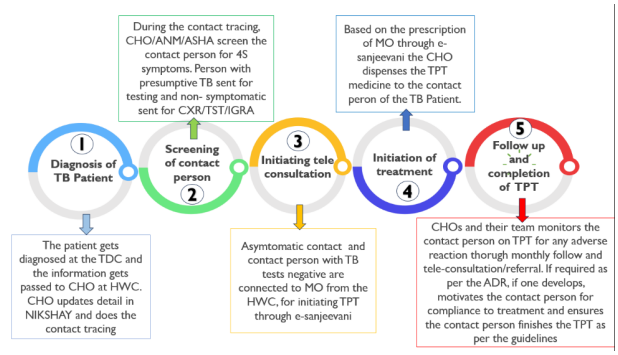
Background and challenges to implementation: TB is a global public health concerned. To support India's End TB strategy by 2025, a project on TPT for contacts of persons with TB was initiated in Manipur in late 2022. Reaching out to all targeted vulnerable population and screening them at facility was challenging due to difficulties in access.

Intervention or response: USAID-funded NISHTHA, implemented by Jhpiego supported the TPT intervention with focus on bringing treatment closer to the community by piloting in Bishnupur district in Jan'23. To mitigate barriers surrounding access, the intervention used teleconsultation (e-sanjeevani) to initiate TPT for the contacts of persons with TB and address of any adverse reactions in the follow-ups (Figure1).

Results/Impact: A total of 33 Spokes *Ayushman Arogya Mandir* (peripheral primary health centres)) and one Hub (District Hospital) were identified and linked. 72 participants including Community Health Officers from the health centres, TB staffs and Medical Officers in the pilot district were trained for facilitating the tele-consultation and initiating TPT.



70 persons with TB were diagnosed in 2022 wherein 430 contact person were identified and screened. Of this, 390 (94%) were put on TPT of the eligible 417 contact person. 13 contact persons for extra pulmonary TB were excluded. By March '24, 213 contact person completed TPT and no major adverse events were reported. Active TB cases was reduced from 70 – 45 from March 2023 to March 2024.

Conclusions: Initiation of TPT through teleconsultation serves as a platform for clients getting therapy with minimal or zero out-of-pocket expenditure closer to their home. The involvement of CHO and leveraging teleconsultation further enhance the adherence by closely monitoring and supporting the treatment thereby reducing the TB cases in the district.

OA17-235-14 Improving TB preventive cascade of care in hard-to-reach populations

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Background: Tuberculosis preventive treatment (TPT) completion rates remain low globally. To enhance tuberculosis (TB) screening and prevention among homeless population in Vladimir city of Russia, we analyzed prevention care cascade to identify losses and associated risk factors.

Design/Methods: A prospective cohort study was conducted over a 4-year period (2019 – 2022). We identified the group of homeless individuals known to be at high-risk for TB. Those in whom TB disease was ruled out according to enrollment algorithm (Fig.1) were offered

TPT with 3-month weekly isoniazid-rifapentine (3HP), 1-month daily isoniazid-rifapentine (1HP) and alternative regimens: 3-month isoniazid-rifabutin (3HRb), 6-month isoniazid (6H), 4-month rifampicin (4R). At 12 months after the initial screening TB examination was performed. We assessed the proportion of noncompletion and associated factors at TB screening, TPT eligibility, enrolment, outcome, and follow-up for active TB at 12 months.

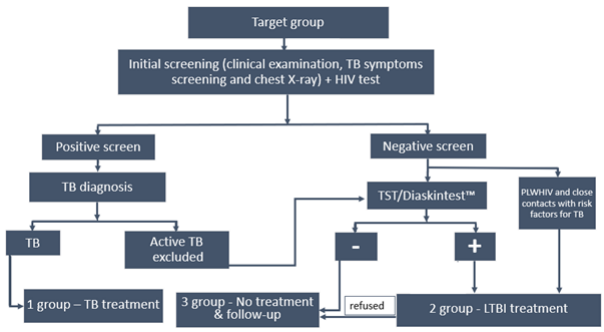

Figure 1. Enrollment algorithm.

Results: From 810 (100%) individuals screened for TB; 29 (3.6%) were excluded due to TB disease. 207 (25.6%) were eligible for TPT (Figure 1). 77/207 (37.2%) were lost before treatment initiation. Risk factors for patient loss were age (28 – 37 years old), alcohol abuse, and HIV-positive status. 42/130 (32.3%) didn't complete full TPT course. The odds of not completing full TPT for regimens 3HP, 3HRb, 4R, 6H were 5.4 (CI: 2.2 - 15.4) times higher than for 1HP regimen. At the 12-month evaluation stage, 64/88 (72.7%) were lost to follow-up. No cases of TB disease were detected among those completed full TPT. Three cases of TB detected in those who refused to start, or interrupted TPT.

Conclusions: Tuberculosis systematic screening followed by TPT is effective for reducing TB in hard-to-reach populations. Intersectoral collaboration, community engagement, and shorter TPT regimens are associated with higher TPT completion rates. A people-centered model of care minimizes losses along the care cascade among homeless individuals, ensuring efficiency of TB control efforts.

OA17-236-14 Adverse drug reactions to isoniazid and rifapentine had no association with discontinuation/missed doses of treatment during the programmatic rollout of TB preventive treatment in Uganda

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Background: There is limited data on adverse events (AEs) related to the three-month course of rifapentine and isoniazid (3HP) for tuberculosis preventive treatment (TPT) when used in programmatic settings. We describe the AEs associated with 3HP and their effect on completion rates and adherence.

Design/Methods: We conducted a prospective cohort study on people initiating 3HP at Infectious Diseases Institute and primary health facilities in Kampala. Participants were followed up at 2, 4, 8 and 12 weeks following 3HP initiation for AE occurrence.

We assessed for AEs using clinical assessment, liver function tests, used the Naranjo score to ascertain relatedness to 3HP and Division of AIDS criteria to assess for severity. Risk factors for AEs were established using modified Poisson regression models.

Results: We enrolled 651 participants; 294(45.2%) were male, 442(67.9%) were people living with HIV (PLHIV) on antiretroviral therapy, median age was 32 (interquartile range (IQR) 26.0–42.0) years. TPT completion rate was 90.5%. Reasons for non-completion include; 1(0.1%) died, 7(1.1%) loss to follow-up, 8(1.2%) transferred out, 12(1.8%) declined medication 16(2.5%) due to AEs and 18(2.8%) could not comply with visits.

Any AE	Unadjusted RR (CI)	p-value	Adjusted RR(CI)	p-value
Gender				
Male	Ref	<0.01	Ref	0.01
Female	1.13(1.05-1.21)		1.12(1.04-1.21)	
Age in years				
Below 55 years	Ref	<0.01	Ref	0.01
55+ years	1.22(1.08-1.39)		1.18(1.04-1.35)	
Baseline Neuropathy				
No	Ref	0.01	Ref	0.03
Yes	1.15(1.04-1.27)		1.12(1.01-1.25)	
BMI				
≤ 18.5	0.95(0.84-1.06)	0.32	0.95(0.85-1.07)	0.39
18.6-24.9	Ref		Ref	
>=25	1.04(0.96-1.13)		1.01(0.92-1.09)	0.91
HIV status				
Positive	1.02(0.94-1.10)	0.66	0.96(0.88-1.95)	0.38
Negative	Ref		Ref	

Table.

A total of 417 (64.1%) participants reported 598 AEs; 492/598 (82.3%) grade 1, 67/598 (11.2%) grade 2, 39/598 (6.5%) grade 3 and 4. Females, older participants ≥55 years and those with baseline neuropathy (p<0.05) (see table) were more likely to experience AEs.
The most common AE was flu-like syndrome 104 (17.4%), neurological events; drowsiness/dizziness (12.9%) and peripheral neuropathy (9.4%). AEs were not associated with an increased risk of missing ≥1 dose of treatment (ARR: 1.00, 95%CI 0.94–1.01, p= 0.936). PLHIV did not have an increased risk of AEs, however, missing ≥1 dose was more likely among them (ARR: 1.11, 95%CI 1.04–1.19, p= 0.001).
Conclusions: In a programmatic setting, 3HP was well tolerated with mostly mild AEs which were not associated with discontinuation or missed doses.

OA17-237-14 Correlation between TB preventive treatment uptake and proportion of women who initiated ART during pregnancy

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Background: Tuberculosis (TB) preventive treatment (TPT) mitigates TB risk among persons living with HIV (PLWH). The World Health Organization recommends TPT for all PLWH, including those who are pregnant, and the U.S President's Emergency Plan for AIDS Relief (PEPFAR) guidance cites this recommendation but supports the principle of clinical autonomy and local variation in national guidance.
The number of pregnant women initiating TPT in PEPFAR-supported programs is unknown.
Design/Methods: We conducted facility-level analyses of TPT initiation among adult women (aged ≥15 years) and proportion of women who initiated antiretroviral treatment (ART) during pregnancy in 17 PEPFAR-supported countries during October 2022–March 2023.
Countries recommending against TPT during pregnancy were excluded. TPT initiation rates were defined as the proportion of adult women who started TPT within six months of ART initiation.
Proportion pregnant was calculated by dividing the number of adult women newly initiating ART who attended at least one antenatal care visit by the number of women newly initiating ART. Spearman's rank correlation (r) assessed the relationship between TPT initiation and proportion pregnant (α=0.05).
Results: Complete data were available for 9,814 health facilities. In total, 291,634 adult women began ART, and 54,210 (19%) were pregnant. The TPT initiation rate was 57% (n=166,626).
Overall, there was a negative correlation between facility-level proportion pregnant and TPT initiation rates (r = -0.15; p<0.05). At the country level, six countries (35%) had statistically significant negative correlations; among these, three explicitly recommend TPT during pregnancy in national guidelines.
Conclusions: While this analysis did not directly measure TPT initiation rates among pregnant women living with HIV, findings suggests that TPT may not be offered to, or accepted by, all women in this population, even in programs where national guidelines recommend it. Pregnancy status is likely one of several factors in the decision to initiate TPT.

OA17-238-14 Incentives as a driver for improved TB preventive treatment uptake: Findings from Kaduna State

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Background and challenges to implementation: With a TB case notification of only 59% in 2022, Nigeria continues to face the challenge of missing TB cases. In the same year, 4693 eligible clients were identified and 365 were placed on various TPT regimens in Kaduna state, Nigeria. Administering TPT to eligible clients remains one of the important strategies to eliminate TB.
With newer regimens recommended for TPT administration in country, we explored the uptake of all TPT regimens including the INH, 3HR and 1HP by eligible clients in Kaduna state viz a viz the incentivized.
Intervention or response: : KNCV Nigeria with funding from USAID is implementing the HCW model for contact investigation in Kaduna state. Trained HCWs were identified and further training provided on contact investigation and TPT administration including the newer TPT regimens of 3HR and 1HP. Incentives were provided for the contact tracing activities however payment of the incentives was fixed to successful TPT enrollment. We reviewed this implementation model for a three Month period looking at the number of eligible clients and those enrolled on all TPT regimens between October and December 2023.
Results/Impact: The adoption of an incentivized model in November FY 24 led to a 36% increase, attributed to additional financial support for DOTS officers and LGT-BLS. This resulted in a notable rise in the number of enrolled eligible clients for TPT in Kaduna State during the implementation phase, from 259 to 1814.

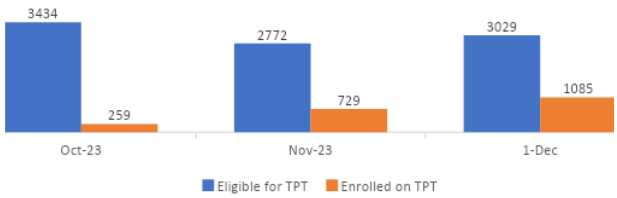

Figure. TPT enrollment chart.

Conclusions: This innovative approach of incentivizing the HCWs to conduct contact tracing with payments hinged upon TPT enrollment has showed promising results with the potential of significantly improving the number of eligible clients placed on TPT.
This should be scaled up on a national basis to improve TPT uptake in the country thereby reducing the reservoir of infection transmission towards eradicating TB.

OA17-239-14 Can community mobilisation and efficient local networks improve TB preventive treatment uptake? The Kano State experience

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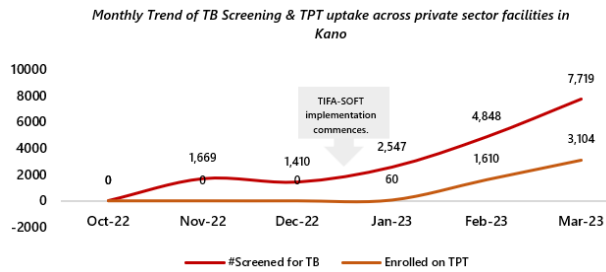
Background and challenges to implementation: Nigeria ranks sixth among the TB high burden countries globally and holds the highest burden in Africa. The World Health Organization (WHO) recommends TB Preventive Treatment (TPT) for household contacts of people with TB as one of the main health care interventions to achieve a reduction in TB incidence to the levels envisaged by the End TB Strategy. TPT uptake among eligible contacts of TB cases notified from private health facilities in Kano state was at 4% due to multiple patient-level and systemic barriers along the TB cascade of care.
This study aims to evaluate the effectiveness of community mobilization and efficient local networks in improving TPT uptake.
Intervention or response: Five (5) Community Based Organizations (CBOs) in Kano State were engaged by KNCV Nigeria based on their experience in community mobilization in TB interventions and efficient local networks to implement the JSI-funded Tuberculosis Implementation Framework Agreement (TIFA) Social Franchising for TB Contact Investigation (SOFT) project.
These CBOs were trained, equipped and contractually obligated to conduct contact investigation among identified index TB cases across selected private sector health facilities within the state as part of efforts to improve TPT uptake.
Eligible household contacts were referred and linked to health facilities for TPT commencement leveraging escort services deployed by the CBOs.

Results/Impact: A total of fifteen-thousand, one-hundred and fourteen (15,114) household contacts of index TB patients were screened for TB and four-thousand seven-hundred and seventy-four (4,774) eligible household members placed on Tuberculosis Preventive Therapy (TPT) within the first quarter of implementation contributing to an increased TPT uptake in Kano State. TPT uptake increased from 4% to 31% after 9-months of field implementation.



Conclusions: The results show an increased uptake of TPT following the community mobilization activities of the CBOs, leveraging their local networks to provide culturally and linguistically appropriate referrals and linkages to the health facilities.

OA18 TB trends in distressed masses

OA18-240-14 Implementation approach of integrated CAST-TB campaigns in Uganda: Community awareness, screening, testing, prevention and treatment of TB

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Background and challenges to implementation: Following COVID-19, Uganda's National TB and Leprosy Program (NTLP) implemented an innovative Community Awareness, Screening, Testing, Prevention and Treatment of TB (CAST-TB) approach. Since then, national TB notifications have rebounded to exceed estimated incidence.
Intervention or response: CAST-TB implemented in March and September 2022/2023 as five-day long campaign. A three-prong predominantly symptom based strategy has been utilized including door-to-door visits by Village Health Teams (VHTs), outreach services at hotspots, and contact investigation by health workers. The campaign involves five coordinated teams VHTs,

specimen transporters/ hub riders, medical laboratory personnel, clinical care, and data person. Data collection occurs daily, and interactive dashboards are discussed at daily check-in meetings with NTLP and stakeholders. Funding is from the Government of Uganda, The Global Fund, and the U.S. Government. After three successful CAST-TB campaigns, CAST-Plus was piloted in September 2023 which expanded the existing approach to cover HIV, malaria, malnutrition, WASH, and maternal and child health.

Results/Impact: CAST-TB campaigns screened over seven million people and contributed 10-33% of national quarterly TB notifications. The sharp increase in TB testing highlighted a need for high throughput GeneXpert machines in high volume settings. Inadequate capacity for sample packaging, movement, storage, laboratory supplies, and delayed payments were also challenges. Cost per TB case identified ranged from $28–$201, with higher costs in western regions compared to eastern and central regions. The biggest cost driver was funding VHT teams. CAST-Plus included higher costs and required contributions from non-TB partners. Many lessons were learned through campaign iterations, including the importance of strong leadership, investment in front-line health workers, community acceptance, and leveraging existing structures.

Conclusions: The CAST-TB campaigns have been extraordinarily successful in increasing early case finding. The CAST-Plus has also proved instrumental in furthering health outreach beyond TB and will require additional collaboration from non-TB partners to sustain.

OA18-241-14 Examining the influence of insurgency-driven internally displaced persons (IDP) camps and refugee camps on TB transmission: A case study from Benue State, Nigeria

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Background and challenges to implementation: The increase of insurgency-driven Internally Displaced Persons (IDP) camps and refugee camps poses significant challenges to public health, particularly in regions affected by conflict such as Benue State, Nigeria. Tuberculosis (TB), a highly transmittable airborne disease, thrives in overcrowded and resource-constrained settings, making displaced populations particularly vulnerable.

This study investigates the connection between insurgency-driven displacement and TB transmission, focusing on Benue State as a case study.

Intervention or response: Active Case Finding (ACF) of TB was conducted in IDP Camps, Refugee Camps and General Population of Benue State using WOW Truck (Wellness on Wheels), IDP Camp 1 from 11th – 12th October 2022, Refugee Camp from 3rd to 4th October 2023, IDP Camp 2 from 25th – 28 March 2024 and General Population from 11th – 15th March 2024.

With community awareness campaigns patients were screened using CAD4 TB Artificial Intelligence Xray, symptom screening, sputum collection and data collection. The study adopted quantitative analysis of TB prevalence data.

Results/Impact: 1143 persons were screened in IDP Camps and Refugee Camps, 128 presumptive TB identified, 128 samples evaluated, and the total number of 46 TB cases were diagnosed. Also 795 persons were screed in General Population, 28 presumptive TB identified, 28 samples evaluated, and the total number of 3 TB cases were identified. TB yield in General Population was lower compared to TB yield in IDP Camps and Refugee Camps.

LGA	NUMBER SCREENED	PRESUMPTIVE IDENTIFIED & EVALUATED	BACTERIOLOGICAL CASES	CLINICAL CASES	NUMBER OF PATIENTS ON TREATMENT
Refugee	300	23	10	1	11
IDP 1	250	37	2	13	15
IDP 2	593	68	14	6	20
TOTAL	1143	128	26	20	46
General Population	795	28	2	1	3
Total	795	28	2	1	3

Conclusions: Preliminary findings indicate a heightened burden of TB within IDP, and refugee camps compared to the general population of Benue State. Factors contributing to increased TB transmission include overcrowding, inadequate sanitation facilities and limited access to healthcare services.

OA18-242-14 Could this be an epidemic of TB in Guma Internally Displaced Persons Camp, Benue State? Wellness on wheels truck story from World TB Day Week

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Background and challenges to implementation: Due to heightened insurgency in Benue State, communities are being displaced from their homes and the Government has set up internally displaced persons (IDP) camps for temporal resettlement of the displaced communities. The Guma IDP camp was targeted for sensitization, awareness creation and screening for TB during the 2024 world

TB Day commemoration (WTBD) in the state using the Wellness on Wheel truck (WoW). The WOW is a motorized truck with a digital X-ray with artificial intelligence and eight modular GeneXpert machines for TB screening and on the spot GeneXpert diagnostic evaluation.
We present the results of active TB case finding activity from Guma IDP camp during the week of WTBD celebration.
Intervention or response: The WoW truck was deployed to the Guma IDP camp for TB screening during the WTBD 2024 following advocacy, communication, and social mobilization.
Consenting members of the IDP camp were screened using the WHO 4 symptoms screening (W4SS) and digital X-ray with AI in the WoW truck. Identified presumptive TB were tested with GeneXpert and those that are negative had their digital chest X-ray films reviewed by radiologists.
Results/Impact: A total of 1,175 clients (M,525, F 650) were screened for TB with 98 (8%) presumptive TB identified and evaluated with 25 (26%) TB cases diagnosed and notified. See table 1 for the results. The significant number of TB cases detected within a week period has raised a great concern of a possible TB epidemic in the Guma IDP camp.

	Screened		Presumptive		TB Cases		Bacteriological Diagnosed		Clinical Diagnosed		NNT	NNS
Age Group	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female		
0-4	0	0	0	0	0	0	0	0	0	0		
5-14	8	9	0	0	0	0	0	0	0	0		
15-24	75	57	3	2	1	0	1	0	0	0		
25-34	106	101	2	5	1	0	1	0	0	0		
35-44	106	143	8	4	1	0	1	0	0	0		
45-54	110	144	10	8	2	2	2	2	0	0		
55-64	57	111	11	17	4	3	3	3	1	0		
>65	63	85	18	10	8	3	5	3	3	0		
Sub total	525	650	52	46	17	8	13	8	4	0		
Total	**1175**		**98**		**25**		**21**		**4**		**4**	**46**

Figure 1: TB screening cascade Guma IDP camp March 25-28, 2024

Conclusions: Finding 25 TB cases in one IDP community within one week of TB ACF could be a sign of an epidemic. This underscores the effectiveness of targeted TB ACF using mobile diagnostic units, emphasizing the importance of proactive TB screening in high-risk populations to prevent TB outbreaks and transmission.

OA18-243-14 Challenges for provision of TB services for internally displaced people at the Resettlement Center in Cabo Delgado, Mozambique

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Background and challenges to implementation: Nearly a million people have been displaced since the commencement of terrorism in Cabo Delgado. Unknown and unprotected sensitive TB and MRTB cases clustered at the resettlement centers, creating new complex for TB prevention and care. The NTP (National Tuberculosis Program) had no clear guidance of tackling TB in humanitarian context.
The Centro de Colaboração em Saúde (CCS), along with the Aga Khan Foundation (AKF) and the Provincial Health Directorate (PHD) through Global Fund funding adapted the Interagency field guide on tuberculosis prevention in humanitarian settings, which enabled the delivery of a package of community TB case-finding activities at the resettlement centers.
Intervention or response: A joint team comprising PHD and AKF was integrated into the humanitarian response and assistance group established at the provincial level. Fifty resettlement centers were targeted. A basic package of community TB services was designed through adaptation of the interagency field guide. The TB package prioritized daily morning lectures and education about TB, human rights literacy, TB screening, sample collection, initiation of TB treatment for all new cases, and preventive treatment for eligible contacts.

Results/Impact: A total of 1,729 TB presumptive cases were identified in 2023, and 1,712 samples were collected for testing. 245 patients were diagnosed with TB, and 244 initiated treatment. Out of the total 244 patients, 239 (98%) were bacteriologically confirmed. Regarding TB preventive treatment (TPT), 607 children under 15 years of age initiated TPT at the resettlement centers.
Conclusions: TB is a major disease in complex emergencies and demands adequate collective public health response. Without in-country guidance to tackle TB in complex emergencies, adaptation of interagency manual was valuable.
Based on the results and experience gained, the design of a package of TB services to be offered in complex emergencies in Mozambique contexts is paramount to guide the different key health actors involved in humanitarian assistance.

OA18-244-14 TB treatment seeking patterns and needs of refugees in North-East Nigeria

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Background: Refugees are one of the main key and vulnerable populations for TB in Nigeria. There are approximately 80,000 refugees in Taraba State, with displacement resulting from ongoing armed conflict. Health service access for refugee populations is hampered by centralisation; inadequate human and financial resources; and a lack targeted services. Understanding care-seeking patterns and experiences of people with TB is critical for supporting improved TB service delivery.
Design/Methods: Twenty-nine semi-structured interviews were conducted with refugees TB accessing TB treatment services in one of three public facilities in Taraba State. Seventeen women (aged 22 - 46 years) and 12 men (aged 22 - 60 years) were included. Interviewees were asked about where they sought care for symptoms, the nature of care provided, costs of care seeking, and timelines from illness onset to diagnosis.
Results: Over half (16/29) participants reported first seeking care for TB symptoms from pharmacies, with only a tenth (3/29) first seeking care at a public facility. The majority of participants (28/29) undertook repeated visits to a range of different healthcare providers before receiving a TB diagnosis.
Almost a third (9/29) of participants were placed on an intravenous drip at least once, and approximately a quarter (7/29) received injections (minimum 1, maximum 20 injections) prior to TB diagnosis.
The median time from symptom onset to TB treatment initiation was 8 months.The median estimated cost of health-seeking was $308. Women experienced greater treatment initiation delays and higher health seeking costs prior to diagnosis.
Conclusions: TB is not readily recognised as likely cause of illness in refugee populations in Taraba State, Nigeria. For people affected, getting diagnosed and appropriate treatment required persistent care seeking, through multiple healthcare providers, often with worsening illness and at a high cost, demonstrating commitment to health-seeking despite obstacles. Analysis of care-seeking patterns can highlight key intervention requirements.

OA18-245-14 Innovative interventions to accelerate detection of TB in the urban-based, key and vulnerable population in four metropolitan cities of India

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Background and challenges to implementation: The estimated missing PwTB in India was 0.26 million in 2023 (India TB Report 2022). A larger proportion of them were from urban-KVP like homeless people, migrants, and unauthorized slums. They were difficult-to-reach due to their high mobility and frequent change of places.
HPPI (Humana People to People India) has been demonstrating TB detection and care model for urban-KVP through its ongoing Project LEAD (Leveraging Engaging Advocating for disruption of TB transmission) in four Indian cities, namely Delhi, Howrah (West Bengal) Hyderabad (Telengana), and Peri-urban Mumbai (Maharashtra).
This activity was funded through the United States Agency for International Development's (USAID) TB Implementation Framework Agreement (TIFA), implemented by JSI Research & Training Institute, Inc., and in partnership with the India National TB Elimination Program (NTEP) and John Snow India Private Limited.
Intervention or response: Active case finding (ACF) was the key activity to detect the missing PwTB in the original design of LEAD. However, during the implementation of the project, the field-staff discovered certain context-specific and small-scale innovative approaches to reach additional number of missing PwTB who were not detected through the ACF.
The interventions, city-wise, were as follows:
Howrah
- Screening at the 10 high-volume Urban Primary Health Centres (UPHCs)
- Follow-up screening (visits) of PwTB who had successfully completed treatment in the last 2 years and their house-hold contacts (HHCs) – the list was collected from local public health-facilities who had treated them
- Intensified screening of the clients of liquor-shops

Peri-urban Mumbai
- Follow-up of symptomatic but sputum-negative presumptive cases, and their re-testing
- Follow-up screening (telephonic) of old PwTB similar to Howrah

Delhi:

- Inclusion of AI-aided cough-sound based, and mass CXR screening

Results/Impact: Shown in the table:

City	Site/population	No of people screened	No of household contacts screened	No of presumptive cases with TB identified	No of people with TB diagnosed
Howrah	10 urban primary health centers	1814		293 (all tested)	33
	Those already completed treatment (old PwTB and their household contacts) - post-treatment follow-ups	78	222	203 (all tested)	18 from old PwTB 11 from contacts Total 29
	3 liquor shops (people visiting for buying liquor)	180		15 (all tested)	7
	Follow-up of sputum negative cases and their re-testing	49		39 (all tested)	25
Peri-urban Mumbai	Those already completed treatment (old PwTB and their household contacts) - post-treatment follow-ups	1660	426	161	9
Delhi	Screening by Artificial Intelligence (AI) aided cough sound in homeless people	2098		364 (all tested)	32
	Mass-scale Chest X-ray screening in homeless people and interpretation by AI-aided tool	144		26 (all tested)	1

Conclusions: The Innovative interventions helped to detect additional presumptive who were missed in routine ACF, however, more PwTB could have been detected with optimal NAAT (Nucleic Acid Amplification test) facilities.

OA18-246-14 Improving access to TB diagnosis and care for hard-to-reach trucking population in India

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Background and challenges to implementation: Over 8 million truck drivers in India are lifelines for access to essential goods. Owing to their special occupational nature, they spend most of the time on roads and their access to health care is limited. Higher consumption of alcohol and tobacco further increases their vulnerability to TB.

Intervention or response: Tyres being the primary product of Apollo Tyres Ltd., truckers are their key stakeholders. Apollo Tyres, through their corporate social responsibility initiative, established healthcare centers for truckers in 33 transshipment hubs across 19 cities. TB care services were initiated through these centers in 2017. These centers provide doctor's consultation, counselling services through a counsellor, linkages for TB treatment, adherence support and monitoring and routine outreach services through their field staff free of cost to the truckers. TB Detection Centers were also established at these health centers in partnership with the government. 10-15 peer educators per transshipment hubs who come in frequent contact with the truckers such as food vendors, local leaders, transporters were identified and trained for generating awareness, screen for TB, referring and supporting truckers for diagnosis and treatment and creating a stigma free environment.

For those identified with TB, prompt linkage to TB treatment services is ensured by the field staff. The centers provide counselling support and follow-up to ensure treatment adherence. They also support truckers to avail direct benefit transfers under the program and provide nutrition kits.

Results/Impact: Till March 2024, Apollo Tyres through their program have screened 13,27,728 people, facilitated 42,836 TB testing, resulting in diagnosis of 1269 people with TB. Nearly 90% of them were successfully linked to treatment. 416 has completed their treatment while 721 are still on treatment.

Conclusions: Apollo Tyre's initiative highlights how a corporate, through their social commitment, can contribute to improve access to TB care to a hard to reach population.

OA18-247-14 The engagement of the TB-affected street activist (or TASA) in the fight against TB in India

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Background and challenges to implementation: The National TB Elimination Program (NTEP) of India identified urban-based homeless people as very high-risk for TB. Delhi houses an estimated 250,000 homeless people. Humana People to People India (HPPI), a national-level NGO of India, documented very high TB burden, and poor treatment adherence in homeless people in its previous TB projects of Delhi (2017 – 21). Their frequent mobility, low risk perception, alcoholism, malnutrition, stigma, and absence of identity documents were key contributory factors. Violation of human rights, gender inequity, and low self-esteem further hindered their accesses to the TB services.

Intervention or response: HPPI introduced TASA project with the help of Challenge Facility Round 11 grant of Stop TB Partnership. The 3 project-mentors capacitated, empowered, and mobilized 26 selected TB survivors and

members of TB-affected families of homeless communities of Delhi as TASA. The key tasks of TASA were to enhance TB case detection and care through education and screening, dispel myths and stigma, restore human rights and promote gender-responsive services.
Results/Impact: TASA screened around 7994 homeless people, detected 93 people with TB (PwTB), put them on treatment at local chest-clinics, and so far helped 27 out of them in treatment completion. TASA helped at least 57 PwTB to access financial benefits of NTEP and linked them to NIKSHAY Mitra (friend) for nutritional supplementation during treatment. They assisted at least 42 female PwTB to seek and adhere to treatment. TASA organized at least 26 advocacy meetings; in at least 10 of those meetings TASA addressed problems of the homeless PwTB and jointly sought their solution with community stakeholders and health-system players. They organized at least 8 rallies engaging community members, school-children, women, and youth for raising community awareness in TB.
Conclusions: TASA became role models in homeless communities of Delhi in terms of bringing equity in TB services among high-priority and high-risk KVP

OA19 Child TB care cascade and treatment

OA19-248-14 "*Let us scale it up. It works*!": Integrating TB, orphans, and vulnerable children services in Uganda

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Background: Orphans and vulnerable children (OVC) and their households are considered at-risk for adverse socio-economic, and health outcomes. OVC programs provide comprehensive support to mitigate these risks. In Uganda's Rwenzori Region, comprehensive TB services (health education, screening, prevention, specimen collection, referral, and treatment follow-up) were integrated into existing OVC programs serving more than 19,000 OVC and caregivers.
Design/Methods: This qualitative study explored staff perceptions on acceptability, feasibility, and impact of the intervention. Data were collected through in-depth interviews with 23 staff, including health care workers, parasocial workers (PSW), civil society organization (CSO) staff, and Baylor-Uganda staff overseeing implementation.
Convenience sampling was used to recruit staff from high-volume catchment areas. Transcripts were double-coded using ATLAS.ti. Thematic and relational content analysis through both deductive and inductive approaches was conducted to identify emerging themes across thematic axes.
Results: Staff cadres overwhelmingly perceived the intervention as successful in diagnosing more TB cases, encouraging treatment completion, raising awareness, and reducing TB-related stigma in beneficiary households. Five main themes emerged:
1. Pre-existing relationships and trust between PSW/CSO staff and beneficiary households were instrumental to acceptance;
2. Relationships between PSW/CSO staff and health facility staff were necessary for successful linkage of beneficiaries to TB services;
3. Health education was critical to reducing stigma, encouraging health-seeking behavior, and completing treatment;
4. PSW-accompanied referrals improved efficiency of facility-based TB services, and;
5. Additional funding, training, protective equipment, and transport were needed to better facilitate specimen collection in the household.
Health education (3), accompanied referral (4), and in-home specimen collection (5), were perceived as facilitating faster diagnostic evaluation.
Conclusions: Community buy-in and establishing responsibilities and communication mechanisms with local health facilities are critical to successful integration of TB services into OVC programs.
Integration was well-received among providers and perceived as enabling TB diagnosis and treatment in OVC households in Uganda.

OA19-249-14 The effectiveness of innovative integrated case finding among children in Lusaka, Zambia

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Background and challenges to implementation: Many countries including Zambia face significant challenges identifying TB among children. In 2023, national treatment coverage was 78%, of which 9% were children under 15. TB case-finding remains low. Although policies exist to support integration of TB and nutrition services for children, implementation is limited.
Intervention or response: Development Aid from People to People (DAPP) Zambia and STOP TB Partnership have in close collaboration with the Ministry of Health (MoH)

implemented the TB-SAFE project using DAPP's Total Control of TB (TCTB) model since May 2023. The project prioritized a strong community approach. TCTB employed 50 Community Health Workers (CHW) in three sub-districts of Lusaka with high TB incidence.
The project's aim is to increase TB case finding among key and vulnerable children and support scale up of TB preventive treatment (TPT) for children.
TB case finding approaches included linking malnourished children from Under-5 Clinics to TB diagnostics and providing comprehensive home-based contact investigation. Family support groups (TRIOs) were established to provide directly observe treatment (C-DOT).
Results/Impact: From May to December 2023, the project screened 4,244 children under 15 years. 2,153 received TB diagnostics. 322 children were notified in the evaluation site compared to 185 in the control site. The evaluation site found 47% more children in the period. Out of 322 children, 122 malnourished children were notified in Under Five clinic.
Community leaders supported stigma reduction efforts. TB survivors supported acceptability of treatment, TPT and reduce self-stigma. All levels of HCW were trained in TB and stigma reduction.
Conclusions: National TB Programme and partners should support further implementation and learnings to scale integrated TB and nutrition services, alongside community-based contact investigation, to strengthen childhood TB programming.

OA19-250-14 Effective screening and diagnostic strategies for paediatric TB in three districts of Malawi

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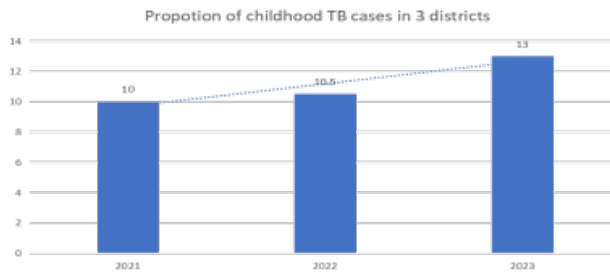
Background and challenges to implementation: In Malawi, childhood TB contributes to 9% of notified new and relapse TB cases against 15% target in the current Malawi national strategic plan.
The diagnosis of TB among children is limited to central and district hospitals because general practitioners and pediatric specialist doctors have historically diagnose TB among children.
As a result of this, children with presumptive TB are usually referred by health care workers from peripheral sites to the district/central hospitals for diagnosis and treatment at more specialized health facilities.

Intervention or response: To improve TB detection among children, USAID-funded TBLON2 project has established multidisciplinary approaches to better diagnose TB at primary health care levels in the 21 health facilities of Machinga, Mangochi and Mulanje.
Our project employed an integrated approach at district and peripheral health facilities by facilitating coordinated efforts involving various stakeholders at health facility and communities. Approach included:
· Capacity building in detection and care of pediatric TB among health workers at peripheral levels was trained including clinicians, nurses, laboratory technicians, radiographers and community health workers. This included training on interpreting x-rays and ultra-sounds for children with presumptive TB;
· Access to WHO-recommended diagnostics for testing stool samples with GeneXpert;
· Enhanced contact investigation for all household contacts of pulmonary TB index cases was instituted;
· Strengthened collaboration and integration of TB screening in other service delivery outlets such as maternal and child health, HIV, nutrition and feeding stations and inpatient wards.
Results/Impact: After two years of implementation, the project achieved significant gains, nearly 1/3 from 10% in 2021 to 13% in 2023, in the overall proportion of children diagnosed with TB.



Conclusions: Multidisciplinary approaches in addressing challenges in paediatric TB management is key to success. We aspire to build this approach and expand it within Malawi.

OA19-251-14 Barriers and facilitators of timely TB diagnosis in children and adolescents in Karachi, Pakistan

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Background: Pakistan has a high TB burden, but the diagnosis, particularly in children and adolescents, is often delayed. We conducted a study to understand the barriers and facilitators to the diagnosis of TB in children and adolescents in a not-for-profit hospital in Karachi, Pakistan.
Design/Methods: We conducted a convergent mixed methods study (August – December 2023).
The study comprised of quantitative surveys with caregivers of 100 TB patients <18 years old and 40 semi-structured interviews (30 caregivers and 10 healthcare providers).
Caregivers were surveyed and interviewed about their journey from symptom(s) onset to TB treatment initiation. Healthcare providers were interviewed on the processes and systems in place at the hospital.
Results: Among the TB patients whose caregivers were surveyed, 77% were female and 82% were 10-17 years old. Caregivers reported a median total delay of 91 days (IQR 58-160) between symptom(s) onset and treatment initiation. Median delay between symptom(s) onset and the first visit to any health facility was 73 days (IQR 42-130). Median delay between the first visit to a healthcare facility and the TB diagnosis was 65 days (IQR 30-114).
The two major barriers were found to be financial constraints of caregivers and the involvement of general physicians. Almost all caregivers who were interviewed mentioned financial constraints as the main reason behind the delay in their child's diagnosis.
In addition, 69% of caregivers who were surveyed chose general physicians for their first healthcare visit, but felt that the general physicians did not provide satisfactory healthcare to the patients.
Conclusions: Interventions that increase the accessibility of TB care services by overcoming cost barriers of families, as well as strategies that enhance the capacity of primary-level general physicians, are necessary to reduce delays in TB diagnosis and treatment initiation for children and adolescents.

OA19-252-14 Exploring pathways to paediatric TB diagnosis and treatment initiation: Insights from a qualitative study

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Background: Tuberculosis (TB) remains the leading cause of morbidity and mortality globally. The largest TB diagnostic gap is seen in children <5-years-old with delays in TB diagnosis and treatment initiation leading to poor outcomes in children. We aimed to describe the experiences of children with presumptive TB as they navigate through the TB care process.
Design/Methods: We enrolled a sub-sample of 9 caregivers of 10 children (⩽5-years-old) enrolled in the *Umoya* study who ended up being treated for TB (both microbiologically confirmed and clinically diagnosed). We conducted in-depth interviews with caregivers which were audio-recorded and detailed case descriptions were written. We used case comparative analysis to identify the key experiences of each participant.
Results: Participants described their initial care-seeking actions, driven by symptom severity. For flu-like symptoms, caregivers sought advice from family, friends, religious leaders, and pharmacists. Primary health clinics accessed when home remedies failed. Hospitals were reserved for emergencies. Some weren't initially tested for TB at clinics but were referred to secondary hospitals for TB testing and treatment. One child required four clinic visits before hospital referral due to deteriorating health. Negative results with ongoing symptoms led to district hospital referral for further work-up and alternative diagnoses. Tertiary hospitals confirmed TB via chest-radiography and further respiratory tests. Delays stemmed from poor sensitivity of TB tests among children, leading to multiple clinic visits and referrals, delaying diagnosis and treatment. Failure to recognize symptoms and reliance on self-medication and home remedies also contributed to delays.
Structural issues such as poverty impede timely access to care, exemplified by individuals lacking the financial means to afford transportation to clinics or hospitals, thus exacerbating delays in seeking essential care.
Conclusions: Our exploration of children and caregivers' experiences highlights crucial barriers and facilitators to early diagnosis and treatment. Improved caregiver awareness and provider preparedness are urgently needed.

OA19-253-14 A qualitative assessment of adolescent TB care services in Lima, Peru

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Background: Approximately 800,000 adolescents develop tuberculosis (TB) disease annually. Adolescents have specific healthcare needs due to their rapid physical and emotional development, including transitioning from dependence on caregivers to autonomy. Relative to other age groups, adolescents are more likely to face challenges with medication adherence and mental health. The World Health Organization (WHO) published guidelines for adolescent-friendly services (AFS) to address age-specific healthcare needs.

There is growing recognition of the importance of adolescent-friendly TB care within National TB Programs (NTPs); however, there is a paucity of data to inform practice.

Design/Methods: In Lima, Peru between August 2018-May 2019, we conducted in-depth interviews using semi-structured guides with 34 adolescents who were treated for drug-susceptible pulmonary TB disease in the preceding 12 months; their primary caregiver during treatment; and 15 nurses or nurse technicians who had ≥6 months' experience supervising TB treatment.

Data were coded and analyzed by authors CC, DA, and SSC using the framework method, in which themes were mapped onto the dimensions of care in the WHO's AFS framework: accessibility, acceptability, appropriateness, and effectiveness.

Results: Adolescent-friendly aspects of TB services included no-cost TB care for those enrolled in SIS (government-sponsored health insurance for low-income Peruvians), convenient locations of health centers, and welcoming, supportive providers.

We found areas in need of improvement, including challenging process to enroll in SIS; shortage of functioning X-ray machines; lack of clean, inviting, and private spaces for adolescents to receive TB care; and insufficient access to psychological care and nutritional counseling.

A major obstacle to adolescent-friendly TB care was daily, facility-based directly observed therapy – which participants reported to be inconvenient and a barrier to treatment adherence. (Table 1.)

Dimension of care	Definition	Adolescent-friendly features	Areas for improvement	Suggestions for improvement from study participants
Accessible	"Adolescents are able to obtain the health services that are available"	- Assigned health centers are close to patients' homes - Diagnosis and treatment are free of charge for patients with SIS	- Limited-service hours - Can only receive TB treatment in one specific health center, which is challenging when patients travel, move, or study/work in a different part of the city - Chest radiographs are not always available at public health centers - Acquiring SIS can be challenging	- Utilizing technology for medication intake such as video DOT - More flexible service hours - Equip health centers with functioning X-ray machines
Acceptable	"Adolescents are willing to obtain the health services that are available"	- Most healthcare providers show respect and are friendly towards adolescent patients	- Lack of privacy at health centers, leading to inadvertent disclosure of adolescents' TB status - Poor ventilation at health centers - Unclean, uninviting treatment spaces	- Making sure that health centers have adequate spaces for adolescent patients that are clean, well ventilated, and private
Appropriate	"The right health services (i.e., the ones they need) are provided to them"	-Psychology and nutritional services are, in theory, part of the package of care for all TB patients	- Due to staffing shortage, not all adolescents are evaluated by psychologists and nutritionists	- Investing in providing psychological and nutritional support for all adolescent patients - Detecting and treating substance use disorders
Effective	"The right health services are provided in the right way and make a positive contribution to their health"	- Providers effectively educate adolescents and caregivers about the importance of treatment adherence - Providers counsel caregivers on the importance of emotional support for adolescents to continue the long TB treatment, and often provide emotional support themselves	- Facility-based DOT does not guarantee adherence and is inconvenient and stigmatizing	- Increased access to video DOT to improve treatment adherence

Abbreviations: DOT, directly observed therapy; SIS, Sistema Integral de Salud (Integrated Health System, the government-sponsored health insurance for low-income people); TB, tuberculosis; WHO, World Health Organization.

Table 1: Features of TB services in Lima that met and did not meet standards of adolescent-friendly care, according to the World Health Organization definition.

Conclusions: Overall, the WHO AFS framework is a useful tool to examine TB services for adolescents. NTPs should conduct similar analyses in their settings to optimize service delivery for adolescents with TB.

OA19-254-14 Comprehensive strategy to improve paediatric TB case notifications: A case study in Kigoma, Katavi, Rukwa, and Songwe regions

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Background: Tanzania is among the 30 high TB-burdened countries with 128,000 estimated cases in 2022; but only 100,100 (78%) were detected. In 2020, at the start of our local organization network (LON) facility-based TB services project, there was low pediatric TB notifications in Kigoma, Katavi, Rukwa and Songwe at 11.7%, below the National target of 15%. We implemented interventions to address pediatric TB notifications, treatment outcomes, and deaths.

Design/Methods: From October 2020 to September 2023, working in 253 health facilities, the project implemented comprehensive capacity enhancement involving pediatric TB training to service providers, on-site mentorship, continuous medical education, and clinical attachment to improve knowledge and skills on pediatric TB diagnosis and management. We also supported TB supplies availability, quarterly TB active case-finding, and supportive supervision.

We analyzed trends of pediatric TB notifications treatment outcomes, and deaths before intervention and during interventions, from the National Electronic TB and Leprosy Database (DHIS 2 -ETL), a case-based TB and Leprosy System used to collect, store, analyze information on TB and Leprosy patients.

Results: Three years before intervention (October 2017-September 2020), supported regions notified **1,105** pediatric TB cases whereas, during the three-year project (October 2020-September 2023), **2,863** (159% increase) pediatric TB cases were notified. One year before project implementation, 11.7% of the notified cases were children and three years later notifications rose to 20.7%. Treatment success rate improved from 89% in October 2017-September 2018 to 96% in October 2022-September 2023. Furthermore, we observed a decrease in TB deaths from 9.1% to 2.8%.

Background and challenges to implementation: Tanzania is among the 30 high TB burdened countries with 128,000 estimated cases in 2022; but only 100,100 (78%) were detected. In 2020, at the start of our local organization network (LON) facility-based TB services project, there was low pediatric TB notifications in Kigoma, Katavi, Rukwa and Songwe at 11.7%, below the National target of 15%. We implemented interventions to address pediatric TB notifications, treatment outcomes, and deaths.

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Conclusions: The capacity building of HCWs coupled with support for availability of supplies has improved childhood TB case detection, treatment success and saved lives. Initiatives should be sustained so that missing cases with pediatric TB are notified and treated.

OA19-255-14 Growth trajectories of children presenting with presumptive pulmonary TB in the 12 months after treatment in Cape Town, South Africa

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Background: Limited data are available on long-term growth trajectories in children with tuberculosis (TB), especially compared to children without TB. This study assessed long-term growth trajectories in children with presumptive TB.

Design/Methods: The study was done as part of the observational TB diagnostic study ("Umoya"). Children aged 0-13 years, presenting with presumptive pulmonary TB (PTB) were recruited. Anthropometric measurements of children with TB, symptomatic controls (symptoms similar to TB, but diagnosis excluded), and healthy controls, were taken at baseline and week 2, 8, 16, 24, and 52. Changes in weight-for-age z-score (WAZ) and height-for-age z-score (HAZ) over time per study arm were assessed using multivariable mixed-effect linear regression.
Results: A total of 372 children were included in the analyses (median age 2 [IQR=1-4] years): 153 children with TB, 168 symptomatic controls, and 51 healthy controls. WAZ was similar between groups, but a higher proportion of children with TB (n=34, 22%) and symptomatic controls (n=28, 17%) were underweight (WAZ<-2) compared to healthy controls (n=3, 6%, p-value=0.03). HAZ of children with TB (median=-1.34 [IQR=-2.17,-0.21]) was lower compared to the symptomatic (median=-1.06 [IQR=-1.90,-0.10]) and healthy controls (median=-0.74 [IQR=-1.26,0.03], p=0.04). Stunting (HAZ<-2) was more common in children with TB (n=45, 30%) and symptomatic controls (n=29, 23%) compared to healthy controls (n=4, 8%, p-value=0.007). WAZ increased over time for children with TB (β=0.015 (95%CI=0.005 – 0.022). There was no significant change over time for HAZ.
Conclusions: This study showed that WAZ recovers in symptomatic children with presumptive TB, but HAZ was low at in these children and remained low after 12 months of follow-up. To minimize the long-term effects of TB and other illnesses, the overall nutrition of children needs to be improved to make them less vulnerable to diseases and to improve their long-term child health outcomes. To achieve this, nutritional programs need to be strengthened.

OA20 Health system strengthening strategies for TB prevention and care

OA20-256-14 Utilising DOT expansion strategy to improve TB case finding in a remote location: Experience from Kano State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) is a major public health problem in Nigeria, ranked 6th globally and 1st in Africa among the 30 high TB burden countries. Nigeria is on the list of 14 countries with the triple burden of TB, MDR-TB, and TB/HIV (Global TB Report, 2023).
The Dot Expansion Strategy aims to enhance TB services by improving TB case finding, accessibility, and coverage. Kano state has the highest Number of LGA's and most populous in the country, despite having an effective Directly Observed Treatment Short-course (DOTS) strategy for tuberculosis (TB) care, the number of missed cases continue to linger in many locations in the state. We present results of how expansion of new Dot sites has increased case finding in kano state.
Intervention or response: The National Tuberculosis, leprosy and Buruli ulcer Control Program (NTBLCP) in conjunction with the WHO in 2017 mapped additional 531 DOT sites consisting of primary health care and secondary facilities across 44 LGA's in the state to render TB services. Following the mapping, DOT officers attached to these sites were trained on TB service provision in 2018, to further increase coverage, another 190 sites were identified and trained. Between 2019 and 2022, additional 625 DOT sites were cumulatively expanded to enhance access to remote locations. Reporting and recording tools were deployed in all facilities.
Results/Impact: From 2017 consistent increase in case notification is noticed with every DOTS expansion. A 6% increase recorded in 2018, followed by 14% increase in 2019, 30% increase in 2020, 51% in 2021 and 47% in 2022.
Conclusions: Results demonstrate a progressive increase in number of TB cases notified with each improvement in TB service coverage. We recommend the Government and the NTBLCP to collaborate with different sectors to provide comprehensive health education, and sustain DOT service coverage in remote locations for peak program performance.

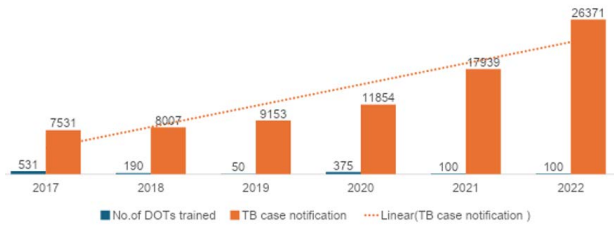

Figure. Six year trend showcasing Dot Expansion and TB case finding.

OA20-257-14 Institutionalising mortality audits at health facilities battling with high TB deaths in Uganda

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Background and challenges to implementation: In 2022, Uganda was one of five countries that received a 50% reduction in Tuberculosis (TB) mortality compared to 2015. However, there were variations within the country with TB mortality at tertiary referral hospitals remaining high (8-10%). Reasons for this have previously not been well understood, due to lack of systematic audits among patients who die while on TB treatment. We present lessons from a national wide TB mortality audit survey.
Intervention or response: The USAID Local Partner Health Services-TB Activity in collaboration with the Ministry of Health identified heath facilities with the highest number of TB deaths. We developed a mortality audit tool based on existing literature to facilitate the review of patient level data and patient support systems at these health facilities. Verbal autopsy was also carried for community level deaths. Trained mentors built the capacity of health facility workers to administer the tools and develop mortality reduction action plans.
Results/Impact: We audited 60 TB deaths and 120 patients that completed TB treatment from Jan 2020 to June 2023 for each of the 23 selected health facilities (total 1266 TB deaths and 2630 patients). Median age was 37 years and 62% (2427/3894) were males. Higher proportions of deaths were observed among TB patients with: severe acute malnutrition (40%vs25%); extrapulmonary TB 54% (132/244) vs bacteriologically confirmed TB 29% (686/2369); HIV co-infection 54% (686/1716) and presence of comorbidities other than HIV 71% (206/290). Health facility care processes for improvement were: management of critically ill patients; standardized protocols for patient management; regular conduct of clinic mortality audits, and management of patients with advanced HIV disease. Formulation of mortality reduction strategies at national and health facility levels was initiated.
Conclusions: Periodically analyzing causes of TB death can guide development of impactful interventions and should be systematically institutionalized particularly at health facilities with high TB mortality.

OA20-258-14 Transitioning towards sustainable TB prevention and care: Bangladesh's path to achieving SDGs and overcoming challenges by 2030

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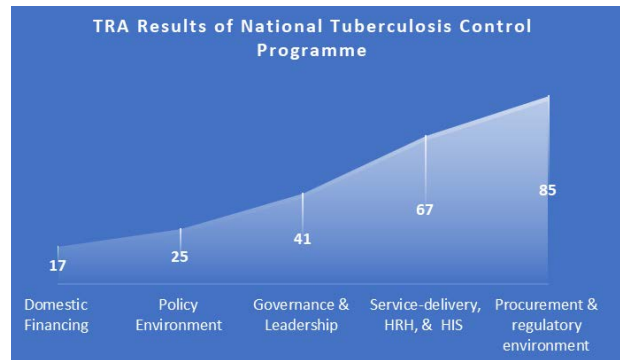
Background and challenges to implementation: The Government of Bangladesh aims to achieve the Sustainable Development Goals and other global indicators of Tuberculosis by 2030. TB presents a complex dynamic, prevails lots of social and economic challenges towards reaching goals. Bangladesh's aim to be a middle-income country by 2026 from UN's Least Developed Countries. Both the Ministry of Health and Family Welfare (MOHFW) and the National Tuberculosis Programme (NTP) recognize the need for a phase-wise transition from donors' support to manage the TB program with domestic resources.
Intervention or response: A Transition Readiness Assessment (TRA) was conducted to evaluate the health system's readiness to gradually reduce external donor support. The assessment employed a qualitative approach. As part of the methodology, a data collection tool was customized following the Global Fund's Sustainability, Transition, and Co-Financing Guidance Note to assess five critical areas: governance, policy environment, financing, procurement, and service delivery models.



Results/Impact: A total of 32 indicators were assessed, with scores ranging from 0 to 3. The best-case scenario was assigned a score of 3, resulting in a potential total score of 96. The TRA revealed an actual score of 49, indicating a readiness percentage of 51%. This score suggests limited readiness for transition. Immediate transi-

tion could pose risks, necessitating improved efficiency in service delivery and phased transition planning over the next decade. The figure depicts the TRA scoring exercise.

Conclusions: The transition readiness assessment is an ongoing process for NTP Bangladesh to formulate short- and long-term transition and sustainability plans for the TB program. These plans can aid the country in strategizing for continued achievement of global targets, minimizing resource gaps, strengthening program governance, and building institutional capacity for effective coordinated planning over the next few years alongside partners and stakeholders. This effort is crucial for achieving the milestones outlined in the End TB Strategy for 2025 and 2035.

OA20-259-14 Income disparity and healthcare utilisation: Lessons from Indonesia's National Health Insurance Claim Data

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Background: Indonesia's National Health Insurance Program, known as Jaminan Kesehatan Nasional (JKN), has a variety of membership pathways for those wishing to gain access. Claim data from JKN offers a cost-effective way of observing who is accessing healthcare services and what types of services are being used. This study is a novel attempt to measure disparities amongst JKN users in their engagement with services, providing an opportunity to reflect on patterns of use.

Design/Methods: Using claims data collected from JKN users between 2015–2016, we used the Ordinary Least Square estimation model to compare health services utilization among subsidized and non-subsidized users. We focused primarily on the individual use of the hospital for outpatient and inpatient treatment.

Results: Analysis reveals that subsidized users access primary healthcare services more frequently than non-subsidized users. Conversely, non-subsidized users access secondary and tertiary health care services more frequently than other users. Subsidized users who utilize secondary and tertiary health care tend to suffer more severe health illnesses than non-subsidized members.

Conclusions: This study concludes that income disparity affects healthcare utilization. Non-subsidized members are more likely than subsidized members to access secondary and tertiary health care services. Our study offers evidence of the potential underutilization of secondary and tertiary healthcare (STHC) by subsidized members, which could lead to inefficiency since subsidized members seeking STHC treatment had severe health conditions, thus needing to be treated longer and requiring higher healthcare expenditures.

OA20-260-14 Assessing survey instruments for measuring household catastrophic spending due to TB

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Background: Valid and reliable data on household spending associated with tuberculosis (TB) is crucial for monitoring the progress in protecting TB-affected households from catastrophic costs – one of the three targets in the global End TB Strategy. Little research has been conducted to validate the WHO TB patient cost survey instrument that has been used in more than 20 countries to generate evidence on catastrophic TB spending in these countries.

Design/Methods: Using 2018 household-reported TB costs data and national health insurance claims data in Taiwan, we compared the estimates on TB-related medical outpatient visits and duration of hospital stay in the survey (based on recall and self-report) to the ones derived from the administrative data. Estimates of the frequency of medical visits were the major determinant of catastrophic spending in the TB survey.

Results: The comparison included 545 randomly selected TB patients who participated in the 2018 national TB patient cost survey and 7433 TB patients from the claims data in the same year. In the preliminary analysis, the sampled TB patients reported a median of 4.3 (mean 4.8, range 23.0) outpatient visits during the intensive phase, whereas in the claims data the median outpatient visits were 4.0 (mean 3.8, range 15.0).

In the cost survey, self-reported information on the anticipated duration of treatment critically affected the estimates of total medical care utilization and associated direct and indirect costs due to TB.

Conclusions: Our assessment provided the first evidence on the robustness of information provided by patient self-report when compared to the objective measurement derived from the claims data. Our ongoing analysis using the survey data cross-matched to the electronic administrative data at the individual level will provide further evidence on the accuracy of information gathered in the cost survey.

OA20-261-14 Catalysing sustainable TB financing through integration of TB services into health insurance schemes: Effective approaches for low- and middle-income countries

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Background and challenges to implementation: Nigeria identifies TB as a disease of public health importance, but there is inadequate financing, with unmet targets. Despite donor dependency, there are still outstanding funding gaps for TB interventions. The USAID Health Policy Plus project provided technical assistance to identify and advance sustainable approaches for increasing domestic TB financing.

Intervention or response: Integrating TB services into existing government interventions like health insurance was identified as a strategy for increasing sustainable TB financing, through a consultative process with key stakeholders involved in TB response. Stakeholders were drawn across health, economic and social sectors, multi-levels at the national, state, local government, and community levels, across geopolitical zones. Using evidence, the actors developed a National Blueprint that outlines the financial, technical, and operational mechanisms of integrating a comprehensive package of TB services into health insurance. Applying a health systems approach, two states were supported to domesticate this policy at subnational levels through roadmaps and technical assistance for operationalization.

Results/Impact: In Lagos state, 61 TB facilities were enrolled to provide services through the scheme. Coverage was expanded to over 600,000 people, including 100,000 poor and vulnerable people, people living with HIV and key populations. This increased the scheme's financial capacity for TB integration and improved access and financial protection to enrollees. Facilities also received funds, and in four months, people were being diagnosed and linked to treatment, tripling the number of TB patients covered by the state scheme, compared to baseline. This covered an estimated cost of US$92 average annual cost of TB care per patient.

Conclusions: The effective integration of HIV services into health insurance schemes provides a mechanism for governments of low- and middle-income countries to increase their domestic commitments to fund priority disease programs while advancing towards universal health coverage concurrently. LMICs can apply similar approaches for expanding financial protection and reducing donor dependence.

OA20-262-14 Pre-treatment out-of-pocket costs for people with drug-resistant TB in Bandung, Indonesia

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Background: People with presumptive drug-resistant tuberculosis (DR-TB) experience multiple visits to a healthcare provider before TB diagnosis and initiating treatment, potentially leading to higher out-of-pocket costs. Our study aimed to quantify pre-treatment direct costs and factors associated with higher costs among people with DR-TB.

Design/Methods: Our cross-sectional study recruited people with DR-TB from DR-TB clinics in three hospitals in Bandung, Indonesia, from February 2023 to February 2024. Participants were interviewed using a pre-validated structured questionnaire regarding their demographic characteristics and out-of-pocket costs related to the categories: administration, chest radiography, laboratory tests, medication, travel, food, and other non-medical costs.

Pre-treatment out-of-pocket costs were analyzed using descriptive analysis and factors influencing higher costs were examined using quantile regression. Costs were presented in U.S. dollars (US$) and reported as median and interquartile range (IQR).

Results: Among 254 participants, 57.3% were male; the median age was 38 years (IQR 26.25-47). A higher proportion of patients resided in rural areas (69.6%) and had initial visits to public primary care facilities for TB-related symptoms (53.1%).

The total pre-treatment out-of-pocket costs per person were estimated at $46.38 (IQR 19.33-96.10). The major contributors to pre-treatment costs per person included hospitalization ($89.23), travel expenses ($14.32), and chest radiography ($11.45).

Factors associated with greater pre-treatment out-of-pocket costs were residing in a rural area ($50.57 vs. $26.39; $p=0.002$), had ≥ 7 visits to a healthcare provider ($64.31 vs. $28.01; $p<0.001$), and their first TB symptom-related visit was to a public hospital ($64.91), private primary care facility ($75.28), or private hospital ($76.09), compared to a public primary care facility ($30.43) ($p<0.001$).

Cost Category (N=254)	Amount (USD) (Median(IQR))
Administration	5.39 (2.02-12.21)
Chest X-Ray	11.45 (8.70-14.90)
Lab examination*	10.10 (4.71-18.52)
Medication	10.91 (4.83-26.94)
Travel	14.32 (6.18-29.92)
Food	6.82 (3.70-18.18)
Other non-medical expenses**	0.54 (0.34-1.01)
Subtotal cost per person	45.79 (19.33-93.74)
Hospitalization (n=15)	89.23 (63.30-182.49)
Total cost per person (including hospitalization)	46.38 (19.33-96.10)

IQR = Interquartile range; USD = U.S. Dollar, $1 = 14,849.85 Indonesian rupiah (Source: The World Bank)
*Lab examination could include a complete blood test, urine test, and antigen swab test.
** Other non-medical expenses could include masks and tissue.

Conclusions: People with DR-TB in Indonesia incurred substantial pre-treatment out-of-pocket costs. Streamlining TB diagnostic services will help alleviate the cost burden and delays to DR-TB management.

OA20-263-14 Journey towards ending TB in Junagadh, Gujarat, India

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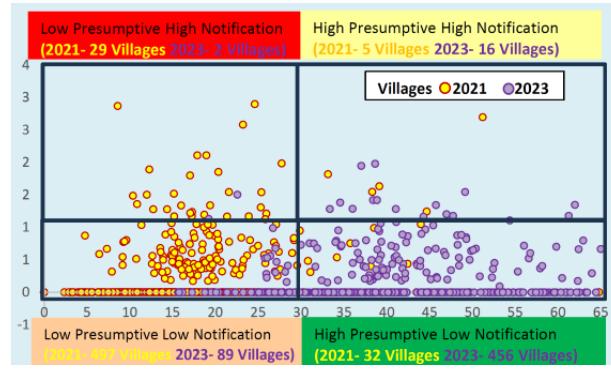
Background and challenges to implementation: Early identification of individuals with presumptive TB (PrTB) is crucial for ending TB. Passive case finding often misses or delays diagnosis, therefore enhanced outreach activities for early identification of cases is critical for achieving end TB targets. As outlined in National Strategic Plan (NSP) of India for 2020-25, district Junagadh systematically strategized towards improving presumptive TB examination and other key program indicators to break chain of transmission and thereby achieve declining TB notification.
Intervention or response: Firstly, district categorized all villages as hot and cold spot for TB based on number of PrTB examined and TB cases notified. Then systematically conducted Active Case Finding in general population every quarterly. Key program activities were strengthened such as passive and intensified case finding, expanded TB preventive treatment to adult household contacts, post-treatment follow-up of TB patients, community engagement and intensified advocacy communication and social mobilisation were done from year 2022 onwards. District also conducted weekly village-wise program review to monitor progress towards ending TB.
Results/Impact: The annual PrTB examination rate increased to 3400 per lakh population as compared to 1400 per lakh for the year 2022. In 2023, Junagadh was able to achieve TB-free status in 228 Gram Panchayats (Total 493).



Conclusions: Efforts and strategies towards improving presumptive TB examination has successful impact on early case detection and thereby reducing chain of transmission and ultimately decreasing burden of disease. Real-time monitoring, community engagement, and extensive case finding activities significantly increase PTB detection, reduce transmission, and contribute in progress towards TB elimination in district of Junagadh, India.

OA21 Values of repurposed drugs and potential markers

OA21-264-14 Linking delamanid and pretomanid minimum inhibitory concentrations with genetic mutations in multi-drug-resistant and extensively-drug-resistant M. tuberculosis isolates in Georgia

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Background: Emerging resistance to delamanid (DLM) and pretomanid (PMD) can limit treatment options of drug-resistant tuberculosis (DR-TB). Moreover, lack of rapid molecular diagnostic tests due to limited knowledge of resistance mutations, along with limited standardization of minimum inhibitory concentrations (MICs) for phenotypic drug susceptibility testing (pDST)

hinders resistance detection. We aimed to determine and explore potential correlation between MICs and genomic variants of DLM/PMD resistance in *Mycobacterium tuberculosis*.

Design/Methods: We selected phenotypically resistant (P^R) isolates to DLM (2021-2023yy) from the National Reference Mycobacteriology Laboratory biobank in Georgia. Re-cultivated isolates underwent MIC testing via resazurin microtiter assay plate (REMA) and whole genome sequencing (WGS) analyses. Subsequent concentrations were used for DLM MIC 0.0078-2 µg/ml, however for PMD we explored wider range - 0.125-32 µg/ml, in absence of routine pDST to latter medication. Sequencing data for DLM/PMD resistance-associated genes (*ddn*, *fgd1*, *fbiA*, *fbiB fbiC*, *fbiD*) were analyzed using an in-house pipeline.

Results: From 12 isolates P^R to DLM, sequencing data was available for 6 (50%), detecting formerly described premature stop codon mutation (W88*) within the *ddn* gene in two (16.7%) isolates, leading to significant increase of DLM and PMD MICs, 0.125-2 µg/ml and 4-8 µg/ml, respectively.

Noteworthy, one of these isolates had additional mutations in *fgd1* and *fbiC,* with an 8-fold increase of PMD MIC. One (8.3%) isolate exhibited WT in all target genes with MIC below the resistance cut-off to both drugs. Within three (25%) isolates, we detected several variants of target genes, unique to Georgian dataset, with MIC values less than proposed resistance cut-off.

Isolate #	DLM (CC 0.06 µg/ml)	PMD (CC 1 µg/ml)	ddn (Rv3547)	fgd1 (Rv0407)	fbiA (Rv3261)	fbiB (Rv3262)	fbiC (Rv1173)	fbiD (Rv2983)
1	0.125	8	W88*	Q279H	WT	WT	H275L S627C	WT
2	2	4	W88*	WT	WT	WT	WT	WT
3	≤0.0078	≤ 0.125	Q99E	WT	D161V V180A	T366S A380G	H275L I277N R477H T707S A756T	WT
4	≤0.0078	≤ 0.125	WT	V301A	P239T	WT	W678G	WT
5	≤0.0078	≤ 0.125	WT	WT	E84K	WT	T707S	WT
6	≤0.0078	≤ 0.125	WT	WT	WT	WT	WT	WT

Table 1.Delamanid/pretomanid MICs and detected genomic variants of resistance conferring genes within phenotypically resistant isolates to delamanid.

Conclusions: We identified some unique mutations in our dataset, prompting further investigation of their correlation with resistance. Moreover, our preliminary findings with consecutive increase of MIC to PMD, naive to latter drug, indicated that patients resistant to DLM might also exhibit resistance to PMD prior to any exposure to the drug.

OA21-265-14 Pretomanid Resistance Surveillance Program (PAEGIS) 2020 to 2025: An interim report

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Background: PAEGIS was initiated to fulfill a post-marketing requirement established by the United States (US) Food and Drug Administration following the approval of pretomanid. PAEGIS aims to monitor changes in *Mycobacterium tuberculosis* (MTB) susceptibility to pretomanid over 5 years (01 July 2020 to 30 June 2025) in 7 countries – the US, South Africa, Tajikistan, Ukraine, India, France, and Vietnam. The abstract presents the interim results of 3 Years (01 July 2020 to 30 June 2023).

Design/Methods: MTB isolates from Tajikistan and Ukraine were tested in the German National Reference Laboratory (NRL), Gauting. Those from other countries were tested in the respective NRLs. Isolates had to be resistant to, at least, rifampicin and isoniazid (i.e., multidrug-resistant, MDR) to be included in the study. Pretomanid minimum inhibitory concentrations (MIC) were determined in the BACTEC™ MIGT 960, and MIC values >2 µg/mL were indicative of resistance (based on previous studies).

Results: Data from 1859 MTB isolates were included in this analysis. Pretomanid MIC distributions appeared similar, suggesting that there has been no shift to higher MICs or increased resistance rates from Year 1 to Year 3, in any of the country data sets *(Table 1)*.

In contrast, when comparing individual countries' distributions, higher MICs (>0.25 µg/mL) seemed more prevalent in Vietnam (likely due to dominant MTB 1 lineage, intrinsically less susceptible to pretomanid).

The overall resistance rate to pretomanid was less than 1% (n=18/1858), which is in line with the baseline resistance rate observed in pretomanid-containing clinical trials.

There were no notable differences between pretomanid MIC distributions stratified by TB type i.e., MDR, Pre-XDR, or XDR.

Country	Year	n^	MIC_{50} (µg/mL)	MIC_{90} (µg/mL)	MIC_{95} (µg/mL)	MIC_{99} (µg/mL)	Min (µg/mL)	Max (µg/mL)
France	1	49	0.25	1	1	1	0.125	1
	2	51	0.25	0.5	0.5	0.5	0.03	0.5
	3	39	0.25	0.5	1	8	0.06	8
India	1	122	0.125	0.25	0.5	0.5	0.06	1
	2	124	0.125	0.25	0.25	0.5	0.03	1
	3	144	0.25	0.5	1	4	0.03	4
South Africa	1	99	0.25	1	1	2	0.06	2
	2	97	0.125	0.25	0.5	0.5	0.03	0.5
	3	102	0.125	0.5	0.5	2	0.03	2
Tahiti*	1	3	0.25	0.25	0.25	0.25	0.25	0.25
	2	2	0.25-0.5	0.5	0.5	0.5	0.25	0.5
	3	3	0.25	0.25	0.25	0.25	0.25	0.25
Tajikistan	1	102	0.125	0.25	0.25	0.25	0.06	0.25
	2	98	0.125	0.25	0.25	0.25	0.06	0.25
	3	97	0.125	0.25	0.25	0.25	0.03	0.25
Ukraine	1	100	0.25	0.25	0.5	0.5	0.06	0.5
	2	101	0.125	0.25	0.25	0.25	0.03	0.25
	3	98	0.25	0.5	0.5	0.5	0.06	0.5
US	1	59	0.25	1	2	2	0.06	2
	2	70	0.25	1	1	4	0.06	4
	3	91	0.25	0.5	1	2	0.06	2
Vietnam	1	67	0.25	0.5	1	2	0.06	2
	2	73	0.5	0.5	1	2	0.125	2
	3	67	0.5	0.5	0.5	1	0.125	1
Total	Year 1	601	0.25	0.5	1	2	0.06	2
	Year 2	616	0.125	0.5	0.5	1	0.03	4
	Year 3	641	0.25	0.5	0.5	2	0.03	8

*MTB isolates from French Polynesia Department Tahiti were analyzed separately owing to the very low availability of information on MTB lineage composition in Tahiti

Abbreviation: MIC, Minimum Inhibitory Concentration; n=number of isolates; Year 1=01 July 2020 to 30 June 2021; Year 2=01 July 2021 to 30 June 2022; Year 3= July 2022 – June 2023

Note: 27 isolates were excluded from these summary statistics because their exact MIC could not be determined.

Table 1. Summary statistics of pretomanid Minimum Inhibitory Concentration data sets.

Conclusions: A pretomanid resistance surveillance program has been set up, involving seven countries where BPaL(M) has been/is being introduced. The interim findings suggest pre-existing pretomanid resistance rates/MIC levels remained similar from Year 1 to Year 3.

OA21-266-14 Usefulness of M. tuberculosis-antigen-specific host protein biomarkers as candidates for the diagnosis of spinal TB

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Background: Spinal Tuberculosis (TB) is a potentially severe form of musculoskeletal TB. Diagnosis of the disease is challenging due to non-specific symptoms, which may be misinterpreted as mechanical back pain (MBP). If diagnosis is delayed, progression of the disease may result in spinal instability and neurological deficits, necessitating corrective surgery.

We evaluated the usefulness of host inflammatory protein biomarkers that are detectable in QuantiFERON (QFT) supernatants as candidate tools for the early diagnosis of spinal TB.

Design/Methods: Thirty-six participants (20 spinal TB, 16 MBP) diagnosed based on bacteriological tests, imaging and/or clinical assessment were enrolled into a case-control study at the Tygerberg Hospital, in the Western Cape, South Africa. Following QFT Plus testing, the concentrations of 27 protein biomarkers were evaluated in supernatants using the Luminex platform. The diagnostic potential of the biomarkers for spinal TB was assessed using the receiver operating characteristic (ROC) curve and general discriminant analysis.

Results: Several individual biomarkers detectable in QFT Plus unstimulated and TB-antigen-stimulated supernatants showed significant differences between those with spinal TB and MBP. When used in combination, 4 biomarkers that were detected in unstimulated supernatants namely; Eotaxin, IL-1ra, PDGF-bb and IL-9 showed potential in diagnosing spinal TB, with an AUC of 0.94 (95% CI, 0.85-1.00), sensitivity of 87.5% (95% CI, 61.7-98.4%), and specificity of 90.0% (95% CI, 68.3-98.8%) after leave-one-out cross-validation. However, the most accurate biosignature for diagnosis spinal TB was a 4-marker combination of the TB antigen-specific levels of IL-17, IL-9, RANTES and unstimulated levels of Eotaxin which attained an AUC of 0.97 (95% CI, 0.92-1.00), sensitivity of 87.5% (95% CI, 61.7-98.4%) and specificity of 85.0% (95% CI, 62.1-96.8%) after leave-one-out cross-validation.

Conclusions: Host protein biomarkers that are detectable in QuantiFERON supernatants may be useful for the early detection of spinal TB. Our findings require further evaluation in larger, prospective studies.

OA21-267-14 Low concordance between bedaquiline drug susceptibility testing with 7H11 solid medium and MGIT methods

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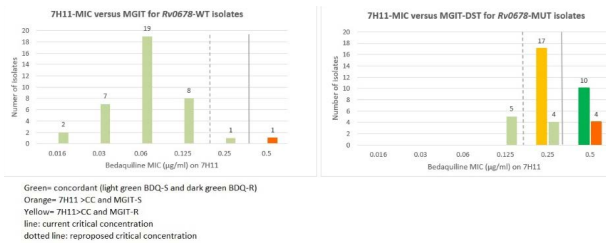
Background: Accurate diagnosis of bedaquiline (Bdq) resistance remains challenging. Mutations in the *Rv0678* gene, the most common type found in clinical isolates, often confer relatively small increases in the Bdq minimal inhibitory concentration (MIC), with values close to the critical concentrations (CC) for phenotypic drug susceptibility tests (pDST). This can lead to suboptimal accuracy and poor correlation between pDST methods.

Design/Methods: Study isolates from Armenian patients treated with Bdq were tested using MIC on 7H11 medium (MIC_{7H11}) and pDST on MGIT. In MGIT, isolates were classified as resistant (R) if growth occurred at CC 1.0 µg/ml. For MIC_{7H11}, dilutions ranged from 0.015 to 2.0 µg/ml and isolates were classified as R if growth occurred at >0.25 µg/ml. All isolates were sequenced by Illumina

and analysed with the MAGMA pipeline. Concordance between methods was calculated with Kappa coefficient (95% confidence interval).

Results: Of the 78 isolates analysed, 38 (48.7%) were wild type (wt) for *Rv0678* and 40 contained one or more mutations in *Rv0678*. Except for 2 mutations at baseline, all mutants were selected during treatment. One wt isolate (2.6%) was 7H11-R (MIC_{7H11}=0.5µg/ml) but MGIT-S. Of 40 isolates with *Rv0678* mutations, 21 (52.5%) were discordant (4 MGIT-S and 7H11-R, MIC_{7H11}=0.5µg/ml, 17 MGIT-R and 7H11-S, MIC_{7H11}=0.25µg/ml), suggesting that both methods may under-call phenotypic resistance, 7H11 to a higher extent (Fig1).

The agreement using current CC levels was fair K=0.3 (CI 0.08-0.51). Lowering the 7H11-CC to 0.125 µg/ml reduced discordances from 22 (28.2%) to 9 (11.5%) and increased the level of agreement from fair to good K=0.7 (CI 0.5-0.8).



Conclusions: The relatively small MIC increase for *Rv0678* variants causes discordance between routine phenotypic DST methods. A lower 7H11-CC, to be confirmed with epidemiological cut-off data, could improve the accuracy and concordance with MGIT pDST for Bdq.

OA21-268-14 Comparative analysis of multiplex immunoassays for host biomarker profiling in TB diagnosis and treatment response

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Background: Proteins such as cytokines, chemokines and growth factors play critical roles in biological processes. These act as disease biomarkers in the study of various infectious diseases. Dysfunction or dysregulation of these biomarkers may cause a variety of pathophysiological conditions.

Consequently, biomarker profiling and related technologies are essential for biological studies, disease diagnosis, monitoring of treatment response and drug discovery. Many multiplexing platforms are available for the detection of these biomarkers. There is limited independently published information about the reliability of most of the platforms available in the market.

Design/Methods: We assessed the abilities of three multiplex technologies; Luminex, MSD and the Curiox Drop-Array system in the detection of five cytokines, interleukin (IL)-2, IL-6, IL-10, Tumor necrosis factor alpha (TNF-α) and Interferon gamma (IFNg), in the same set of spiked serum samples. Experiments on each platform were performed as recommended by the kit manufactuer. We assessed the concentration of each analyte detected by each platform Vs. the expected actual concentrations.

Results: For samples with known low and high cytokine concentrations, all platforms were able to discriminate between low Vs. high expression, however, the actual concentration for each cytokine varied amongst the three platforms by 50 to 100pg/ml. Our data revealed MSD as the most sensitive amongst the platforms compared, and Curiox as the most suitable for high-throughput multiplexing, when employed alongside a Luminex platform.

Conclusions: Although quantitative differences were found between the platforms assessed, the relative concentrations detected were comparable, showing that all three platforms were suitable for analyzing trends in multiple cytokine profiles. Further studies, including comparison with ELISA are ongoing.

OA21-269-14 Challenges in the diagnostic cascade of drug-resistant TB in Namibia

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Background: Namibia has one of the highest TB incidence rates globally. It is one of the WHO top 30 high TB burden countries with an estimated TB incidence rate of 450/100.000 and 550 cases of multidrug-resistant tuberculosis (MDR-TB) annually. Early and accurate diagnosis is crucial for reducing disease transmission and ensuring successful TB treatment outcomes. National TB diagnostic guidelines require that an additional sample be sent to the central reference laboratory to confirm diagnosis and for further drug sensitivity testing (DST) after rifampicin resistance (RR) is detected at a peripheral laboratory level. We aimed to analyze the diagnostic cascade of TB culture specimen for resistance testing.

Design/Methods: Specimens with RR on Xpert® MTB/RIF Ultra were collected countrywide between April 2020 and September 2023. Data were extracted from a surveillance study database, including whether sample for cul-

ture and DST was received by the reference laboratory.
Results: A total of 772 patients were identified as RR by Xpert® MTB/RIF Ultra. Out of 772 sputum samples, 602 (80%) were received by the reference laboratory with 170 (20%) not reaching the reference laboratory. Sputum culture by MGIT was performed on 504/602 (83%) of the samples received. Among cultured samples, 68% (344/504) had a positive culture, 17% (83/504) had a negative, 11% (55/504) were contaminated and 4% (22/504) were non-tuberculous mycobacteria (NTM).
Conclusions: Significant proportion of samples with rifampicin resistance detected by Xpert® MTB/RIF Ultra could not be confirmed phenotypically by DST. Reasons for the loss of samples are not yet formally investigated, however transport challenges as well as unavailability of consumables may be possible reasons. Further, the high proportion of Xpert® MTB/RIF Ultra positive samples with a negative culture are concerning, implying possible treatment of patients with false positive Xpert® MTB/RIF Ultra results, which warrants further investigation.

OA21-270-14 Potential mutations reducing the binding affinity of MPT64 identified among TB cultures

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Background: MPT64, a 24-kDa secretory protein of *M. tuberculosis* (MTB), is one of the first to interact with host immune system and therefore important for activating the immune response in individuals infected with MTB. It is conserved across all organisms in the *Mycobacterium tuberculosis complex*. Currently, MPT64 has been used in immuno-assays developed for the detection of MTB and has also been considered as a novel candidate for vaccine against tuberculosis(TB). Identification of mutations in this gene can help in evaluating the sensitivity of these tests as well as its potential used for vaccine development.
Design/Methods: Gene mutations in *mpt64* (Rv1980c) were identified among 600 MTB clinical isolates from India analyzed using the ΩTB® pipeline, a standardized pipeline for analyzing whole genome sequencing of MTB. The mutations were checked for any correlation with lineage and drug susceptibility. 3D protein structures with each of the mutations was generated using *SWISS-MODEL* and its protein destabilizing effect was predicted using *DDMut*.
Results: Only 7.5%(n=45/600) of the samples contained one or more mutations in the mpt64 gene. Eleven different mutations were identified of which 3 were synonymous and 6 were non-synonymous mutations. All 6 non-synonymous mutations were present on the epitopes, 5 of which had a destabilising effect on the protein. F159L was present in 53.3%(n=24/45) samples. All the samples with F159L belonged to the East African Indian (EAI) lineage.
Conclusions: Presence of these protein destabilizing mutations indicate a potential loss in the antigen's binding affinity to the antibodies. A similar study undertaken in Pakistan also identified the presence and effect of F159L mutation and other such mutations. None of the previous studies found an association of the variant with EAI lineage. This could imply a bias in detection of specific lineage/sub lineage by the tests.

OA21-271-14 Drug-susceptibility testing for new and repurposed anti-TB drugs: Experience from 3 rounds of Supranational TB Reference Laboratory proficiency panel testing

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Background: New and repurposed anti-tuberculous drugs, such as bedaquiline (BDQ), clofazimine (CFZ), delamanid (DLM) and linezolid (LZD) are increasingly used for treatment of rifampicin-resistant tuberculosis (RR-TB). Their roll out should go hand in hand with quality-assured drug-susceptibility testing (DST) to monitor acquisition and emergence of their resistance.
Design/Methods: The World Health Organization's global TB DST proficiency panel testing (PPT) program, supported by the US Centers for Disease Control and Prevention, provides *Mycobacterium tuberculosis* isolates to 31 Supranational Reference Laboratories (SRLs) around the world to assess accuracy of their phenotypic (p) and genotypic (g) DST services. Since 2021, BDQ, CFZ, DLM and LZD were added to drugs for which susceptibility was assessed in three PPT rounds.
Results: Not all SRLs have the capacity to perform pDST for the four drugs, however, the number reporting results did increase over the years. In 2023, 61% of SRLs reported for DLM, 71% for BDQ, 74% for CFZ and 84% for LZD. The overall accuracy of pDST across participating SRLs was good (96-99%) for BDQ, DLM, and LZD, however, results for the CFZ-resistant strains could not be scored due to <80% agreement across participants. Challenges with media stock-outs and non-availability of drugs were identified.
gDST by sequencing was available at only half of the SRLs. Accuracy of results was slightly lower than pDST (89-99%), mostly due to inconclusive classification of the broad variety of mutations associated with resistance to BDQ, CFZ and DLM.
Conclusions: Availability of DST for new anti-TB drugs in the SRL network remains incomplete, particularly for sequencing-based testing. Access to testing for these drugs is likely to be even lower at national and subnational lev-

els. While SRL performance of phenotypic DST was good, genotypic DST accuracy remains lower due to incomplete understanding of mutation classifications with resistance.

OA21-272-14 A simplified pyrazinamidase test for M. tuberculosis pyrazinamide drug susceptibility testing

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Background: Pyrazinamide (PZA) is an important first-line drug for the treatment of tuberculosis (TB) by eradicate the persisting *Mycobacterium tuberculosis* complex (MTBC). PZA is a prodrug which converted to its active form, pyrazinoic acid, by the enzyme pyrazinamidase (PZase) encoded by the *pncA* gene. Due to cost and technical challenges, end TB strategies are hampered by the lack of a simple and reliable culture-based PZA drug susceptibility testing (DST) for routine clinical use.
Design/Methods: We developed a simplified chromogenic PZase test in the TB reference laboratory (TRL) using a training set of 106 MTBC isolates with various drug-resistant profiles, and validated its performance using 1,793 consecutive MGIT-culture-positive culture in 10 clinical laboratories during August 2022 to January 2024. The *pncA* gene Sanger sequencing results were used as the reference; and compared to that of the MGIT-PZA DST. Discordant MGIT-PZA DST results were retested by the TRL. Differential diagnosis of *M. bovis* was conducted using patented in-house real-time PCR.
Results: Of the 106 training isolates, the PZase test and MGIT-PZA DST showed 100% and 99.1% concordance as compared to *pncA* sequencing, respectively. In addition, 34 (32.1%) isolates harbored *pncA* mutations including 1 isolate with silent mutation S65S. For validation, 1,793 clinical isolates were tested including 150 duplicate isolates from sputa of the same cases and 16 isolates with uncharacterized drug-resistance (UDR) associated mutations. Excluding duplicated and UDR isolates, we identified 43 (2.64%) PZA-resistant isolates including 21 (1.29%) *M. bovis* isolates. The kappa values were 0.851-1.000. In addition, the accuracy of the PZase test conducted by 10 laboratories was 98.5%-100%. Two discordant PZA-resistant clinical isolates were retested by the TRL as PZA-susceptible.
Conclusions: Our simplified PZase test demonstrated high concordance with *pncA* sequencing and MGIT-PZA DST. Integrating the PZase test into routine first-line DST is effortless and represents an improvement in laboratory services for Ending TB.

OA22 Integrating multi-sectoral strategies for TB prevention and care: From research to public impact and government enhancement

OA22-273-14 Translating research into policy: Exploring stakeholder perspectives in the Indian Tuberculosis Program

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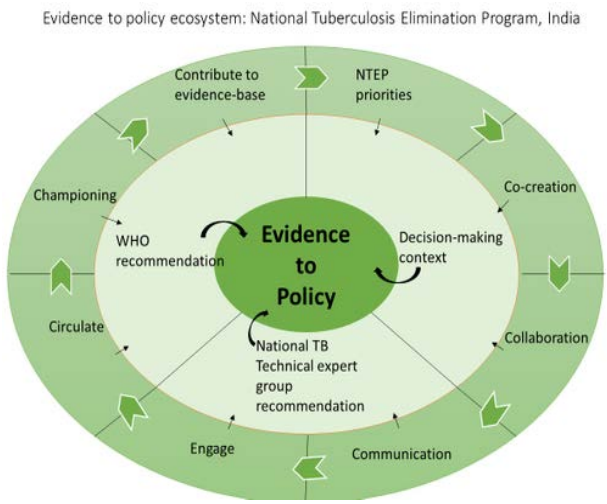
Background: Effective research is crucial for evidence-informed tuberculosis (TB) policy making in India, especially given its high TB burden and the goal of elimination by 2025. Limited resources and ever-growing demands necessitate evidence-based decision-making.
However, challenges persist in aligning evidence with policy. This study explores factors influencing evidence-informed TB policy making to improve health outcomes and system resilience.
Design/Methods: A qualitative study was conducted aiming to explore stakeholder's perspective related to translating evidence to policy. We interviewed eighteen key informants from academia, program, research, development sector and media, adopting Jacobson et al.'s theory of knowledge translation as a framing tool to reflect on the perspectives of key informants.
Results: India's TB program employs the National Technical Expert Group and Health technology assessment to translate evidence into policy. However, policymakers find current research insufficiently aligned with program priorities, demanding studies relevant to program's interests.
This discrepancy stems from researchers producing work they deem important at the risk of reinventing the wheel, reducing the likelihood of evidence incorporation into policy. Participants cited 'isomorphic mimicry', lack of contextualization, credibility issues, and poor dissemination strategies as barriers to evidence adoption.
The endeavor to adopt and replicate research methodologies from high-income countries in resource-constrained settings may at times exhibit characteristics akin to isomorphic mimicry, where the replication process mirrors the original study but lacks contextualization.
Researchers prioritize academic recognition and publication over delivering timely, context-specific research, while policymakers face delays in accessing relevant stud-

ies, resulting in policy adoption delays. Enhancing policymakers' involvement in research, from conception to dissemination, was recognized as a critical factor for promoting the adoption of evidence into policy.



Conclusions: Our findings emphasize that effective evidence translation into policy hinges on collaboration between researchers and policymakers. Co-creation of evidence, contextualized research availability, policymaker engagement, and widespread dissemination are key pillars informing evidence-based policymaking.

OA22-274-14 Assessment of governance of TB programmes: Trends and practices in 22 countries

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Background: Governance encompasses a framework of institutions, regulations, policies, and laws that formally and informally allocate accountability among diverse stakeholders. As nations progress toward the ending TB, the significance of effective governance becomes paramount. In practical terms, governance of national tuberculosis programs (NTP), representing the entire ecosystem under the stewardship of the Ministry of Health, can be categorized into four key themes: Transparency, Inclusiveness, Legal Framework, and Process Efficiency and Effectiveness.
Design/Methods: Over three rounds, assessment of governance in 22 tuberculosis programs designated as High Burden Countries by the World Health Organization and prioritized by USAID have been conducted. In the first round national governments participated, serving as a pilot. Subsequently, both civil society partners and national governments participated. Twenty benchmarks were established across four thematic areas. A questionnaire administered via Google Forms assessed various components of these benchmarks.
The analysis was spearheaded by the Stop TB Partnership (STP) in collaboration with USAID. Detailed methodologies and results from the first two rounds are already accessible on the STP website, with the third-round report slated for release by mid-2024.
Results: This paper unveils the findings from the third round and traces trends across the three assessment cycles. The results are presented in terms of the number of benchmarks achieved by each country within each thematic area. Additionally, an index score is provided for each theme per country. From a program management perspective, the assessment empowers countries to identify strengths and areas for improvement and facilitate prioritization of actions in consultation with stakeholders.
Furthermore, the assessment report serves as an advocacy tool for both national TB program managers and civil society partners, to enhance governance practices.
Background and challenges to implementation: Governance encompasses a framework of institutions, regulations, policies, and laws that formally and informally allocate accountability among diverse stakeholders. As nations progress toward the ending TB, the significance of effective governance becomes paramount.
In practical terms, governance of national tuberculosis programs (NTP), representing the entire ecosystem under the stewardship of the Ministry of Health, can be categorized into four key themes: Transparency, Inclusiveness, Legal Framework, and Process Efficiency and Effectiveness.
Intervention or response: Over three rounds, assessment of governance in 22 tuberculosis programs designated as High Burden Countries (HBCs) by the World Health Organization (WHO) and prioritized by USAID have been conducted, with the most recent concluding in the first half of 2024. In the first round only national governments participated in the assessment, serving as a pilot. Subsequently, both civil society partners and national governments have participated. Twenty benchmarks have been established across the four thematic areas. A questionnaire administered via Google Forms assesses various components of these benchmarks. The analysis is spearheaded by the Stop TB Partnership in collaboration with USAID.
Detailed methodologies and results from the first two rounds are already accessible on the Stop TB Partnership website, with the third-round results slated for release by mid-2024.
Conclusions: This is a first of its kind assessment of governance of TB responses with a huge potential to improve, transparency, inclusiveness, efficiency and legal frameworks of national TB responses.

OA22-275-14 Impact of centralised payment system on timely direct benefits transfer (DBT) of Nikshay Poshan Yojna (NPY) to people with TB (PWTB) in Maharashtra, India

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Background and challenges to implementation: Direct Benefits Transfer (DBT) is one of the ambitious strategies of the Government of India for sending financial benefits directly into the bank accounts of beneficiaries, thus eliminating the chains of intermediaries. Nikshay Poshan Yojna is one of the important strategies of the National Tuberculosis Elimination Programme (NTEP) to provide financial support to people with TB for nutrition.

Under the NPY scheme, each patient is provided Rs. 500 per month directly in their bank account through DBT during the treatment course. Receiving timely benefits is crucial for meeting nutritional requirements. Before 2022, these DBT benefits were processed at the block or district level, causing significant delays. Hence, state intervened by centralising the payment process at the state level to reduce the bottlenecks.

Intervention or response: The state adopted a system of centralised payment in 2022. All TB units in the state are mapped to a single Public Finance Management System (PFMS) agency, which is linked with a bank account having adequate funds for the entire state. The DBT benefits pushed up by the TB units across the state are processed by this single agency.

Results/Impact: After the implementation of the centralised DBT payment system, the turnaround time for the processing of payments for NPY at the PFMS level has been reduced from 23 days in 2021 to 8 days in 2022. Almost 80% (166221) of eligible PWTB were paid all NPY benefits during 2022.

Conclusions: The centralised DBT payment system has improved timely NPY payments to PWTB. It has also eliminated the challenges of fund availability at the block or district level and extra monitoring efforts required by the state. This model is highly successful and should be explored in other geographies, as well.

OA22-276-14 Strengthening TB prevention through multi-sectoral engagement: Lessons from Uganda's collaborative efforts with civil society organisations and private sector

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Background and challenges to implementation: Uganda is among the 30 high-burden TB/HIV countries globally, with 94,480 new cases and 12,000 deaths in 2023. Uganda experienced an 11% increase in incident TB cases, but treatment success rates increased from 87.3% to 89.4%. The mortality rate reduced from 1180 to 1019. The national TB notification data also showed a higher risk of TB among miners, uniformed personnel, fisher folks, and health workers than the general population.

The Multi-sectoral Accountability Framework for TB (MAF-TB) is needed to address challenges like failed integration of TB prevention, TB-HIV co-infection, and human rights protection.

Intervention or response: National Tuberculosis and Leprosy Program (NTLP) partnered with private sector and civil society organisations to raise funds for TB prevention initiatives. Through multi-sectoral collaboration, NTLP engaged Equity Bank and other entities to increase funding for TB marathons to raise TB awareness and TB screening and testing in communities.

Additionally, NTLP engaged Civil Society Organisations (CSO), including the Inter-religious Council of Uganda, Uganda Manufacturers Association and other organisations supporting NTLP's efforts to disseminate TB prevention messages, facilitate screenings, and enhance community engagement through regional advocacy meetings and cultural engagements.

Results/Impact: Collaborative efforts with the private sector and CSOs have facilitated the first-ever TB screening at religious and other events, including Uganda Martyrs Day 2023, Uganda International Trade Fair 2023, identifying and linking 95 TB patients out of 13,834 individuals screened.

Involvement of private sector players is the right step towards expanding the resource envelop for TB control efforts, while civil society organisations increased community mobilisation and participation in screenings and dissemination of prevention messages.

Conclusions: Uganda's experience underscores the need for multi-sectoral engagement to address limited awareness, resources, and stigma surrounding TB prevention and control in the HIV/AIDS workplace. Findings suggest the potential for similar collaborative approaches to improve TB control efforts in other settings.

OA22-277-14 Sustaining TB programme interventions amid conflict: Remote phone mentorship experience from Amhara, Ethiopia

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Background and challenges to implementation: Due to the ongoing conflict in Amhara region of Ethiopia, movement was restricted, internet connection was interrupted, and health facilities were providing only emergency services. TB program commodity and supply delivery systems were compromised, and health care services and performance data have not been captured since July 2023. Hence, it was crucial to look for innovative remote means of support to the TB program amid the conflict.
Intervention or response: USAID Eliminate TB Project issued a monthly airtime for TB focal persons at zones, districts, hospitals, and prisons so that they could communicate health facilities for mentorship and possible check of anti-TB and TB lab reagent stock outs. The focal persons communicated to the suppliers to ensure anti-TB and lab reagents. TB diagnostics and drug redistribution between districts in the zones were also executed. They traced anti-TB treatment interrupters.
We facilitated case scenario consultation and context-based appropriate management and follow ups for drug-sensitive TB and drug-resistant TB.
Results/Impact: From August 2023 to January 2024, about 91 health facilities and 74 districts were communicated weekly by phone. Nine anti-TB drug interrupters were traced, no patients were on waiting lists for drug susceptible TB treatment, and TB commodity and supply availability were maintained at the facility level through distribution and redistribution systems. Five scenario consultations and context-based appropriate management were conducted, and case holdings and TB treatment success rate were sustained.
Conclusions: Through remote phone mentoring, the USAID Eliminate TB Project managed to sustain TB program services at health facilities, proactively prevented the potential TB commodity and supply stockout, and prevented TB treatment interrupters. This model could be used as a lesson for maintaining basic TB services in conflict-affected areas.

OA22-278-14 Digital drive for TB-free village councils: Charting hotspots and empowering TB Mukt Panchayats (the local governing bodies) in Andhra Pradesh, India

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Background and challenges to implementation: With the goal of eliminating tuberculosis (TB) by 2025, India launched the TB Mukt Panchayat program (TBMP), focusing on eliminating TB at the Gram Panchayat (GP). However, as per 2022 program parameters and prescribed eligibility criterion, a significant proportion of GPs in Andhra Pradesh (13052 out of 13371) remained ineligible for TB-free status. This underscored the necessity for targeted interventions. To address this gap, the TBMP initiative required data visualization and interpretation on TB program metrics at the GP level.
Intervention or response: Utilizing the gathered data, a digital monitoring system was developed using Excel power pivot This system enables the identification of TB hotspots at GP level and prioritizes interventions, offering a strategic approach to enhance TB service delivery. A dynamic scatter plot was developed taking 2 metrics – PTBER (Presumptive TB Examination Rate) and Notification rate (NR) with dropdown options to visualize the data at block/ programme management unit/ district level by selection. This scatter plot is categorized into 4 colour coded quadrants based on NR and PTBER. Based on quadrants, specific strategies are devised to improve TB services.
Results/Impact: The tool's detailed analysis has unearthed insights into testing rates, notifications, and hotspot areas, facilitating the optimization of diagnostic networks. The

increase in PTBER from 1524 in 2022 to 1978 in 2023 underscores the effectiveness of the intervention strategy. In 2023, 786 GPs are eligible for TBMP claims, with 1574 GPs currently trained and regularly utilizing the monitoring tool at the GP level. The digital monitoring tool has played a pivotal role in guiding program monitoring units to target interventions on specific GPs.

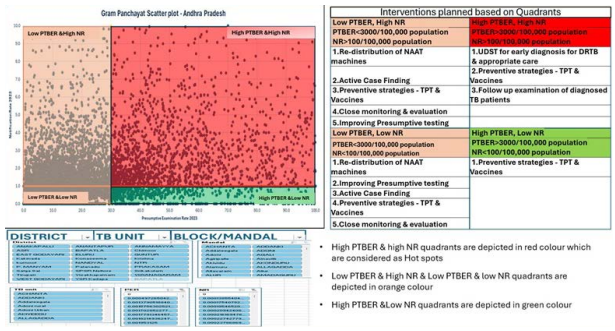

Figure.

Conclusions: This approach has enabled the National TB program staff to focus efforts on areas with the most pressing needs, thereby enhancing diagnostic networks and accessibility to TB testing and services.

OA22-279-14 Evidence-based advocacy: The gap in public-private mix implementation for TB programmes across seven priority districts in Indonesia

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Background and challenges to implementation: A patient pathway analysis study in 2017 revealed that around 74% of individuals with tuberculosis (TB) symptoms in Indonesia preferred seeking care at private healthcare facilities. While the government has included Public-Private Mix (PPM) as part of its national strategic plan for TB elimination and mandated the establishment of a PPM team at district level, the implementation remains a challenge. From all TB cases notified in 2023, private clinics contribute 2% and private hospitals 29%.
Intervention or response: Stop TB Partnership Indonesia (STPI) developed an evidence-based advocacy intervention to bolster PPM at the grassroots level. The intervention began with a situational analysis, stakeholder mapping, and identification of PPM challenges through desk studies, focus group discussions (FGDs), and interviews. A national FGD engaged 9 stakeholders, followed by 4 regional sessions involving a total of 30 stakeholders. Interviews were conducted with 30 national and sub-national stakeholders. The findings were analyzed descriptively, leading to the formulation of an advocacy strategy. Roundtable discussions in 7 intervention areas with high TB burden, each attended by 15 representatives, further refined the strategy.
Results/Impact: Local government commitment emerged as a significant barrier to PPM implementation, leading to insufficient funding support. Although PPM teams were established in all 7 intervention areas, operational plans were underdeveloped, hampering effective implementation.
Additionally, challenges like lack of multi-stakeholder support, inefficient reporting regulations, and poor program infrastructure were reported. An advocacy strategy addressing these challenges was formulated, focusing on health financing, enhancing the district-based PPM network, and improving implementation by local governments.
Conclusions: The advocacy intervention highlights the critical need for addressing implementation challenges to strengthen PPM in Indonesia. Government commitment, multi-stakeholder support, and improved regulatory frameworks are crucial for effective PPM implementation. By addressing these issues, the advocacy strategy aims to enhance PPM implementation and contribute to achieving national TB elimination goals.

OA22-280-14 Oxygen use and liquid oxygen infrastructure in Vietnam's provincial lung and TB hospitals

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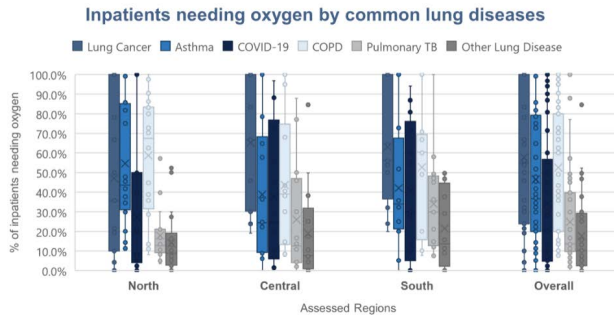
Background: In Vietnam, provincial tuberculosis and lung hospitals provide specialized care for various lung diseases. Provincial departments of health administrate hospitals with technical oversight from the National Tuberculosis Control Program (NTP). The NTP and USAID's EpiC project measured existing infrastructure and technical capacity to use medical oxygen and the burden of patients in need of oxygen to inform future investments.
Design/Methods: All 50 provincial lung and TB hospitals completed an online questionnaire focused on current infrastructure and capacity needs, as well as patient load and oxygen demand in 2022. Two hospitals were excluded because they did not actively serve inpatients in 2022, and one because it serves as a central facility and is not comparable to provincial facilities. Hospitals appointed a focal point to compile and input information. Descriptive analysis was performed using Stata 18.0.
Results: In 2022, assessed hospitals had inpatients with COVID-19 (50,198); pulmonary TB (40,809); chronic obstructive pulmonary disease (COPD) (36,681); asthma (8,090); lung cancer (4,560); and other lung diseases (64,170). Despite large and comparable demand for oxy-

gen for hospitalized patients at lung and TB hospitals across regions, oxygen infrastructure access was unequal. 31/47 hospitals (66%) have liquid oxygen systems (LOXS). All hospitals in the South have LOXS, while only 57% (8/14) in the Central region, and 50% (10/20) in the North. This difference is statistically significant ($p<0.05$). Sixteen hospitals do not have LOXS, of which 15 desired such services. Five hospitals (16.1%) with LOXS expressed a need to upgrade their systems. Twenty hospitals (42.6%) have pressure swing adsorption plants (PSAs). Eighteen hospitals (38.3%) want more PSA capacity.



Conclusions: Despite broad use of oxygen therapy for various lung diseases, disparities in infrastructure and access exist across regions, highlighting the need for targeted investments. Recommendations include expanding LOXS and PSA access to enhance patient care and mitigate regional disparities.

OA23 Automation in TB diagnosis

OA23-281-14 QuantiFERON supernatant-based biomarkers predicting active TB progression in people with silicosis

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Background: Despite the higher specificity and reliability of IGRA in detecting latent tuberculosis infection (LTBI), these tests do not perform satisfactorily in predicting the risk of active TB (ATB) development. It is crucial to identify new biomarkers with high predictive accuracy to identify individuals bearing high risk of progression to ATB.

Design/Methods: This is a sub-study of an open-label, randomized clinical trial of preventing TB in the silicosis pateints(ClinicalTrials.gov number: NCT02430259). From February to April 2015, 513 patients aged 18 to 65 years were recruited and screened by QuantiFERON Gold-In-Tube (QFT).

Twenty-six participants were diagnosed with ATB after 37-month follow-up period, based on microbiological confirmation of *Mycobacterium tuberculosis* (MTB) by positive sputum culture or Xpert MTB/RIF testing.

These 26 patients (TB progression group) were matched in a 1:2 ratio with 52 individuals (non-TB progression group) based on QFT results, silicosis stage, age, body mass index (BMI) and comorbidities, and then we measured levels of inflammatory cytokines using Human XL Cytokine Magnetic Luminex Performance Assay 45-plex Fixed Panel (R&D systems) in both the Nil and TB antigen-stimulated QuantiFERON supernatants of these patients. The concentration difference between the Nil and TB antigen-stimulated supernatants was used for the comparison between the two groups.

Results: The expression levels of 30 cytokines showed statistically significant differences between the TB progression and non-progression groups (Figure 1).

Further analysis of the receiver operator characteristic (ROC) curves reveals that the area under the curve (AUC) values of six cytokines—GM-CSF(0.9053), VEGF(0.9083), IL-3(0.9098), IP-10(0.9112), IL-10(0.9423), and IL-9(0.9896)—are higher than that of Interferon-γ (0.9024). These findings suggest that the interaction among these six cytokines could serve as meaningful new biomarkers for predicting TB progression.

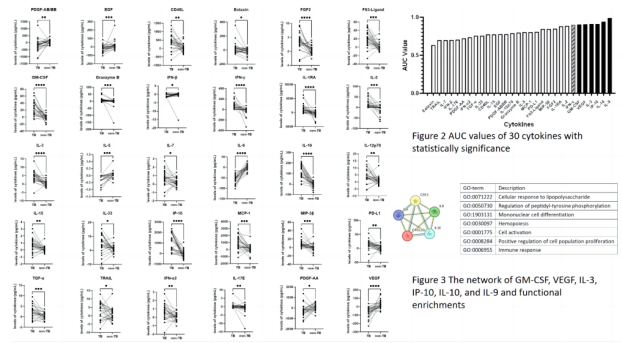

Figure 2 AUC values of 30 cytokines with statistically significance

Figure 3 The network of GM-CSF, VEGF, IL-3, IP-10, IL-10, and IL-9 and functional enrichments

Conclusions: Six cytokines—GM-CSF, VEGF, IL-3, IP-10, IL-10, and IL-9—could serve as better predictors of TB progression, enhancing early detection and treatment strategies in high-risk populations.

OA23-282-14 Understanding stool Xpert Ultra trace results: Evidence from a case-control diagnostic study

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Background: Tuberculosis (TB) molecular detection methods alongside alternative sampling techniques have enhanced the confirmation rate of TB in a broader patient population. The identification of „trace" results via Xpert Ultra indicates a low limit of detection, rendering their interpretation challenging.
Moreover, there is scarce evidence regarding the interpretation of "trace" results obtained from stool samples using Xpert Ultra.
Design/Methods: We conducted a prospective case-control study from October 2020 to June 2023 in Eswatini, Mozambique, and Tanzania. Participants of all ages with presumed TB completed the following investigations: clinical examination, chest radiography, culture, sputum Xpert Ultra, stool Xpert Ultra, and urine LAM.
Results: Of 239 participants with TB confirmed by at least one microbiological test, 40 (16.7%) stool Xpert results were labeled as "trace", and 26 (10.9%) were positive by "trace" in stool only.
Of the 26 participants with stool "trace" results only, 15 had symptoms suggestive of TB, and 8 had a chest radiography suggestive of TB (among 9 performed radiographs). Children <15 years had 8.14-fold higher odds of having stool trace results (95% confidence interval [3.39-20.70]). HIV status was not associated with higher odds of having trace results. Among 33 participants with stool "trace" results and available TB outcomes, 18 were cured, 10 completed TB treatment, 1 was lost to follow-up, and 4 died. Notably, of 6 participants not treated for TB, 4 were monitored and 2 received TB preventive treatment.
Of these 6 participants, 2 subsequently developed TB - one from the TPT group and one who was monitored only.
Conclusions: In our setting we found that trace results from stool are indicative of TB disease, especially in children. If left untreated, people with "trace" results have a non-negligible risk of subsequently developing TB. In high-burden settings, trace results from stool should be interpreted as TB disease and treated as such.

OA23-283-14 User perspectives on Molbio Truenat platform and MTB assays for use as a decentralised point-of-care diagnostic test in Mozambique and Tanzania

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Background: Timely and appropriate diagnosis and treatment are key to end tuberculosis (TB). Incorporating users' preferences when implementing point-of-care (POC) strategies for diagnosis may facilitate scale-up and impact. This qualitative study embedded within a cluster randomized controlled trial explores the values and preferences of multiple stakeholders regarding a POC TB diagnostic strategy using the Molbio Truenat platform and MTB Assays in Mozambique and Tanzania.
Design/Methods: We conducted semi-structured interviews with people with presumptive TB (n=34), professional users (laboratory technicians, nurses, clinicians, n=19) and decision makers (n=5).
Direct observations of testing procedures and usability surveys were also conducted. Thematic analysis was conducted, informed by the Consolidated Framework for Implementation Research.
Results: The Truenat platform and MTB assays were considered easy-to-use (median SUS score 90/100). Facilities varied in testing capacity, number of cases and time-to-results (from same-day to >2 weeks).
Availability and supply of reagents and cartridges were described as an issue by healthcare workers, and a potential cause for delayed results. In general, Truenat platform and assays were considered acceptable and fit to the context where the evaluation was conducted. Relative advantage was appreciated in facilities with limited prior testing capacity (e.g., shipping samples, using microscopy), in-

cluding short time-to-results and reduced infrastructure needs (compared to Xpert). Participants were often required to return to provide additional samples or receive results in facilities without Truenat. They preferred the same-day results and fast initiation of treatment enabled by Truenat testing.
However, some viewed waiting longer time for the results as an acceptable trade-off of accuracy. In terms of the diagnostic process, participants valued the support and counseling from the healthcare workers.
Conclusions: The Truenat platform and TB assays were perceived as easy to use by health providers, and POC testing was an acceptable alternative for TB diagnosis and fit-for-purpose, compared to off-site Xpert testing, in Mozambique and Tanzania.

OA23-284-14 Feasibility of deploying rapid molecular anti-TB susceptibility testing using Xpert MTB/XDR assay: A cross-sectional study in three high burden provinces of Zimbabwe, 2022 – 2023

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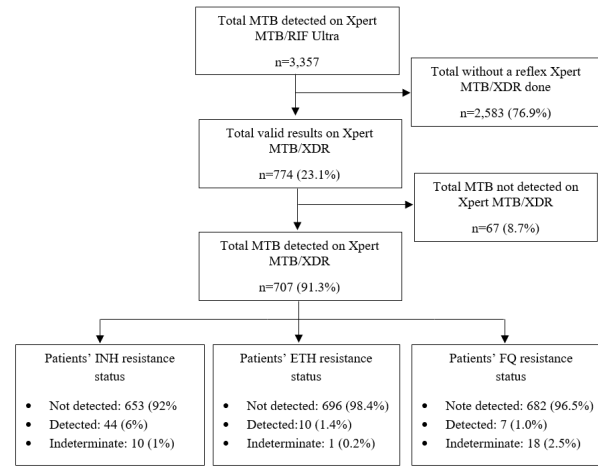
Background: Xpert® MTB/XDR combined with the frontline Xpert MTB/RIF Ultra test, sets new standards by detecting mutations associated with resistance towards INH, FQ, second-line injectable drugs (amikacin, kanamycin, capreomycin), and ETH in a single test.
In 2020, less than 50% of RR-TB patients had access to second line DST in Zimbabwe and introducing this assay was expected to improve 1st and 2nd line DST access, and uptake of all oral regimens for the treatment of DRTB.
Design/Methods: A descriptive cross-sectional study was conducted using data collected from laboratory registers. Data were collected at GeneXpert sites supported by the TB REACH Wave 9 project. Corresponding Xpert MTB/XDR results were linked to Xpert MTB/RIF Ultra results using patient demographic data. Analysis was done using Stata 15 to characterize MTB infection and resistance patterns.
Results: A total of 3,357 patient records had an MTB detected laboratory result on Xpert MTB/RIF Ultra eligible for Xpert MTB/XDR assay. Only 774 (23.1%) had a result for this add-on assay, with 707 (91.3%) being significant. Among the 707, 44 (6.2%), 10 (1.4%) and 7 (1.0%) had INH, ETH and FQ resistance detected respectively. RR-TB had been reported among 68/707 (9.6%) with 51 (7.2%) being RIF mono-resistant. Seventeen (2.4%) had MDR-TB and 26 (3.7%) INH resistance/RIF susceptible (Hr-TB). Seven (1.0%) had FQ resistance; four as isolated, two with additional INH resistance and one with additional second line drug resistance.



Conclusions: Xpert MTB/XDR was successfully introduced into the TB diagnostic network, though fraught with coverage gaps. Hr-TB can raise the prevalence of DR-TB if undiagnosed or managed appropriately, with isolated FQ resistance being a potential barrier to adoption of shorter Fluoroquinolone containing regimens for drug-sensitive TB.
To effectively scale-up Xpert MTB/XDR use, there is need to urgently optimize the laboratory specimen referral pathway and further decentralize Xpert MTB/XDR testing to sub-national level.

OA23-285-14 Evaluation of the accuracy of Xpert MTB/XDR in detecting isoniazid and fluoroquinolone resistance in children with rifampicin-resistant TB

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Background and challenges to implementation: Rifampicin-resistant tuberculosis (RR-TB) poses a significant threat to the health of children. However, detecting drug

resistance in children is challenging due to difficulties in obtaining specimens, paucibacillary nature of specimens, and low culture positivity rates. Therefore, there is an urgent need for accurate and rapid drug susceptibility testing.

To address these limitations, we evaluated the diagnostic accuracy of the rapid Xpert MTB/XDR automated molecular detection system.

Intervention or response: From January 2023 to January 2024, we conducted a prospective study in the Tenth People's Hospital of Shenyang, including newly diagnosed pediatric rifampicin-resistant patients <18 years old who were diagnosed with Xpert MTB/RIF. Xpert MTB/XDR was performed with sputum or Alveolar lavage fluid as samples, and phenotypic drug susceptibility test (pDST) was used as the reference standard.

To evaluate the diagnostic efficacy of XDR in isoniazid and fluoroquinolone resistance.

Results/Impact: A total of 35 patients were performed with Xpert MTB/RIF, of whom 33 had available results for pDST were included in the study. There were 13 males and 20 females, age 13±7.07 years. The sensitivity of Xpert MTB/XDR to detect isoniazid resistance was 91.3% (21/23, 95%CI 70.5-98.5), and the specificity was 100% (10/10, 95%CI 65.6-100.0); The sensitivity and specificity for detection of fluoroquinolone resistance were 100% (11/11, 95%CI 67.9 -100.0) and 100% (22/22, 95%CI 81.5 -100.0). The rate of indeterminate Xpert MTB/XDR results for isoniazid and fluoroquinolone was 6.1%.

Conclusions: The use of Xpert MTB/XDR with sputum or alveolar lavage fluid samples has demonstrated high diagnostic accuracy in the diagnosis of drug-resistant tuberculosis among children, meeting the minimum target product profile criteria established by the World Health Organization for next-generation drug susceptibility testing.

This detection method has the potential to rapidly and accurately diagnose drug-resistant tuberculosis, enabling precise treatment of drug-resistant tuberculosis in children.

OA23-286-14 A pragmatic, cluster-randomised controlled trial to evaluate the effect of the implementation of Truenat platform/MTB assays at primary health care clinics in Mozambique and Tanzania

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Background: Globally, 4.3 million people living with TB remain undiagnosed due to inaccessible TB diagnostics and attrition during the diagnostic journey. This study aimed to investigate the effect of placing a point-of-care WHO-endorsed TB diagnostic (Molbio Truenat platform/MTB Assays) at primary health clinics in Mozambique and Tanzania on treatment initiation of microbiologically confirmed TB.

Design/Methods: We randomized 29 clinics to placing a Truenat platform in the clinic (n=15, intervention) and to standard-of-care including off-site Xpert MTB/Rif Ultra testing (n=14, control). Adults presenting with symptoms suggestive of pulmonary TB were enrolled.

The primary outcome was the number and proportion of participants diagnosed with microbiologically confirmed pulmonary TB and initiating treatment within 7 days.

Results: A total of 2007 participants were in the intervention and 1980 were in the control arm. The prevalence of microbiologically confirmed TB was 7.6% (11.4% in men and 4.3% in women). The proportion of participants with microbiologically confirmed pulmonary TB starting treatment within 7 days was 7.3% (95% CI 6.2%-8.6%) and 4.8% (95% CI 3.9%-5.8%) in the intervention and control arm, respectively. Notably, 82.2% of those diagnosed with TB in the intervention arm commenced treatment on the same day. The median time to TB treatment in participants diagnosed with microbiologically confirmed TB was 0 days (IQR 0 – 0) in the intervention arm and 5 days (IQR 3 – 10) in the control arm. For participants diagnosed with clinical TB, the median time to TB treatment was 4 days (IQR 1 – 7) in the intervention arm and 8 days (IQR 2 – 16) in the control arm.

Conclusions: Decentralisation of point-of-care molecular diagnostics to primary health clinics and same-day treatment initiation is feasible. It facilitates more rapid TB treatment initiation both for microbiologically confirmed and clinically diagnosed TB.

OA23-287-14 Truenat MTB for detection of pulmonary TB in adolescents and adults: A systematic review of diagnostic test accuracy

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Background: Truenat MTB is a World Health Organization recommended rapid molecular diagnostic test that can be used as a point of care test for diagnosis of tuberculosis (TB). It is a battery-powered, portable device, providing advantages over Xpert assays for use in low-resource settings and has been found to have non-inferior diagnostic accuracy to Xpert assays.
We aimed to synthesize evidence on the diagnostic accuracy of Truenat MTB for detection of pulmonary TB (PTB) in adolescents and adults (≥10 years).
Design/Methods: We included studies that evaluated Truenat MTB against microbiological or composite reference standards in adolescents and adults with presumptive PTB. We searched electronic databases between 15-17 October 2023, performed manual searches and contacted experts to identify additional studies.
Four reviewers in pairs independently screened titles, abstracts, full text and assessed study quality using the QUADAS-2 tool.
We used bivariate models to obtain summary estimates of sensitivity and specificity with 95% confidence intervals (CIs). We used the GRADE approach to assess the certainty of the evidence.
Results: We identified 1175 reports, screened 651 titles/abstracts, and 38 full texts for eligibility. We included six studies (3896 participants; Figure 1).
Risk of bias was generally low. One study (17%) was judged to have unclear risk of bias in the patient selection and reference standard domains.
Two studies (20%) had unclear applicability concerns in two domains. Summary sensitivity (95% CI) and specificity (95% CI) of Truenat MTB for detection of PTB were 86.7% (79.3 to 91.7 ; high certainty of evidence) and 85.7% (69.7 to 94.0 ; moderate certainty of evidence).
Among smear positive individuals (804 participants), summary sensitivity and specificity were 93.7% (89.7 to 96.2) and 29.1% (12.1 to 54.9) (Figure 1).

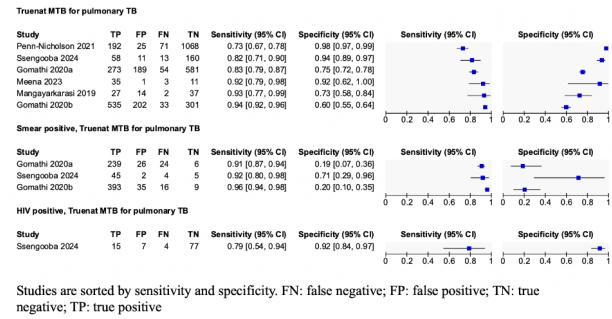

Figure 1. Forest plot of Truenat/MTB for detection of PTB.

Conclusions: Both the sensitivity and specificity of Truenat MTB were lower than previously reported estimates for Xpert MTB/RIF Ultra.

OA23-288-14 Integrated diagnostic use of GeneXpert machines to scale up laboratory services for HIV and TB programmes in Zimbabwe

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Background: GeneXpert, initially designed for TB diagnosis, now serves multiple diseases due to its multifunctional point-of-care capabilities. However, this integration could pose a risk of potentially disadvantaging the TB specimens.
In Zimbabwe, the GeneXpert machines has been used for integrated testing for HIV viral load (VL), HIV early infant diagnosis (EID), SARS-CoV-2 and human papillomavirus (HPV) tests. We report successful integration of the GeneXpert machine in other programs and services without negatively impacting TB program.
Design/Methods: We conducted retrospective analysis of laboratory system strengthening project data (2014-2023) ; we included information on GeneXpert utilization and integration of TB, VL, EID, SARS-CoV-2, and HPV tests. We examined test numbers and proportions over time, assessing the impact of integration. Using descriptive statistics and trend analysis, we assessed the overall impact of diverse test integration on near point of care testing strategy.
Results: Integration of TB, VL, EID, and SARS-Cov2 testing between 2014 and 2023 showed a significant increase in overall number of GeneXpert tests, from 7,325 to 151,677. The shift in the diagnostic use of GeneXpert included additional tests for, VL (35%), EID (13%), and COVID-19 (1%). TB testing on GeneXpert increased from 31,323 to 77,864. This integration improved labo-

ratory service delivery, access to diagnostics, particularly for priority population groups, pregnant and lactating women, children, and adolescents. This streamlined processes for priority populations and reduced VL and EID turnaround times, supporting program scale-up without impacting TB testing.

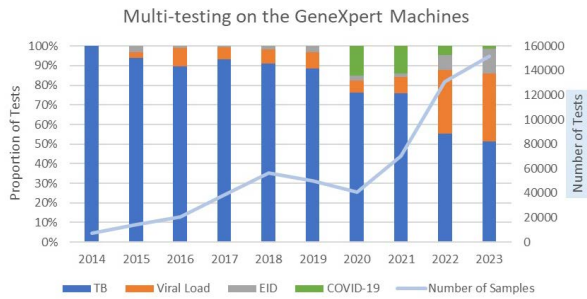

Figure 1: Integrated diagnostics use of the GeneXpert machines in Zimbabwe.

Background and challenges to implementation: GeneXpert, initially designed for TB diagnosis, now serves multiple diseases due to its multifunctional point-of-care capabilities. However, this integration could pose a risk of potentially disadvantaging the TB specimens.

In Zimbabwe, the GeneXpert machines has been used for integrated testing for HIV viral load (VL), HIV early infant diagnosis (EID), SARS-CoV-2 and human papillomavirus (HPV) tests.

We report successful integration of the GeneXpert machine in other programs and services without negatively impacting TB program.

Conclusions: The integration of diagnostics testing on GeneXpert platform resulted in increased number of diagnostic tests in TB and HIV programs in Zimbabwe. Enhanced access to diagnostics, streamlined laboratory processes and improved service delivery have the potential to respond to evolving public health needs.

These findings support the continued utilization of GeneXpert for comprehensive and efficient healthcare delivery.

OA24 Non-sputum based diagnosis

OA24-289-14 The development of an optimised, cost-effective long-read sequencing pipeline to complete the M. tuberculosis genome

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Background: The highly variable PE/PPE genes represent ~10% of coding regions in the *Mycobacterium tuberculosis (Mtb)* genome. Their proposed roles in pathogenesis, virulence, and immune evasion make them key targets for investigation. PE/PPE genes, which are GC-rich and highly repetitive, are often excluded from whole-genome studies because of assembly issues with short-read sequencing. Long-read sequencing can overcome these limitations; however, an optimized long-read pipeline for *Mtb* has not been fully developed.

We present a Nanopore sequencing pipeline for accurately assembling the full *Mtb* genome and reducing the per-genome sequencing cost by evaluating DNA extraction and sequencing conditions.

Design/Methods: DNA from H37Rv cultures was extracted using either mechanical (bead-beating) or chemical (phenol-chloroform) methods, with half of the extractions undergoing fragmentation. To evaluate fragmentation and extraction techniques on sequencing output, samples were sequenced on the Nanopore GridION, with performance determined by the rate of nanopore depletion under each set of conditions. Pairwise comparisons using general linear models ascertained which conditions improved efficiency. An optimized sequencing pipeline was then applied to 195 clinical *Mtb* isolates collected between 2009-2018 in Peru, and the resulting assemblies inspected.

Results: Samples extracted using mechanical bead-beating showed a slower depletion of nanopores than phenol-chloroform extractions, while fragmentation reduced the nanopore depletion rate compared with non-fragmented samples, significantly improving output. Clinical isolates sequenced under these conditions achieved an average coverage of 153x with 99.2% genome completion. A minimum of 147 of ~168 known PE/PPE genes were fully assembled amongst all samples. Furthermore, increasing the DNA loading concentration to 70fmol increased the total run output 10-fold, drastically reducing sequencing costs.

Conclusions: Considerations including mechanical DNA extraction, further DNA fragmentation, and an increased flow-cell loading concentration are critical for enhancing Nanopore sequencing efficiency and output. This cost-

effective, high-throughput Nanopore sequencing pipeline facilitates long-read *Mtb* sequencing, crucial for a comprehensive understanding of the full *Mtb* genome.

OA24-290-14 The potential of an electronic nose as a TB screening tool in a high-burden TB country

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Background: TB remains a global health threat, particularly in resource-limited regions where early diagnosis is challenging. There is a pressing need for an accurate, affordable, and non-invasive diagnostic tool. Breath analysis, which detects specific volatile organic compounds, holds promise for disease detection.
We developed an electronic nose (e-Nose) inspired by human olfaction, augmented with artificial intelligence, to screen for TB through breath samples.
Design/Methods: Conducted in diverse Indonesian cities, including in remote areas of Papua, Yogyakarta, Klaten, and Surakarta, our study trained the e-Nose to distinguish individuals with TB from healthy subjects and those with other respiratory conditions.
Afterward, we tested the e-Nose on presumptive TB patients. Participants provided breath samples into air-collecting bags, which were analyzed by the e-Nose connected to a laptop. Support Vector Machine algorithms processed the data.
Diagnostic accuracy was assessed against composite reference standards, integrating clinical symptoms, bacteriological examination, chest X-ray, and follow-up. Ethical clearance was obtained, and participants provided informed consent.
Results: We trained the e-Nose to 27 individuals with TB, 24 healthy controls, and 53 with other respiratory diseases (median age: 43 years; BMI: 19.5 kg/m^2). We tested it on 1383 people screened for TB. No adverse events occurred. In the training phase, the e-Nose had a sensitivity of 95% (95% CI=77-100%) and specificity of 82% (95% CI=60-95%). Analysis of the testing phase is ongoing.
Conclusions: In this development phase, the e-Nose had high sensitivity and specificity. Further research is imperative to validate its performance across larger and diverse populations, including with different geographic regions and TB epidemiological profiles.

OA24-291-14 A mixed methods evaluation of preferences for tongue swab-based testing among people with presumptive TB in five high-burden countries

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Background: Use of tongue swabs for tuberculosis (TB) testing could potentially expand accessibility of molecular testing in high TB-burden settings. However, the perceptions of and preferences for tongue swab-based testing among people undergoing TB evaluation at routine health facilities is unknown.
Design/Methods: We utilized a convergent, parallel, mixed-methods study design to evaluate preferences for tongue swabs for TB testing across five high TB-burden countries. We conducted a cross-sectional survey from July 2023-January 2024 among participants undergoing sputum and tongue swab collection as part of the Rapid Research in Diagnostics Development for TB Network (R2D2 TB Network) in India, the Philippines, South Africa, Uganda, and Viet Nam.
A subsample of R2D2 TB Network participants completed qualitative semi-structured interviews. Quantitative and qualitative data were triangulated and interpreted through comparisons for concurrence/discordance.
Results: Among 861 participants who completed the preference survey (49% male; median age 48, 7% living with HIV), 55% reported an overall preference for tongue swab, 23% for sputum, and 22% no preference. Discomfort during collection was more common for sputum compared to tongue swab (42% vs. 13%, p<0.001). Most participants (n=522, 61%) reported tongue swab was easier to provide than sputum.
Qualitative interviews (n=40) revealed key influences on preference for tongue swab as compared to sputum: importance of where in the body a sample comes from, balance between ease of collection vs. accuracy of sample

testing, the role of the health worker, and differences in discomfort experience among men and women. *(Table 1)*.

Quantitative	Qualitative	Synthesis: Drivers of Preference
-Over half of participants reported tongue swab was easiest to provide (n=522, 61%), followed by sputum, (n=176, 20%), and no difference between ease of tongue swab and sputum provision (n=163, 19%)	"I do not understand much about medicine, but maybe if the tongue swab and sputum [accuracy] are the same, it is quicker to get the tongue swab. If the sputum is accurate, then I have to collect sputum. That is what I think." -Participant, male, age 59	Ease and accuracy -Tongue swabs are viewed as easy and fast. -Awareness of the accuracy of sputum/understanding of sputum to be a 'good' test for TB, common across participants, was weighed heavily in deciding what sample type is preferred.
-Tongue swab was the preferred sample type overall (n=478, 55%), followed by sputum (n=195, 23%) and no preference (n=188, 22%)	"Sputum is advantageous because it comes from inside the body…. of course, our lungs are inside. For me, it's where TB symptoms are primarily found." -Participant, male, age 49	The relationship between sample type and illness -Qualitative findings show that while sputum is a trusted type of sample because it comes from the lungs - the location of TB illness in the body for most people - this and other factors such as ease and comfort ultimately influence preference for sputum or lack of preference. -Swabbing the tongue may be perceived by some to yield a less actuate sample than sputum because it is further away from the illness source.
-Discomfort or difficulty providing a tongue swab (n=108, 13%) did not differ by sex (X% vs. Y%, p=0.634) -Nearly half of men (n=209, 49%) and the majority of women (n=269, 62%) said tongue swab was their preferred sample type (compared to sputum and no preference) (p<0.001)	"I felt like I wanted to vomit [during tongue swab collection], and whenever I would pull away, [health worker] would ask me 'what's wrong, do you feel like vomiting', and the way he was using that things, it's like he was pushing it at the far inside like that so I was feeling like I wanted to vomit. -Participant, female, age 20	The nuanced influence of discomfort -Although not more likely to experience it, women are more likely to describe discomfort (particularly gagging/nausea) with tongue swabbing in qualitative interviews. The influence of this discomfort on ultimate sample preference for women may be minimal.
-Discomfort or difficulty during sputum collection (n=358, 42%) was more common compared to discomfort or difficulty during tongue swab collection (n=108, 13%) (p<0.001)	"You can imagine that at times you might come to the hospital when you are coughing but when you are told to collect the sputum then you fail. So, in that way I choose the one for cotton [tongue swab]." -Participant, female, age 36	Tongue swabs: a good alternative -While overall easier and more comfortable, tongue swabs may be considered a viable and/or preferential alternative to sputum when sputum cannot be collected. -People who have difficulty producing sputum may be more likely to prefer or view tongue swabs favorably.
-Most participants (n=703, 82%) preferred a health worker to swab their tongue rather than swab it themselves under health worker supervision (n=71, 8%; no preference: n=87, 10%)	"It was up to the health worker to do what she wanted. I have gone to an expert that knows because as for me I don't know, and I was going to do anything that I was told."-Participant, female, age 50	The impact of the health worker -Health workers are generally trusted in their ability guide patients through the TB diagnostic process and collect samples.

Table 1. Preferences for tongue swab-based TB testing.

Conclusions: Perceptions of tongue swabs among people undergoing TB diagnostic testing are generally favorable. This multi-country mixed methods analysis revealed preference for sample type is driven by more than just ease of collection and grounded in a combination of multi-level factors.

These findings provide important considerations for recommendations and implementation of tongue swabs as a complementary or alternative TB diagnostic approach.

OA24-292-14 Pooled testing to increase access to rapid molecular diagnostics for TB among people with clinical risk factors of TB in Cameroon

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Background: Screening for TB using sensitive methods such as rapid molecular diagnostics is recommended for people at higher risk of TB, but access to rapid molecular diagnostics is often limited. Pooled testing is an approach that can extend the availability of rapid molecular diagnostics, and further evaluation of this approach is needed.

Design/Methods: At 180 health facilities in Cameroon, people were screened for clinical risk factors of TB, including undernutrition, diabetes, tobacco use, and alcohol use disorders. People with one or more symptoms of TB and/or clinical risk factors were classified as having high, medium, or low risk of TB, and Xpert MTB/RIF Ultra testing was performed either individually or with pooled testing based on risk.

The numbers of people along the care cascade were summarized, and the efficiency and estimated positive percent agreement of pooled vs individual testing was assessed as part of these TB REACH activities.

Results: From July 2023 to March 2024, 113,831 people attending health facilities were screened, 24,860 with TB symptoms were tested for TB, and 2,259 people (9.1%) were detected with TB and linked to treatment.

Among these, TB was detected in 19.3% (222/1,150) of people at risk of undernutrition, 7.5% (78/1,034) of people with diabetes, 21.4% (201/941) of people who smoke, and 10.7% (234/2,192) people who screened positive for alcohol use disorders.

In total, 6,082 pools were tested, and 0.55 Ultra tests were used per person with a result, enabling an additional 11,149 people to receive rapid molecular tests. The estimated positive percent agreement between pooled and individual testing was >99%.

Conclusions: Pooled testing facilitated increased access to rapid molecular diagnostics in this population, with similar performance as individual testing. Assessment of the performance of TB screening using pooled molecular testing among asymptomatic people with clinical risk factors of TB is ongoing.

OA24-293-14 Nanopore-based targeted next-generation sequencing (tNGS): A revolutionary technology unmasking mycobacterium species in TB

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Background: The 2023 global tuberculosis report indicates that the epidemiological situation of tuberculosis remains concerning. Constraints in current tuberculosis detection methods necessitate the development of more accessible, efficient, and widely utilized detection technologies for clinical diagnosis,aimed at facilitating early diagnosis and guiding treatment for tuberculosis.

Nanopore-based targeted next-generation sequencing (tNGS) offers advantages such as convenience, efficiency, and long-read sequencing, making it a commonly used method for *mycobacteria* identification.

Design/Methods: This study benchmarks the detection efficiency of tNGS against Xpert MTB/RIF, MTB culture, and acid-fast bacteria (AFB) smear in sputum, BALF, and pathological tissue samples, evaluating its clinical applicability in diagnosing tuberculosis,including cases with low bacterial load, extrapulmonary and smear-negative cases.

Results: The research findings demonstrated that tNGS exhibited high detection efficiency, with sensitivity and specificity rates of 93.4% and 94.7%, respectively. Besides, tNGS demonstrated a significantly higher positive detection rate for tuberculosis and low bacterial load tuberculosis compared to the other three detection methods ($P < 0.05$), except in sputum samples.

Moreover, tNGS achieved a final diagnostic consistency rate of 94.1% for the identification of non-tuberculous mycobacteria(NTM).

Conclusions: The findings suggested that tNGS is poised to become an invaluable tool in the early prevention,diagnosis, and control of tuberculosis in clinical settings.

OA24-294-14 Evaluating stool and sputum-based test accuracy and TB prevalence using Bayesian latent class analysis

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Background: There is no perfect reference-standard for diagnosis of tuberculosis (TB). Sensitivity and specificity of new diagnostic tests are challenging to estimate because true TB status is unknown. Bayesian latent class analysis (BLCA) can help estimate test performance while considering inherent uncertainties resulting from the lack of a reference standard.

Design/Methods: Using BLCA, we fit five models to estimate prevalence of TB and sensitivity and specificity of culture, sputum xpert, stool xpert, and a stool-based quantitative polymerase chain reaction (qPCR) assay.

The first model assumed independence between test outcomes; subsequent models do not assume independence between tests.

The second introduced one random effect (RE) for bacillary burden.

The third included two RE, representing bacillary burden in stool-based tests and sputum-based tests separately.

Finally, models including RE(s) were modified to include HIV and malnutrition status.

The model displaying the best fit (low residual correlation and expected test pattern matching observed pattern) included a single RE and covariates.

Results: Among the 252 adults with clinically-diagnosed or bacteriologically-confirmed TB used to fit the models, the final model identified 86.5% as having TB (95% credibility interval: 65.6,96.2). 76.3%(34.0,99.9) of malnourished participants without HIV are predicted to have TB, while 92.6%(51.7,99.9) of malnourished participants with HIV are predicted to have TB.

Among those predicted to have TB, the median test positivity rates are: culture 48.7%(33.5,56.8), sputum xpert 55.7%(42.5,63.4), stool xpert 48.3%(33.0,56.5), and stool qPCR 56.1%(43.3,63.7).

Among those predicted not to have TB, the median test positivity was less than 1% for each test.
Conclusions: This is the first BLCA including stool-based diagnostic tests. Stool samples are non-invasive and easy to collect, therefore making them more accessible than sputum, with similar performance between stool qPCR and sputum xpert. The low estimates of sensitivity for each test align with the known detection gap in TB patients.

OA24-295-14 Diagnostic performance of a direct-from-sputum next generation sequencing method for prediction of phenotypic resistance to second-line TB drugs

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Background: Multidrug resistant tuberculosis (MDR-TB) is associated with poor treatment success rate. Whole genome sequencing (WGS) allows simultaneous testing of resistance to all drugs, potentially facilitating treatment. Currently, this requires culture growth before sequencing, introducing diagnostic delay compared to molecular or targeted sequencing methods.
In this study, we evaluated a direct-from-sputum WGS method for prediction of resistance to the new and repurposed MDR-TB drugs.
Design/Methods: WGS and phenotypic drug susceptibility testing (DST) were conducted on prospective cohort samples collected from October 2015 to February 2022 at a tertiary care center in Mumbai, India. Phenotypic resistance was predicted from uncultured sputum and cultured sample WGS results by identifying resistance-associated mutations listed in the 2023 World Health Organization (WHO) mutation catalogue. Percent agreement, Kappa statistic, sensitivity, and specificity were reported for comparison. Between method differences were evaluated by McNemar's test ($p<0.05$).
Results: Results were analyzed from 100 uncultured sputum, 172 liquid culture, and 172 solid culture samples obtained from 172 participants. No samples showed phenotypic resistance to bedaquiline, clofazimine, or delamanid. Uncultured sputum WGS achieved sensitivity >70% for isoniazid, rifampin, and moxifloxacin, but 60% for linezolid, and <50% for second-line injectables.
Specificity was >95% for linezolid and injectables, 93.7% for bedaquiline, 87% for delamanid and moxifloxacin, and 81% for clofazimine. Sensitivity and specificity were 82.8% and 0%, 81.8% and 77.8%, 38.6% and 76.7% for first-line, WHO group A, and WHO group C drugs, respectively. Overall, uncultured sputum WGS showed lower sensitivity (62.6%) than liquid and solid culture WGS (84.8%; 84.1%) and similar specificity to WGS from liquid culture (90.4% vs. 93.3%), albeit lower than solid culture (93.8%).
Conclusions: Direct-from-sputum WGS demonstrates reasonable sensitivity and specificity for predicting resistance to first-line TB drugs, but lower performance than cultured WGS for linezolid and group C drugs. Further clinical evaluation of this technique is necessary.

OA25 Harnessing community leadership for achieving target

OA25-297-14 Community engagement in TB elimination: Lessons from the Tribal TB Initiative in Meghalaya, India

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Background and challenges to implementation: Tuberculosis (TB) remains a significant challenge in tribal communities, where traditional healing practices are deeply entrenched. The context presents challenges to implementing modern healthcare strategies due to cultural beliefs and limited community engagement.
Intervention or response: The Tribal TB Initiative, led by Piramal Swasthya, adopts a pioneering approach by involving village headmen, traditional healers, and community influencers. Targeted education and empowerment initiatives mobilize stakeholders to actively participate in TB elimination efforts. Collaborative efforts strengthen referral systems and establish vital patient support networks. Data collection involved ethnographic studies, stakeholder interviews, and community surveys. Analysis techniques included qualitative thematic analysis and quantitative data analysis to inform conclusions.
Results/Impact: The initiative successfully designated 229 villages as TB-free, indicating the effectiveness of integrating traditional practices with modern healthcare

approaches. The potential application lies in replicating this model in similar contexts globally. What worked included robust community engagement and collaboration, while challenges included cultural resistance and resource constraints.

Conclusions: The Tribal TB Initiative demonstrates the importance of cultural sensitivity and community involvement in TB elimination efforts. Key recommendations include prioritizing community engagement, fostering interdepartmental collaboration, and securing sustainable funding.

Opportunities for future practice lie in adapting this model to address other public health challenges in diverse settings.

OA25-298-14 Prevalence of TB multimorbidity among the tribals in India: Findings from a cross-sectional study

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Background: Multimorbidity, defined as presence of two or more chronic conditions in an individual, is a recognized challenge among tuberculosis (TB) patients in India. Tribal population is more vulnerable to TB multimorbidity due to socioeconomic disparities, and higher prevalence of risk factors like malnutrition and indoor air pollution, increasing their susceptibility to TB and other chronic conditions.

A study was conducted to assess the burden of TB multimorbidity among tribals in India.

Design/Methods: We conducted a cross-sectional secondary data analysis of individual-patient records from 2021-2023 sourced from the Ni-kshay TB surveillance database to assess multimorbidity among TB patients in the eastern tribal regions of India.

A total of 76,912 records, encompassing 16 chronic conditions, were analyzed. TB multimorbidity, defined as TB coexisting with one or more chronic conditions, was examined, identifying prevalent dyads (TB + one chronic condition) and triads (TB + two or more chronic conditions).

Results: The prevalence of TB multimorbidity among tribals was 31.46%, regardless of drug sensitivity status. Among pregnant females, the prevalence was 19.04% and among those working in mining sector, it was 14.9%. The mean age of TB multimorbid patients was 44.1±14.4 years. Among all TB patients, 38% of males and 18% of females had TB multimorbidity.

Additionally, 33% of patients from public sector facilities and 25% from private sector facilities were diagnosed with TB multimorbidity. Pulmonary TB was observed in 34% of TB multimorbid patients, while 21% had extrapulmonary TB.

The most common dyads were 'diabetes+alcohol' and ‚autoimmune disease+alcohol', while the most common triads were 'diabetes+autoimmune disease+ alcohol' and 'diabetes+COPD+alcohol'. TB multimorbidity was significantly associated with unfavorable treatment outcomes ($p<0.0001$), and male gender ($p<0.0001$).

Conclusions: A high prevalence of TB multimorbidity among tribals stresses the need for improved healthcare access, integrated care, and better treatment outcomes for TB and other chronic conditions.

OA25-299-14 Indigenous community participation in a TB accompaniment program increased the treatment completion rate among The Suku Anak Dalam of Indonesia

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Background and challenges to implementation: Indigenous people are vulnerable to delayed tuberculosis diagnosis and poor treatment adherence due to cultural gaps and inequities in healthcare access, increasing the risk of poor treatment outcome. However, no specific strategy is available to improve tuberculosis care cascades among this group. This accompaniment program aimed to develop a comprehensive indigenous-led TB care in The Suku Anak Dalam (SAD), indigenous people of Indonesia rainforest.

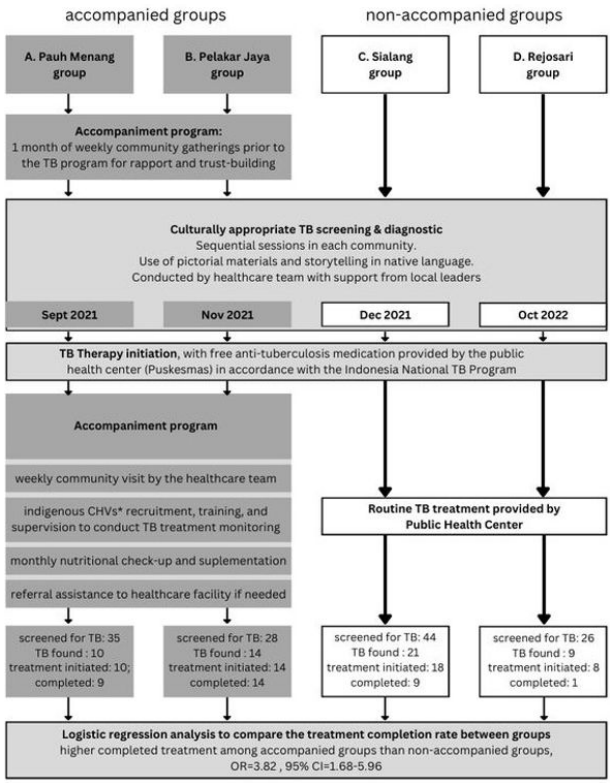
Intervention or response: We implemented sequential culturally appropriate tuberculosis active screening in four SAD groups in Merangin district, Jambi. Two groups received community assistance through the tuberculosis accompaniment program, which included weekly visits from healthcare professionals, recruitment and training for indigenous Community Health Volunteers (CHVs) to monitor daily treatment, conduct anthropometric measurements for children, and distribute nutritional support. The remaining two groups underwent standard tuberculosis treatment provided by the public health center (Puskesmas). Treatment completion rates were compared between the groups using logistic regression analysis.

Results/Impact: During the screening program conducted from September 2021 to December 2022, more than half of the community members from the four SAD groups participated (133/239).

Most respondents were children under 18 years old (72/133). The majority of adult respondents had never attended school (48/61), with scavenging and hunting being the dominant occupations (55/61). Among respondents, 54 were diagnosed with tuberculosis.

In the accompanied groups, 23/24 individuals successfully completed their TB treatment, compared to 10/30 in the non-assisted groups, showing a higher completion rate (cOR=3.83; 95% CI=1.68-5.96).

Other factors like proximity to Puskesmas, medication side effects, occupation, education, and gender were not conclusively assessed due to limited sample size.



Conclusions: Indigenous health accompaniment programs helped nurture participation of indigenous people in tuberculosis care and increased TB treatment completion rate. This approach has the potential to be replicated in other 2200 underserved communities of indigenous people of Indonesia to improve TB care.

OA25-300-14 Situation analysis of TB among the tribal population of Karnataka state: A mixed method study

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Background: India is the largest contributor to the global burden of tuberculosis and 8.6% of its population are tribal. Tuberculosis has a high prevalence of 703 cases per 100000 tribal population compared to the general population where prevalence is 256 per 100000. Karnataka state in India has a significant tribal population of 727194 residing in 7 southwestern districts with unique geopolitical characteristics.

This study is a novel attempt to understand the situation of National Tuberculosis Elimination Program among the tribal population of Karnataka.

Design/Methods: A mixed method study was conducted in July 2023 in three purposively selected districts with high tribal presence viz Mysuru, Chamarajanagar, and Kodagu. Comparative analysis was undertaken between data from 199 notified TB patients belonging to tribal communities and 2,582 non-tribal patients. Quantitative analysis of secondary data was conducted to assess the tuberculosis program indicators of the year 2022 using inferential statistics in SPSS.

In-depth interviews were conducted with patients, healthcare personnel, and community stakeholders to discern associated factors and programmatic challenges among tribal populations. Qualitative data underwent thematic analysis utilizing NVivo software.

Results: The TB case notification among tribal population (205 per 100000) was significantly higher than that of non-tribal population (97 per 100000) in the study area in 2022. However, the notification among the tribal population is proportionately suboptimal compared to the available national statistics. The indicators related to case holding were better among the tribal population owing to

the high presence of NGOs in the region. The qualitative analysis also threw light into the challenges and way forward to improving TB care among the tribal population.

Parameter	Tribal Population		Non-tribal Population		p Value*
Population	97,238		2672667		
TB Case notification (rate per lakh)	199 (205)		2582 (97)		<0.001
Parameter	**Number**	**%**	**Number**	**%**	**p Value***
Microbiological Confirmation of TB	152	76	1878	73	>0.05
Proportion of microbiologically confirmed TB patients with known rifampicin susceptibility status	113	74	1262	67	>0.05
Successful treatment outcome for TB	121	91	1297	86	>0.05
End of Intensive Phase testing done among Pulmonary DSTB cases	133	90	1343	82	<0.05
End of Continuation Phase testing done among Pulmonary DSTB cases	17	13	310	21	>0.05
Initial house visit done by health workers and GPS location of the household captured	190	95	2354	91	<0.05
Nutritional Support given to the patient through Pradhan Mantri TB Mukt Bharat Abhiyan	87	44	443	17	<0.05
*Chi-square test					

Table 1. Analysis of programmatic data of 2022 related to TB case detection and case holding by the National TB Elimination Program in the study region in Karnataka.

Conclusions: The TB case detection efforts in tribal populations require multifaceted strategies, including active, intensified, and passive case-finding approaches. Decentralized TB screening services should be offered, facilitated by inter-departmental coordination and NGO engagement.

OA25-301-14 Policy brief to enhance community active case finding and prevention strategies for TB to reduce the burden of TB in Uganda

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Background and challenges to implementation: Uganda is among the 30 high TB/HIV burden countries globally. The country aims to reduce TB incidence by 20% from 200/100,000 in 2020/21 to 160/100,000 in 2024/25 but only 2.7% reduction was achieved by 2021.
This policy brief aims at synthesizing effective strategies to improve community TB case finding and prevention to reduce the TB incidence in Uganda.
Intervention or response: We reviewed evidence from published studies using PubMed, Cochrane and Google Scholar search engines to identify relevant articles for inclusion and also conducted document review of non-published reports, from the national TB and leprosy program.
Results/Impact: Policy considerations and evidence:
1. Initial intensified TB case finding campaign followed by serial TB case finding in a defined urban community led to a drop in the TB yield from 0.94% to 0.52% and prevalence of TB by 45% within 2 years (Emily Kendall et al., 2023)
2. Implementing an active case-finding intervention based on sputum tuberculosis tests for everyone reduced tuberculosis prevalence in the community (Burke RM, et al., 2021)
3. A package of community-based TB active case finding and prevention interventions with a defined TB elimination package among high-risk groups can achieve TB elimination with a projected 16% annual TB reduction (Agizew T.B et al. 2022).
4. Community-wide active case finding for TB using a mobile clinic van. Repeated rounds of active case finding has higher TB yield from mobile van (4.7%) compared to door-to-door visits (2.9%) and TB prevalence declined from 6.5 to 3.7 per 1000 adults (Corbett et al., 2010).
Conclusions: Integrated community-based TB case finding and prevention involving serial campaigns in well-defined communities using mobile clinics and sputum test for every one may reduce the TB incidence. Ministry of Health and partners should invest resources to expand coverage and intensity of these interventions for impact on TB incidence.

OA25-302-14 Empowering women to enhance health outcomes in persons with TB: A community engagement initiative in tribal communities of Rajasthan, India

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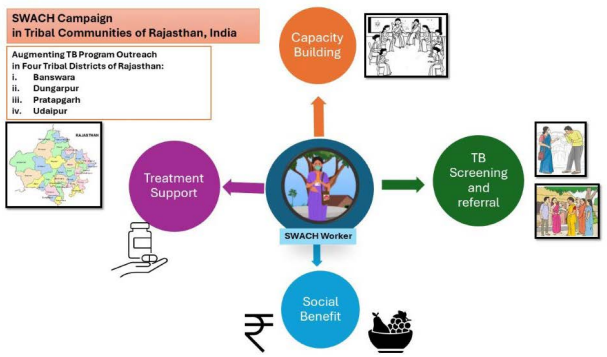
Background and challenges to implementation: Empowering women is critical to reach the end TB goals as it effectively addresses human rights and equity challenges. Tribal regions in Rajasthan, India, face socio-cultural and geographic barriers due to interstate migration, resulting in limited access to tuberculosis (TB) services. To address these issues, Government of Rajasthan rolled out the women-led SWACH (Integrated Sanitation, Water, and Community Health) campaign.
The initiative is led by native tribal women known as SWACH workers. This study assessed the impact of the SWACH initiative on enhancing health outcomes in persons with TB among tribal communities.
Intervention or response: Over the period 2020-2023, four tribal districts (Banswara, Dungarpur, Pratapgarh, and Udaipur) of Rajasthan implemented the SWACH initiative for enhancing TB program outreach.

The interventions included were regular capacity building of SWACH workers, assigning target-based TB screening, improve uptake of social benefits and engaging them as treatment supporters with program incentives.
The impact of these interventions was assessed by studying trends in presumptive TB examination rates (PTBER), favourable TB treatment outcomes and social development parameters. Quantitative data from Ministry of Tribal Affairs and Ni-kshay (India's digital TB surveillance system) was analysed on R version 4.2.3.



Results/Impact: In the initiative, 3544 SWACH workers were engaged across the four districts. The period saw growth in most of the social development and TB program parameters. PTBER rose 4-folds, with 7% increase in favourable treatment outcomes for drug-sensitive TB coupled with 61% reduction in loss-to-follow up.
Comparative assessment with State level performance revealed significantly higher TB notification rates and favourable treatment outcomes (246/100,000 and 91% in SWACH districts; 191/100,000 and 91% in the state respectively; $p<0.05$).
Conclusions: Empowering women through the SWACH initiative significantly improved TB program outcomes in tribal communities of Rajasthan. The initiative emphasizes the vital role of women in enhancing health outcomes, with potential for broader implementation across similar regions.

OA25-303-14 A hybrid approach to improve community TB contribution: Volunteers and TB survivors augmented health extension workers in Ethiopia

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Background and challenges to implementation: Health extension workers (HEWs) are the frontliners in implementing community TB activities in Ethiopia. They are overstretched with more than 16 community-based health packages. So, the community TB contribution has never been above 20%. Hence, it is quite essential to augment community TB case activities by other community workers.
Intervention or response: The USAID Eliminate TB Project engaged community-based organizations (CBOs) that deployed TB survivors and other community volunteers to augment community-based TB health education, presumptive TB case identification, contact tracing, and adherence to anti-TB drugs. There are 73 districts supported by CBO (HEWs plus community volunteers and TB survivors), 'hybrid' districts. A trend analysis of community TB contribution (computed as proportion of TB cases referred from the community to total TB cases) was described and the quarterly average increment was compared between the 'hybrid' districts and other districts without volunteers and TB survivors (only HEWs) using the mean comparison test (t-test).

Quarter	Hybrid districts (HEW, community volunteers and TB survivors)	Districts without community volunteers and TB survivors (only HEWs)
Jan-Mar 2022	21%	23%
Apr-Jun 2022	37%	21%
Jul-Sept 2022	24%	16%
Oct-Dec 2022	30%	19%
Jan-Mar 2023	31%	18%
Apr-Jun 2023	41%	31%
Jul-Sept 2023	34%	29%
Oct-Dec 2023	37%	24%

Table: Community-based TB contribution by support categories, January 2022-December 2023.

Results/Impact: Overall, the community contribution in the project-supported areas increased from 18% in January 2022 to 24 % by December 2023. In the same period, in those districts without supports from volunteers and TB survivors, the contribution increased from 22% at baseline to 24%, increased by 9.1%; and in those with 'hy-

brid' support, it improved from 21% at baseline to 37%, increased by 16%. The difference in the quarterly trend increment is statistically significant (t-value=2.4, p-value=0.02)

Conclusions: The performance of the community contribution in 'hybrid' districts was improved by two-fold as compared to districts without community volunteers and TB survivors. The community TB activity could be improved by augmenting the already overstretched HEWs with other community workers. This experience could be scaled up to other districts and zones in Ethiopia.

OA25-304-14 Community engagement for TB elimination: Insights from a pilot project in Jharkhand, India

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Background: Tuberculosis (TB) poses a significant global health challenge with high mortality rates compounded by factors including lack of awareness and social stigma. To address this issue and recognizing the pivotal role of community engagement in promoting knowledge, awareness, and improving healthcare services, Government of India is establishing Jan Arogya Samitis (JAS)-People's Health Committees at peripheral-most primary healthcare facilities called Ayushman Arogya Mandirs (AAM). Comprising of community health workers, health officials, civil society members, and beneficiaries including TB survivors, JAS aims to improve quality of service delivery, catalyze grievance redressal, ensuring social accountability and contribute to collaborative TB elimination efforts. USAID-supported NISHTHA project, piloted and evaluated a model, operationalizing JAS and demonstrating community-led monitoring across 35 AAMs in Jharkhand.

Design/Methods: We employed a pre-post study design, randomly selecting 10 AAMs. Household surveys conducted in the catchment of the selected AAMs gauged TB knowledge and service awareness at AAMs, with targeted sample size of 660 participants for both baseline and endline assessments, utilizing random sampling. Facility assessments evaluated logistics availability and portal utilization, and quarterly data abstraction captured TB-related service utilization statistics. Baseline assessment occurred in June 2022, with endline assessment in February 2024, allowing model maturation.

Results: All 10 AAMs had atleast one TB survivor in JAS. Household survey revealed statistically significant improvement in TB knowledge and awareness of available services (Table 1). Facility Assessments showcased increased availability of sputum collection containers from 7 to 8 AAMs, with all 10 AAMs utilizing the portal. TB screening and the number of persons receiving TB treatment increased more than two-fold (increase by 118.3% and 128.9% respectively from baseline to endline).

Indicator	Baseline (N=651)	Endline (N=657)	Change from Baseline to Endline (%)	p-value
Knowledge of Cough as Symptom of TB	420 (63.6%)	525 (79.5%)	105 (15.91%)	<0.001
Knowledge of Blood in Sputum as Symptom of TB	299 (45.3%)	408 (61.8%)	109 (16.5%)	<0.001
Knowledge of Fever as Symptom of TB	63 (9.5%)	138 (20.9%)	75 (11.4%)	<0.001
Knowledge of Weakness as Symptom of TB	204 (30.9%)	335 (50.8%)	131 (19.8%)	<0.001
Knowledge of Weight Loss as Symptom of TB	20 (3.0%)	224 (33.9%)	20 (30.9%)	<0.001
Knowledge that TB is a Communicable Disease	469 (71.1%)	517 (78.3%)	48 (7.2%)	<0.001
Knowledge of TB is a curable disease	534 (80.9%)	584 (88.5%)	50 (7.6%)	<0.001
Awareness about availability Screening and Management services for TB at AAMs	162 (24.5%)	336 (50.9%)	174 (26.4%)	<0.001
Awareness about availability of Sputum collection service for TB at AAMs	144 (21.8%)	314 (47.6%)	170 (25.8%)	<0.001

Conclusions: Operationalization of JAS, having representation of TB survivors, for community-led monitoring of AAMs was associated with improved community knowledge and awareness of TB-related services, increased resource availability, and TB-related service utilization at AAMs.

OA26 Engage private sector for TB prevention and care

OA26-305-14 Joining forces: Corporate sector's role in finding the missing people with TB

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Background and challenges to implementation: Tuberculosis (TB) persists as a compelling public health issue in India, with more than half a million missing cases. Although TB diagnosis and treatment are available at all government health facilities, some at-risk populations are unable to access these TB services, thus remaining undetected and untreated. Corporate TB Pledge (CTP), serves as a framework for the corporate sector organizations pledging to commit to the social cause fighting against TB.

Intervention or response: CTP mobilized Corporates to invest in screening and testing based projects as a part of their social responsibility. Based on their commitment, the CTP holders design projects based on different levels of contributions, that may involve, workplace and community level interventions.

These projects are at differing scales and implemented at various locations across India with direct coordination and linkages with the National TB Programme.

Results/Impact: Over 25 corporates have been engaged, mobilized, and supported to implement projects involving TB screening and testing activities. These projects often include activities such as community outreach, mobile screening units and mass screening campaigns with appropriate linkages to treatment. Between 2019 and 2024, these projects have conducted over 5.35 million TB screenings, 0.21 million tests for people with presumed TB, and diagnosed a total of 15,320 people affected with TB.

Corporate interventions have increased access to hard to reach populations such as tea gardens and trucker community. It also helped to pilot many interventions beyond national guidelines such as using X-rays for screening of asymptomatic to identify sub-clinical TB, lessons from which was later incorporated to the national guidelines.

Conclusions: As countries move towards achieving the global goal of ending TB, partnerships can strengthen the foundation of our health system.

The Government and Corporates can maximize each other's strengths and resources and work jointly towards eliminating TB.

OA26-306-14 Expanding TB case detection in private health facilities: An intensified intervention in Nigeria

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Background and challenges to implementation: Private health facilities, including clinics, hospitals, and laboratories, play a significant role in tuberculosis (TB) care, especially in countries where a large portion of the population seeks healthcare services in the private sector. This paper presents the contribution of private health facilities to TB case findings in Southwest, Nigeria.

Intervention or response: Private for-profit providers (PfP), faith-based organizations (FBOs), patent and proprietary medicine vendors (PPMV), standalone laboratories, and informal health providers such as traditional birth attendants (TBAs) and traditional medical practitioners (TMPs) are all involved in the TB-LON 3 project's Public-Private Mix (PPM) engagement scheme. The PPM providers offer high-quality TB services, including systematic screening, identification of presumptive TB, diagnosis, treatment, and case notification to the National TB and Leprosy Control Program (NTBLCP). TB-LON 3 is working to strengthen the existing PPM linkages to expand the coverage of formal and informal private healthcare providers with TB services. The project supports 492 PfP/FBOs, 439 PPMV/CPs, 139 standalone labs, and 133 TBAs/TMPs.

Results/Impact: During the period from October 2022 to September 2023, under the PPM intensified case finding intervention, 80.8% (1,839,126) out of 2,276,673 eligible clients were symptomatically screened for TB and 80,244 presumptive TB were identified giving a 4.4% presumptive TB yield. Among these, 76,671 (95.5%) of the identified presumptive TB were facilitated to TB diagnosis, and,736 (7.4%) TB cases were diagnosed with a treatment enrolment rate of 5,427 (94.6%). All (100.0%) of the TB cases enrolled on treatment were notified to the National TB Program. The number needed to screen was 227 and the number needed to test was 13 during the reporting period.

Conclusions: This outcome showed that private health facilities play a vital role in tuberculosis screening efforts, and collaboration between the public and private sectors is essential to effectively combat tuberculosis and achieve global targets for prevention and control.

OA26-307-14 District intervention packages to improve TB notification and access to quality TB care in private sector in Indonesia

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Background and challenges to implementation: The role of private healthcare providers in finding, diagnosing, treating, and reporting TB cases to the national TB surveillance system/registry (SITB) is critical to ending TB in Indonesia, but they face barriers in access to molecular WHO-recommended rapid diagnostics (mWRD) testing, programmatic TB drugs, and TB notification through SITB.

Intervention or response: To address these barriers, the USAID Tuberculosis Private Sector (TBPS) activity provided a district intervention package of support from October 2020 to June 2023 in Medan, North Jakarta, South Jakarta, Gresik, Denpasar and Samarinda districts.

The package included mapping of health facilities and instigation of a suite of public-private mix (PPM) initiatives including networking private health facilities with public sector mWRD testing and programmatic TB drug availability; providing SITB access; building health worker capacity through e-learning, webinars, and coaching; and facilitating non-monetary incentives from professional organizations to health workers who contribute to the TB program.

A District Technical Officer (DTO) assigned to each district enabled these activities and supported the districts to supervise and monitor implementation.

Results/Impact: In the six districts, 100% (153/153) of private hospitals, 95% (710/745) of private clinics, and 79% (524/664) of general practitioners were engaged in the PPM initiatives, marking a significant overall increase from 11% in 2020 to 89% in June 2023. TB case notifications rose from 4,999 in 2020 to 7,333 in 2023, and the number of presumptive TB cases reported through SITB increased from 11,610 in 2020 to 22,121 in 2023.

The percentage of presumptive TB from private sector tested with mWRD rose from 36% in 2020 to 60% in 2023.

Conclusions: Limited access to mWRD testing, programmatic drugs, and SITB poses obstacles to TB notifications from the private sector. District intervention packages implemented by USAID TBPS have improved PPM engagement and significantly increased presumptive TB reporting and TB notifications.

OA26-308-14 Private health facilities: Frontlines in diagnosing TB during conflict in Tigray, Ethiopia

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Background and challenges to implementation: During the conflict in the Tigray region from November 2020-December 2022, government delivery of essential health services, including access to diagnosis and treatment of tuberculosis (TB) in public health facilities, was severely compromised. However, many private health facilities continued to deliver health services to the community during the conflict. In Tigray region, there are about 1,000 private health facilities but only 85 were engaged in the Public Private Mix (PPM) TB program, which continued to provide TB diagnosis to the community during the conflict.

Intervention or response: Amid the conflict, the USAID Eliminate TB Project regional staff supervised the TB program in the private health facilities in major towns, supporting consistent supply of anti-TB drugs and TB diagnostics. The project implemented TB program restoration activities both in public and private health facilities immediately after cessation of the conflict in November 2022. The project collated data from TB unit registers from public health facilities to supplement program reports and measure the contribution of PPM in TB case notification.

Results/Impact: About 54% (517/964) of total TB patients were receiving treatment in the three public health centers and were diagnosed initially at the private health facilities in the regional capital of Mekelle during October 2020 to December 2022. The PPM program contributed 42-76% during and immediately after the conflict. However, after basic TB service at public facilities was resumed (2023) the contribution was 33% in the region (Table 1).

	Oct-Dec 20	Jan-Mar 21	April-June 21	Jul-Sep 21	Oct-Dec 21	Jan-Mar 22	April-Jun 22	July-Sep 22	Oct-Dec 22
TB patients on DOTS	64	129	115	84	90	79	130	164	109
Referred from PPM	40	54	60	64	56	52	59	78	54
%	63%	42%	52%	76%	62%	66%	45%	48%	50%

Table: Proportion of TB patients diagnosed in PPM sites and on treatment in public health facilities of Mekelle town, Oct 2020-Dec2022 (Secondary data from Semen, Kasech and Adis Health Center).

Conclusions: The PPM TB program is important not only to find missed TB patients but can also sustain TB programs when the public system fails during conflict.
Therefore, expanding engagement of private health facilities in sub-national TB programs could further improve TB screening, diagnosis, treatment, and prevention during periods of conflict or instability that affect the provision of basic TB services.

OA26-309-14 Private sector engagement: Integrating TB services into HIV activities while addressing drug use, HIV, and TB in Myanmar

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Background and challenges to implementation: Myanmar is known for opium cultivation and heroin production, leading to widespread drug use due to accessibility and affordability. Consequently, opiate consumption, including smoking and injecting, is prevalent. HIV prevalence among People Who Inject/Use Drug (PWID) is high at 34.9% (IBBS 2017). Moreover, Myanmar faces a significant TB burden.
However, PWID's limited access to healthcare services exacerbates the challenges, particularly in rural areas with sparse health infrastructure.
Intervention or response: The Asian Harm Reduction Network (AHRN) and its partner, Best Shelter (BS), implement comprehensive harm reduction services for PWID in northern Myanmar. AHRN and BS have collaborated with local grocery shops since 2015 to implement the Needle Syringe Automatic-taking Machine (NSATM) near shooting galleries where PWID usually hanging around, facilitating private sector engagement for TB case finding. In 2021, TB presumptive screening and referral services were integrated into existing NSATM HIV activities, following extensive training of NSATM owners in TB screening, proper referral and follow-up for people with TB.
Results/Impact: This has had a significant impact on TB case detection and linkage to care among PWID. Out of 24 NSATM shops, TB interventions were integrated into 18 of them, and 2515 people received TB presumptive screening services.This number surged from 467 in 2021 to 1139 in 2023. Additionally, 74 people were diagnosed with TB, making an increase from 13 in 2021 to 21 in 2022 and 40 in 2023.
Conclusions: Engaging with the private sector, in this case, with local grocery shops, and integrating TB interventions into existing Needle Syring Program (NSP) activities makes it more convenient for PWID to access not only needle and syringe services but also increasing the likelihood of early detection and treatment initiation. This can also serve as a gateway for PWID to access further healthcare services such as HIV, HCV, etc.

OA26-311-14 Patients provider support agencies (PPSA) and its impact on the private sector engagement in TB Elimination Program in Uttar Pradesh, India

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Background and challenges to implementation: The state of Uttar Pradesh (UP) with 16% of India's population accounts for 26% of TB cases notified in the country. Drug sales data study carried out by IQVIA in 2022 shows that there are more people accessing TB medication from private sector. In 2023, the total state private sector target for TB notification was 2,23,400 and 83% (185300) of this target was from 36/75 PPSA districts.
Timely out-reach to private health facilities for enhancing TB notification and subsequent follow-up for public health actions was huge challenge for NTEP staff who were already overwhelmed with public sector.
Intervention or response: The State Health Mission, UP and State TB program entered into an agreement with PPSA in 36 high burden districts. State TB Technical Support Unit, India Health Action Trust played a vital role in on-boarding the PPSA and built their capacity in collaboration with WHO consultants.
PPSAs recruited exclusive field and district level team members to engage and support private health facilities to facilitate notification and public health actions including co-morbidity (HIV and Diabetes) screening, molecular testing, treatment follow-up and Bank account validation to get Nikshay Poshan Yojana (nutrition support) for the private sector patients. In remaining 39 districts district NTEP staff were directly involved to engage private doctors for TB elimination.
Results/Impact: More than 100% of target TB Notification was achieved in 36 high burden PPSA districts in comparison to 81% in non-PPSA districts.
The state notified 99% of the overall Private sector target, a highest since 2017.
Public health actions among private sector TB individuals were also better in 36 PPSA districts as compared to 39 non-PPSA districts.
Conclusions: To eliminate TB, engaging NGOs to enhance roles of private health facilities particularly in districts with a high burden (>1000 TB individuals) produced better results for TB notification and public health actions.

Sr. No.	PPSA/NON PPSA	Number of Cases Notification/ Target (Percentage)	NAAT Testing	Bank Validation among Eligible (Excluding Forgone)	HIV Testing among Notified	DM Testing among Notified	Treatment Outcome Cohort (Jan 2022 to Dec 2022)
1	Cluster 1 (18 Districts)	91889/87000 (106%)	42509 (46%)	74865 (81%)	89206 (96%)	89295 (96%)	45127/48465 (92%)
2	Cluster 2 (18 Districts)	98531/98300 (100%)	39081 (40%)	73218 (74%)	95626 (96%)	95665 (96%)	43223/46192 (94%)
3	Non PPSA (39 Districts	31228/3900 (81%)	7455 (24%)	22248 (68%)	28471 (90%)	28505 (90%)	17544/19904 (88%)
4	UP State (75 Districts)	221648/224300 (99%)	89045 (40%)	170331 (77%)	213303 (95%)	213465 (96%)	106894/114561 (92%)

Treatment Outcome: Cohort is Taken from Jan 2022 to Dec 2022

Table. Private Sector Notification and Public Health Action in PPSA and NON PPSA Districts (Jan 2023 to Dec 2023) Data Source Ni-Kshay Analytics as 19th Feb 2024

OA26-312-14 Impact of private sector engagement (STEPS) strategy on TB notification and outcome in Kerala, India, 2018-2023

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Background: Kerala, a southern state in India, implemented the System for TB Elimination in Private Sector (STEPS) in 2019 to ensure standards of TB care in the private sector. The model had three components: a consortium of private hospitals, a coalition of professional medical associations, and designated private institutions (STEPS centres), which serve as a single window ensuring comprehensive TB care.

We evaluated the impact of the STEPS model on tuberculosis notification, case retention and treatment outcomes in the private sector under the National Tuberculosis Elimination Program in Kerala

Design/Methods: The data on TB notifications and outcomes from 2018-2023 was abstracted from the National TB data management portal (Nikshay). We defined case retention as the number of persons affected by tuberculosis who continued the treatment from private institutions till the outcome. Treatment success was defined as the proportion of notified cases with cured or treatment-completed outcomes. Trend analysis of the proportion of private sector notification, case retention and treatment success were done from 2018 to 2023.

Results: The proportion of TB cases from the private sector consistently increased over the years from 19 % in 2018 to 37% in 2023. TB notifications in Kerala fell by 23% between 2019-2020, with a 15% rise in private sector notifications. The proportion of case retention increased gradually from 38% in 2018 to 57% in 2023. There was no significant difference between the treatment success rates among notified cases from the private and public sectors over the years.

Background and challenges to implementation: Kerala, a southern state in India, implemented the System for TB Elimination in Private Sector (STEPS) in 2019 to ensure standards of TB care in the private sector. The model had three components: a consortium of private hospitals, a coalition of professional medical associations, and designated private institutions (STEPS centres), which serve as a single window ensuring comprehensive TB care. We evaluated the impact of the STEPS model on tuberculosis notification, case retention and treatment outcomes in the private sector under the National Tuberculosis Elimination Program in Kerala.

Intervention or response: Meetings and sensitisation sessions on NTEP with professional medical associations and private hospital consortiums were conducted across 14 districts. Private institutions designated as STEPS centres were established statewide in a phased manner to provide comprehensive TB care. Data on TB notifications and outcomes from 2018-2023 were extracted from the National TB data management portal (Nikshay). Case retention, defined as ongoing treatment in private institutions, and treatment success rates were analysed for trends from 2018 to 2023.

Results/Impact: The proportion of TB cases from the private sector consistently increased over the years from 19 % in 2018 to 37% in 2023. TB notifications in Kerala fell by 23% between 2019-2020, with a 15% rise in private sector notifications. The proportion of case retention increased gradually from 38% in 2018 to 57% in 2023. There was no significant difference between the treatment success rates among notified cases from the private and public sectors over the years.

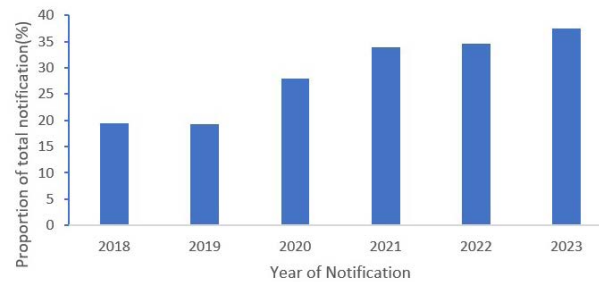

Figure 1. Trend of private notification in Kerala, 2018-2023.

Conclusions: The STEPS strategy increased TB notifications in Kerala's private sector from 2018 to 2023 and treatment success rates remained comparable to the government sector. Despite the decline in notifications during the COVID-19 pandemic, an upward trend in notifications from the private sector was obvious.

Thus, STEPS showcases a sustainable, replicable patient support model, leveraging private-sector engagement and public-sector recognition.

OA26-313-14 Public/private sector engagement for decentralised laboratory services to reduce pre-treatment loss-to-follow-up among persons with drug-resistant TB

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Background and challenges to implementation: Nigeria ranks 5th among countries contributing 70% to the global MDR/RR-TB diagnosis-enrollment gap, with a 3-year (2020-2022) average pre-treatment loss to follow-up (PTLTFU) of 24% as 1:4 diagnosed persons with DR-TB (PwDRTB) did not receive treatment. Despite adopting community DR-TB treatment, care coordination remains largely centralized causing undue delayed patient enrollment and PTLTFU.

A key driver is the centralized laboratory services for conducting requisite baseline investigations prior to commencing treatment. High transport and opportunity costs hinder access to care, resulting in a large number of individuals waiting for baseline investigations and delayed treatment initiation.

Intervention or response: Between April-2022 to June-2023, RedAid Nigeria piloted multilevel interventions to decentralize DR-TB services to reduce PTLTFU in two southern Nigeria states (Akwa-Ibom and Oyo), funded by TB REACH wave-9 grant.

Project interventions included decentralizing baseline investigations to more peripheral laboratories; prompt DR-TB notification to TB supervisors, incentivizing patient tracking, structured counseling by DR-TB survivors, transport support for in-patient care, mobile connectivity solution for quicker result retrieval, and decentralized treatment initiation.

State quality assurance officers used a pre-qualification checklist to identify eligible laboratories closer to communities for enlistment. Checklist items entailed regulatory requirements, conducive and accessible environment, and equipment availability for required investigations. Memorandum of Understanding was signed by the selected labs with the State TB Program and were renumerated according to the national Global Fund rates.

Results/Impact: At baseline, there were a total of 4 laboratories (75% were private laboratories), and this increased to 13 (with 92% being private laboratories) post-intervention. The project successfully reduced proportion of persons 'awaiting baseline investigation' by 91%, from 11% pre-intervention to 3% post-intervention, with an overall reduction in PTLTFU from 48% to 25%.

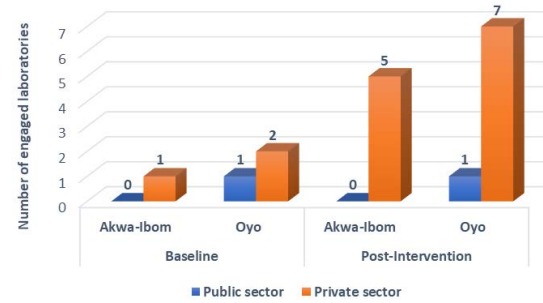

Figure. Number of laboratories engaged pre-post intervention.

Conclusions: Decentralization of DR-TB services by expanding laboratory access, remarkably reduced the proportion of individuals awaiting baseline investigations by 91%, contributing to significant reduction in PTLTFU.

OA27 Addressing TB myths

OA27-314-14 Prevalence and predictors of TB stigma in peri-urban settlements in North-central Nigeria

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Background: TB stigma in the communities has not been fully understood especially in Nigeria. Our study was to determine the level of TB Stigma in the communities within our study sites. We also examined associations between TB stigma and key socio-demographic factors. Understanding these associations will facilitate efforts aimed at reducing TB stigma.

Design/Methods: This cross-sectional survey was conducted in a substantial TB burdened peri-urban settlements in Nasarawa state North-central Nigeria.

An adapted version of the STOP TB Partnership Stigma assessment tool was used by trained and experienced community surveyors to collect data using Kobocollect toolbox.

Participating households were randomly selected from the WHO-validated state master list of enumerated households used for vaccination campaigns. We estimated prevalence using percentages, chi-squared tests were

used for categorical variables and logistic regression was used to estimate adjusted odds ratios with associated 95% confidence intervals.

Results: A total of 1641 heads-of-households (HOH) responded to our survey with790 (48.1%) males, and females were 851 (51.9%). Only 560 (34.1%) were employed.

Overall, there was a high prevalence of TB stigma 704 (82.7%) in female HOH and 691 (87.5%) in male HOH. Being male, with aOR (95% CI) of 1.529 (1.152 – 2.030) was associated with high stigma whilst being in paid employment was associated with less stigma with aOR of 0.651 (95% CI= 0.479 – 0.885). Household size did not show significant association with community TB stigma.

	N = 1641	Low Stigma (%)	High Stigma (%)	Chi-sq p-value	aOR	95%	p-value
Gender Female	851	147 (17.3%)	704 (82.7%)	0.008	1	-	-
Male	790	99 (12.5%)	691 (87.5%)		1.529	1.152 - 2.030	0.003
Employment No	1081	178 (16.5%)	903 (83.5%)	0.020	1	-	-
Yes	560	68 (12.1%)	492 (87.9%)		0.651	0.479 - 0.885	0.006
Household size Above 20	6	2 (33.3%)	4 (66.7%)	0.155	1	-	-
1 - 5	863	127 (14.7%)	736 (85.3%)		2.725	0.490 - 15.161	0.252
6 - 10	690	99 (14.3%)	591 (85.7%)		2.845	0.510 - 15.873	0.233
11 - 15	74	15 (20.3%)	59 (79.7%)		2.099	0.348 - 12.680	0.419
16 - 20	8	3 (37.5%)	5 (62.5%)		0.993	0.107 - 9.258	0.995

Conclusions: Community TB stigma remains unacceptably high in Nigeria. Our study shows it still holds sway in our communities with gender and employment status as predictors. Therefore, improving the understanding of this issue warrants more multi-disciplinary efforts.

OA27-315-14 Impact of TB-related stigma on people with TB, their contacts, and the larger society: Insights from Kano State, Nigeria

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Background: Understanding the sociocultural context of TB stigma is crucial to mitigating its effects. A study was conducted in Kano State to explore perceived and enacted stigma among family caregivers, health workers, and community leaders, and to assess the influence of structural stigma on TB patients.

Design/Methods: : Quantitative research was conducted across four local government areas in Kano State using an electronic data collection application. Questionnaires based on validated TB stigma scales were administered to 247 participants, including TB patients, carers, healthcare providers, and community leaders. Data collection spanned six days, with participants selected through convenience sampling. Informed consent was obtained prior to interviews, and data were analyzed using specific tools.

Results: The study revealed significant self-stigma among TB patients, leading to isolation and secrecy about their condition. Primary caregivers and community representatives expressed fear and discomfort around TB patients, contributing to the perpetuation of stigma. Healthcare workers exhibited a mix of pity and nervousness towards TB patients, with some advocating for forced treatment and isolation. Stigmatization was most pronounced during treatment support and post-follow-up services, as well as during symptom recognition and treatment initiation in healthcare settings.

Conclusions: The study reveals the pervasive impact of self and secondary stigma on individuals grappling with TB. Community input suggests a path forward through targeted awareness campaigns, education initiatives, and comprehensive support structures. By offering multi-dimensional support and integrated care where both material and psychological support are given, an inclusive community can be fostered that embraces those affected by TB, dispelling fears and prejudice.

OA27-316-14 Psychological distress of rifampicin-resistant TB diagnosis and treatment on children and their caregivers in South Africa, India, and the Philippines

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Background: In 2021, an estimated 1.17 million children developed tuberculosis (TB), with 25,000–32,000 having rifampicin-resistant (RR)-TB. South Africa, India, and the Philippines are among the top 10 countries with the highest RR-TB burden. Studies showed psychological distress among adults with TB and RR-TB. Data on psychological distress in children with RR-TB is limited.
Nested in the CATALYST RR-TB treatment trial in South Africa, India, and the Philippines we assessed psychological distress and its triggers during disease diagnosis and treatment among children with RR-TB and their caregivers.
Design/Methods: A series of in-depth interviews (IDI) were conducted with children treated for RR-TB and/or their caregivers for 4 times over ~24 weeks of treatment. IDIs were audio-recorded, and detailed case narratives were completed. The data analysis was conducted using the rapid qualitative analysis method.
Results: We interviewed 26 children (Male=11, Female=13, Age: <15 years) and/or their caregivers (Male=6, Female=20, Age:18-60 years). Children in three countries reported psychological distress caused by social isolation due to RR-TB diagnosis, daily pill burden, and changing bodily appearances during the RR-TB diagnosis and treatment period.
Triggers for psychological distress among caregivers were anxiety and depression during the RR-TB diagnosis of their children, children's resistance to taking daily bitter-tasted pills, the burden of administering medicines, decreased social support, increased burden of responsibilities, financial insecurities, and social isolation (Table 1). Perceived and received social stigma were frequently cited as common triggers for distress among children and their caregivers.
Caregivers additionally expressed anxiety about getting infected, re-infection, children's long-term well-being, and the adverse impact of RR-TB on household income and expenditure. Some caregivers cited distress caused by spousal domestic violence during treatment.

Children with RR-TB		Caregivers	
Psychological Distress during Disease Diagnosis	**Psychological Distress during Treatment**	**Psychological Distress during Disease Diagnosis**	**Psychological Distress during Treatment**
a) Overwhelming sadness due to social isolation after RR-TB diagnosis.	a) Irritability and distress during medicine administration due to pill burden and bitter-tasted medicines. b) Depression due to Social Isolation and stigma after disease disclosure d)Low self-esteem changing bodily appearances and/ or hyperpigmentation of the skin during treatment.	a) Constant anxiety due to the child's diagnosis and fear of the extent of severity, b) Anxiety due to the potential risk of getting infected themselves, c) Depression due to a sense of guilt in cases where the caregivers were also index cases.	a) Stress and anxiety due to the additional burden of caregiving over and above existing domestic and professional responsibilities, b) Stress due to increased financial burden during treatment c) Helplessness and distress due to lack of social or familial support, d)Stress and depression from witnessing the constant struggle of the child during medicine ingestion, e) Fear of potential reinfection of the child or development of more severe TB, e) Anxiety, depression, and fear due to received or perceived stigma from the neighborhood, f) Anxiety about the risk of other family members getting infected with TB/RR-TB. g) Stress and anxiety among female caregivers due to domestic violence by their male spouses during their children's treatment period added to their distress.

Table 1: Psychological Distress Matrix among Children with RR-TB and Their Caregivers in South Africa, India, and the Philippines.

Conclusions: Children treated for RR-TB and their caregivers experience psychological distress during diagnosis and treatment. Future research must prioritize addressing psychological distress and offering patient-centered care for better treatment experiences.

OA27-317-14 TB-related stigma in Vietnam: Findings from a nationwide baseline assessment

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Background: Tuberculosis (TB)-related stigma is a major barrier to accessing TB care and is present throughout the care journey. A clear understanding of the extent and nature of TB-related stigma is key to developing, implementing and assessing stigma-reduction interventions. We aimed to achieve this in Viet Nam by understanding the anticipated and internalized stigma of people with TB (PWTB) as well as the underlying social, cultural and economic drivers PWTB, families, and health care workers face.
Design/Methods: A nationwide stigma baseline assessment was conducted in Viet Nam (2023), generating estimates of Global Fund indicators of TB-related stigma. We used a mixed-methods study design, combining a questionnaire-based survey and qualitative research methods. The survey (n=236) was conducted with PWTB across 17 provinces. Semi-structured interviews were conducted (n=30) with PWTB and their family members (n=11). Focus group discussions (n=9) were conducted with health care providers. Policy stakeholders attended a half-day workshop.
Results: Survey participants indicated anticipated stigma, especially fear of disclosure, as the main driver of stigma. Nearly half the participants (47.5%) were careful with whom they shared their TB diagnosis with and 50 (21%) participants were concerned about disclosing to non-family. Internalized stigma was driven by guilt about bad behavior (49.2%) and manifested as isolation (62.7%). Participants from the Central Highland region presented the highest rates of stigma. Healthcare workers both experienced secondary stigma and exhibited stigmatizing behaviour towards PWTB. For many PWTB, it was the socioeconomic impact (unemployment/job insecurity, changes in family income) that had a large impact on the ways in which they experienced stigma.
Conclusions: Anticipated TB-related stigma remains relevant for PWTB in Viet Nam. Results highlight the need for stigma reduction strategies to be customizable at multiple levels, including by region. Increasing awareness of TB through education campaigns is one approach to addressing internalized stigma such as guilt, shame and isolation.

OA27-318-14 The national TB stigma assessment in Indonesia: Opportunity to build equitable, rights-based TB care

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Background: A national TB stigma assessment was undertaken, in collaboration with the Ministry of Health and TB-affected communities in Indonesia, to inform transformative approaches to stigma mitigation.
Design/Methods: Using systematic random sampling, four participant groups (people with TB including survivors, relatives, health workers, neighbours) were recruited from eight districts reporting the highest gaps in TB notifications. Standardized surveys captured data on overt (external) stigma, secondary stigma, stigma perpetrators and settings. Scaled questions captured data on covert (perceived/internal) stigma. Descriptive statistical analyses and a logit model of stigma and sociodemographic variables were performed.
Results: From June 2021 to September 2022, 3200 consenting adults (n=1280 people with TB/survivors, n=640 relatives, n=640 health workers, n=640 neighbours) participated (57% female, 1% transgender). Key populations comprised 44% of people with TB; most (n=305) lived in rural poverty. 192 people with TB (15% overall, 16% women, 14% men, and 43% transgender persons) reported overt/external stigma. Stigma was significantly higher in key populations (21 vs 10%), and those who never had TB treatment had more stigma (38%) than those who began or completed treatment (14-19%). The likelihood of stigmatization significantly increased among key populations (coefficient=0.7111, $p<0.001$).
The most common settings for encountering stigma were communities and health facilities (puskesmas), during the stages of TB symptom recognition and treatment support. Covert stigma was widespread: 33% of people with TB, 33% of relatives, 35% of health workers, and 41% of neighbours held negative perceptions and discriminatory attitudes towards TB and/or affected people. Between 10-11% of families and health workers reported secondary stigma.
Conclusions: This study provides a baseline for stigma reduction efforts in Indonesia. Psycho-social interventions, alleviating perceived/internal stigma in people with TB, should be combined with interventions combating stigma in TB-affected families, health facilities, and

communities. Economic and rights-based protections are especially needed to safeguard people in poverty and of diverse genders.

OA27-319-14 Enhancing sexual health and mitigating stigma in TB care through educational discussions in Conakry

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Background: Tuberculosis (TB) affects not only the physical well-being of individuals in Conakry (Guinea) but also their sexual health and social experiences, often leading to stigma. This study assessed the impact of incorporating educational discussions into TB prevention and care protocols on improving sexual health outcomes and reducing stigma, with an emphasis on fostering an inclusive and supportive environment for all individuals undergoing TB treatment.
Design/Methods: This mixed-methods cohort study included individuals from two diagnostic and treatment centres in Conakry from July to November 2023. The participants were grouped into intervention and control cohorts. This study utilised the Men's Sexual Health Questionnaire (MSQ) and the Female Sexual Function Index (FSFI) to assess sexual satisfaction over the previous month and evaluate changes in stigma perception at the start and conclusion of the TB care regimen.
Results: Significant improvements were observed in the intervention group. The stigma scores in individuals decreased, with a notable shift from an average score of 23.4 to 13.9 and an increase in reported sexual desire. Although there was a slight reduction in sexual desire among some (from 24.7 to 21.4), overall sexual satisfaction improved (from 23.3 to 27.4). The adoption of contraceptives has shown a marked increase, indicating enhanced sexual health management. Qualitative feedback highlighted the beneficial influence of educational talks on altering stigma perceptions, enhancing the quality of medical care, and empowering individuals to manage sexual relationships during TB treatment.
Conclusions: The integration of educational discussions into TB prevention and care significantly enhances sexual health and reduces stigma among individuals in Conakry. These findings underscore the importance of a holistic approach to TB care that addresses physical and social aspects and advocates for supportive and inclusive treatment environments.

OA27-320-14 Reducing stigma experience among vulnerable populations with TB: Insights from a community intervention in selected Indian states

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Background: Understanding and addressing the experience of stigma is crucial in combating tuberculosis, as it adversely affects healthcare utilization. This study focuses on assessing the effectiveness of behavior change solutions in reducing the experience of stigma among vulnerable populations in India.
Design/Methods: We undertook two cross-sectional surveys as part of the Breaking the Barrier (BTB) initiative, funded by the United States Agency for International Development. These surveys targeted vulnerable groups, such as migrants, tea garden workers, miners, industrial workers, tribals, and urban populations with TB across four Indian states. We inquired about stigma experiences at various places and situations during treatment from all respondents. Our analysis examined changes in stigma experiences based on various characteristics and the impact of awareness regarding behavior change solutions. Using the nearest neighborhood method, we evaluated the treatment effect of behavior change solutions on stigma experiences.
Results: Interviewed a total of 4299 respondents, comprising 2153 at baseline and 2146 at endline. Overall, respondents who experienced stigma reduced from 43% to 30% between baseline and endline surveys. Stigma experiences decreased significantly among vulnerable groups, except the urban vulnerable group in Bihar and Karnataka. A noticeable reduction in stigma experiences was observed across various socio-demographic characteristics between baseline and endline. Utilizing the nearest neighborhood method to assess the impact of BCS, we found a positive effect on stigma reduction among those aware of TB Campion health worker interventions.
While other BCS, like Jaanch Coupon, Starter Kit, and TB Mukt Certificate, also showed positive effects on stigma reduction, statistical significance remained below a 10% p-value.
Conclusions: These findings underscore the importance of community-level interventions through certain BCS, particularly through TB Champion Health Worker engagement, in mitigating TB-related stigma among vulnerable populations. Such insights are crucial for shaping policies and programs aimed at reducing stigma and improving TB care and support services.

OA27-321-14 Stigma in people with multi-drug-resistant TB and HIV in South Africa

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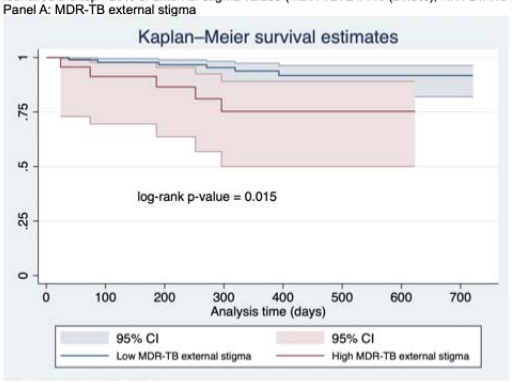
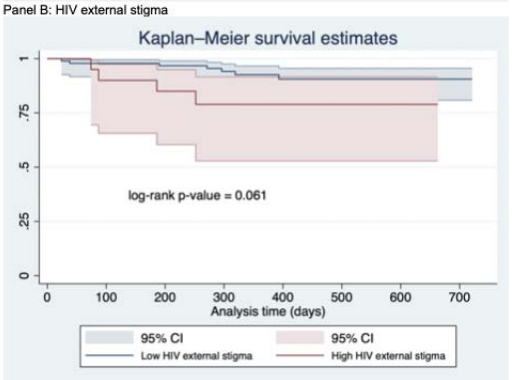
Background: Combatting stigma is a priority recommendation of the WHO's End TB Strategy, yet important gaps remain in our understanding of stigma associated with multidrug-resistant tuberculosis (MDR-TB), and stigma experienced by people living with HIV and MDR-TB.
Design/Methods: Adults with MDR-TB and HIV initiating bedaquiline and receiving antiretroviral therapy in KwaZulu-Natal, South Africa, were prospectively enrolled in the PRAXIS study. To assess MDR-TB and HIV stigma, questionnaires measuring internalized (internalization of negative thoughts regarding disease) and external (experiences or anticipation of discrimination) stigma were developed. Exploratory factor analysis (EFA) was used to develop final stigma scales.
Results: From November 2016 through March 2020, 113 participants with a completed stigma questionnaire were enrolled and followed through MDR-TB treatment completion. EFA yielded 6-item MDR-TB and HIV stigma scales with two factors consistent with internalized and external stigma (Cronbach's alpha: 0.86, 0.83). Mean MDR-TB stigma was greater than mean HIV stigma (13.35 vs 11.69, p<0.001), and mean MDR-TB stigma sub-categories were also greater (internalized stigma: MDR-TB 7.27 vs. HIV 6.02, p<0.001, external stigma: MDR-TB 6.07 vs. HIV 5.67, p=0.025).
In univariate analysis, being unemployed (coefficient: 2.23 95% CI (0.03-4.42)) and active alcohol use (6.15 (1.80-10.49)) were associated with significantly higher MDR-TB stigma. Female sex (1.60 (0.01-3.19)), being unemployed (2.05 (0.31-3.80)), and active alcohol use (4.38 (0.88-7.88)) were associated with higher HIV stigma. 11/113 (9.7%) participants died during the follow-up period. HIV and MDR-TB external stigma were significantly associated with mortality (MDR-TB: HR 1.26 (1.06-1.49), HIV: HR 1.33 (1.05-1.69)) (Figure 1).

Figure 1: Kaplan Meier curve demonstrating mortality stratified by MDR-TB (panel A) and HIV (panel B) external stigma. High MDR-TB/HIV external stigma was defined as ≥8. This cutoff was chosen as it identified the top ~20% of external stigma values (MDR-TB: 24/113 (21.0%), HIV: 21/113 (18.4%)).
Panel A: MDR-TB external stigma



Panel B: HIV external stigma



Conclusions: In our study, individuals with MDR-TB and HIV reported greater stigma from MDR-TB than HIV. Stigma related to MDR-TB and HIV was associated with important social variables, and external MDR-TB and HIV stigma predicted mortality. It is essential that MDR-TB programs strategically address stigma, especially in key & vulnerable populations.

OA28 Novelty in approaching people with TB

OA28-322-14 Targeting village hotspot sites for active case finding in Vietnam: Comparative results in two rural high-burden provinces

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Background and challenges to implementation: ACF campaigns enable early detection of TB through community-level access to screening, but site selection is constrained by the need to transport equipment and ex-

pertise. Since 2020, Vietnam's National Tuberculosis Program (NTP) and USAID Support to End TB conducted annual ACF campaigns in communes in one district per province, inviting people who are household contacts or members of a TB vulnerable population.

Intervention or response: Taking advantage of lightweight ultra-portable X-ray (UPXR), we sought to target 2023 ACF by locating screening in villages—the lowest administrative level in Vietnam—among three districts per province. Provinces with historically high TB notification were selected for the hotspot approach.

Three districts with high TB notifications and without recent ACF were selected; within them 5 communes with the highest TB notifications were identified; within communes, the district TB team chose three village campaign sites.

Training and budget was provided to engage village health collaborators, who directly invited all contact persons and conducted follow-up to support treatment initiation. Hotspot ACF used a battery-powered Delft UPXR followed by sample collection for GeneXpert testing among participants with TB-presumptive x-ray or TB symptoms.

Results/Impact: Hotspot ACF was held in 87 sites, screening 9,318 individuals. 111 people with TB were notified (yield: 1,191/100,000 CXRs). Compared with 2022 routine ACF in the same provinces, the rate of TB-CXRs decreased, GeneXpert positivity increased (12.4% vs. 9.8%), and the treatment initiation rate improved (93.7% vs. 87.3%). Post-campaign follow-up was more efficient, reaching above 80% treatment initiation 8 weeks earlier than routine ACF.

Year	Geography	Screened with CXR	CXR suggestive of TB, n (%)		Tested with Xpert	Xpert positive, n (%)		TB diagnosed (all forms)	Initiated TB treatment, n (%)		Yield per 100,000 CXR
2023 Hotspot ACF	Tien Giang (3 districts, 45 sites)	4,942	514	10.4%	514	54	10.0%	57	55	96.5%	1,153
	Can Tho (3 districts, 42 sites)	4,376	402	9.2%	358	54	15.1%	54	49	90.7%	1,234
	All Hotspots	9,318	916	9.8%	872	108	12.4%	111	104	93.7%	1,191
2022 Routine ACF	Tien Giang (1 district, 11 sites)	2,553	440	17.2%	450	40	8.9%	40	36	90.0%	1,567
	Can Tho (1 district, 9 sites)	2,058	266	12.9%	275	31	11.3%	31	26	83.9%	1,506
	All routine campaigns	4,611	706	15.3%	725	71	9.8%	71	62	87.3%	1,540

Conclusions: Using UPXR, the hotspot ACF strategy feasibly reached villages that had never had TB screening services in their community. Use of a different x-ray modality and CAD4TB software likely impacted yield. Targeting a greater number of smaller sites with high engagement of local health workers resulted in increased treatment initiation.

OA28-323-14 Integrating TB screening with other primary healthcare services in urban poor communities in the Philippines

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Background and challenges to implementation: Despite efforts to address the high burden of tuberculosis (TB), a large proportion remains undiagnosed due to poor health seeking behavior and limited access to healthcare, especially in urban poor communities. Fragmented service delivery further complicates access to healthcare.

Intervention or response: Active TB case finding (ACF) through symptomatic screening and chest X-rays (CXR) equipped with computer-aided detection powered by artificial intelligence (CAD-AI) was implemented alongside other primary healthcare (PHC) services in urban poor communities in two highly urbanized cities in Metro Manila. The CXR CAD-AI was brought to the targeted communities through mobile vans while other PHC services were either organized in ACF activity areas or were provided by the nearby health facilities. Spot sputum specimens for molecular World Health Organization-recommended rapid diagnostic test (mWRD) were collected from those with presumptive TB.

Results/Impact:

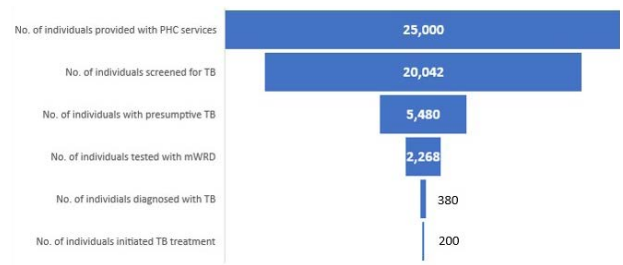

Figure. Integrated active case finding in urban poor communities cascade of care.

Between August-October 2023, approximately 25,000 individuals received primary healthcare services and 20,042 individuals underwent TB screening (67% females, 33% males). Of those screened for TB, 27% had presumptive TB either through symptoms, CAD-AI or human CXR reading, and 41% of presumptives were tested with mWRD. A total of 380 individuals with presumptive TB (7% of those screened) were diagnosed with TB (315 bacteriologically confirmed and 65 clinically diagnosed) and were referred for treatment initiation at local health centers. Advocacy to primary care providers for household contact investigation for bacteriologically confirmed TB resulted in 145 household contacts assessed for eligibility for TB preventive treatment. Despite several operational challenges including unfavorable weather conditions, lo-

gistical constraints and the short implementation period, 67% of the screening target was achieved with a 1.9% yield rate.
Conclusions: Integrating TB screening into other PHC services in urban poor communities is a realistic approach combining community mobilization with collaborative strategic design, problem-solving and decision-making. The approach expands sustained provision of targeted TB screening and contributes to TB case finding.

OA28-324-14 Active TB case finding in most at-risk populations at the community level and how it changed after the full-scale war started in Ukraine

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Background and challenges to implementation: According to WHO report, after the full-scale russian invasion started the number of missing TB cases has doubled in Ukraine compared with the pre-war years and is 48% now. The reasons for this are mass population migration, limited access to TB diagnostics services in general population, occupation of the 20% of territory, full or partial destruction of the healthcare infrastructure in many regions as well as deprioritizing health issues. If the situation remains as it is this will lead to an increase of TB burden in Ukraine and neighboring countries during the war and in the first post-war years.
Intervention or response: To mitigate the consequences of the war on TB program, Alliance scaled up the activities on ACF-TB including new regions and engaging new local NGOs. Screening for TB symptoms, support of screening-positive people during TB diagnostics process up to treatment enrollment of those with diagnosed active TB is provided by NGOs. They have changed the routes of reaching the risk groups' representatives and increased security measures: work in bomb shelters, in undeground during the shelling and wear body armor when working on the streets.

Risk group	2021 (NNI)		2022 (NNI)		2023 (NNI)	
Homeless populations	134	(26)	196	(24)	214	(18)
Ex-prisoners	67	(20)	81	(24)	66	(23)
Roma population	110	(35)	113	(36)	135	(42)
Internally displaced persons	13	(218)	25	(206)	78	(134)
Poor rural and urban populations incl. children	181	(58)	209	(57)	318	(47)
People who inject drugs	179	(20)	144	(19)	97	(20)
Contact persons	208	(16)	445	(15)	701	(13)
Militaries of the acting army	n/a				80	(211)
Total	892		1213		1689	

[1]NNI - number of persons who should be examined for TB in HCF to diagnose 1 TB case.

Table 1. Number of diagnosed TB cases within Alliance projects and (NNI[1])

Results/Impact: The intervention resulted in 2 times more TB cases diagnosed among MARPs in 2023 compared with 2021 (last pre-war year).
In some risk groups we see increase in the number of diagnosed TB cases, while in others - decrease (PWID). Special attention was paid to IDPs, NNI in this group has decreased dramatically.
Conclusions: Risk groups' representatives become more vulnerable to TB disease during the war. Engaging communities to ACF-TB in vulnerable populations is crucial since improves access to TB diagnostics to the most affected population groups.

OA28-325-14 Role of active case finding and artificial intelligence in significantly increased TB case finding numbers in correctional centers: USAID TB-LON3 project experience in Oyo State

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Background and challenges to implementation: Just like any other correctional center in Nigeria, overcrowding and poor environmental conditions are notable challenges being faced in correctional centers in Oyo state. The capacity for the two correctional centers is a maximum of 590, and the minimum number of inmates recorded consistently at a time has been over 1,500. Thereby increasing the risk of the spread of TB among inmates. Before the involvement of the USAID TB-LON3 project in active case-finding activities in correctional centers in the state, case-finding activities were mainly done passively.
Intervention or response: Between January 2019 and December 2021, TB case finding was passively done in the Agodi and Abolongo correctional centers. With the support of the USAID TB-LON3 project, screening was done with both a World Health Organization (WHO) 4-symptom checklist and ultra-portable digital X-ray (uPDX) with artificial intelligence (AI) from January 2022 to December 2023. Identified presumptive TB had their sputum samples collected and analyzed with the GeneXpert, and X-ray images of bacteriologically negative presumptive TB were reviewed by radiologist.
Results/Impact: Out of approximately 4,500 inmates between Q1 2019 and Q4 2021, a total of 71 TB cases were identified passively and enrolled into care. Between Q1 2022 and Q4 2023, approximately 3,200 inmates were screened with both a WHO 4-symptom checklist and

uPDX with AI. A total of 239 inmates were diagnosed, and 235 were enrolled into care. This shows about 237% increase in case finding when symptomatic screening and uPDX with AI were combined for case search.
Conclusions: Combining both symptomatic screening and uPDX with AI significantly improved the ability of TB programs to detect more TB cases in correctional centers and the importance of engaging the government to tackle some of the challenges encouraging the spread of TB among inmates in correctional centers.

OA28-326-14 Uptake, yield and experiences of HIV testing within TB household contact screening programmes: A systematic review and meta-analysis

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Background: World Health Organization guidelines suggest HIV testing for TB household contacts; given coincidence of TB and HIV, and risk of transmission. We undertook a systematic review and meta-analysis to summarise implementation considerations for this approach in low- and middle-income countries.
Design/Methods: We conducted a systematic search for studies reporting HIV testing among TB household contacts in low- or middle-income countries, from January 2000 to present, across MEDLINE, Embase, Global Health and Africa Wide. Qualitative and quantitative reports were included. Two independent researchers completed protocol-driven study selection, study quality and data extraction (PROSPERO registered: CRD42024471979). Narrative synthesis and meta-analysis were performed.
Results: Of 32 included studies (n=108,160 household contacts) with quantitative data, 24 were from west, east or southern Africa (63.0% of included household contacts). Study size varied from 186 people to 38,099 (mean: 3,380). The proportion tested for HIV was highly heterogeneous, ranging from 6.8% to 100%, with a weighted pooled mean of 72.8% (95%CI 62.0-82.49%). Some heterogeneity was explained by region: the weighted pooled mean in studies from west/east/southern Africa was 69.5% (95%CI 57.14-80.5%) compared to 84% (95%CI 63.3-97.1%) in the rest of the world. The number of people newly diagnosed with HIV also varied: pooled mean prevalence was 10.4% (95%CI 3.9-19.4%) in west/east/southern Africa compared to 1.1% (95%CI 0.4-2.0%) elsewhere. Very few studies reported on linkage to care among people diagnosed with HIV. Six studies reported participant perspectives: HIV testing was acceptable for some people, others felt unprepared or feared an HIV diagnosis. Lack of confidentiality (potentially exacerbated by home-based testing) was a major concern.
Conclusions: Coverage of HIV testing among TB household contacts was highly variable; among people tested a considerable number of new diagnoses were made. Variable uptake reflects differences between populations as well as study design. Addressing community concerns in design of HIV testing interventions may improve uptake.

OA28-327-14 Enhancing multi-drug-resistant TB case detection in urban Uganda through strengthening access to molecular diagnostic testing for people with presumptive TB

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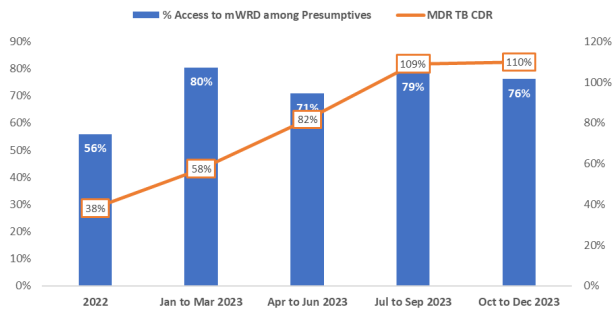
Background and challenges to implementation: The WHO END TB strategy emphasizes early diagnosis of multi-drug resistant (MDR TB) through universal drug susceptibility testing. However, in 2021 and 2022, only 48% of patients with bacteriologically confirmed TB in the three central districts of Kampala, Mukono and Wakiso were tested with a molecular test. As a result, only 23% of estimated patients with MDR-TB were notified. The USAID Local Partner Health Services (LPHS) TB Activity in collaboration with Ministry of Health and local district health authorities implemented interventions to improve access to molecular diagnostics for all presumptive TB patients.
Intervention or response: We recruited seven additional motorcycle riders to supplement the existing ten, carried out timely maintenance of GeneXpert® and Truenuat® machines, and ensured the availability of supplies (GeneXpert cartridges and sputum mugs). We also supported district health teams to conduct targeted mentorships in 153 health facilities. Mentorships focused on training laboratory health workers to utilize GeneXpert® and Truenat® machines, orientation of cough monitors on good sputum collection techniques, identifying patients who had not received molecular testing and making follow-up plans to have them tested and integrating sample collection into individualized drug delivery. In addition, we trained all facility and community healthcare workers to fill the health facility TB registers. We held monthly data validation meetings to ensure all registers were properly filled.
Results/Impact: Access to molecular WHO recommended diagnostic (mWRD) tests improved from 56% (57208/102414) in 2022 to 77% (93687/122204) in 2023. The case detection rate for MDR-TB also increased from 38% (47/123) to 89% (115/129) in the same period.



Conclusions: Improving access to molecular diagnostics for TB presumptive patients in high-burden countries can significantly improve MDR-TB case detection and treatment coverage. This can be achieved by optimizing the sample transportation network and reorganizing health facility workflow.

OA28-328-14 The efficacy of contact tracing and preventive therapy in preventing community transmission in Nigeria

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Background and challenges to implementation: Contact tracing of tuberculosis (TB) patients holds substantial public health significance as it mitigates the collective burden of TB within a community. Through the proactive identification and treatment of individuals exposed to TB, healthcare professionals can forestall outbreaks and diminish the occurrence of active TB disease.
This paper delineates the efficacy of contact investigation and preventive therapy in averting and ameliorating TB progression in Nigeria.
Intervention or response: Systematic Contact Investigation was carried out among contacts of bacteriologically diagnosed index TB patients receiving treatment in 458 health facilities across all levels of health care (primary, secondary, and tertiary) in four States (Osun, Oyo, Lagos, and Ogun) supported by the USAID TB-LON 3 project in Southwest, Nigeria.
The engaged contact tracers conducted home visits and were able to access at least four household contacts during the implementation period (October 2021 to September 2022).
Results/Impact: Out of 16,889 bacteriologically diagnosed index TB cases identified,16,085 (95.0%) had their contacts traced. A total of 72,327 contacts (1:4 index contact ratio) were identified to be eligible for screening and 72,173 (99.9%) of them were screened for TB. Among these, 17,881 presumptive clients were identified, 17,495 (98.0%) were evaluated and 1,222 (7.0%) TB cases were diagnosed, out of which 1,195 (97.8%) contacts were linked to facilities for treatment and in turn further contact traced. The number needed to screen (NNS) was 59 and the number needed to test (NNT) was 14.
Conclusions: Contact investigation and tuberculosis preventive therapy were effective in the prevention and regression of tuberculosis in Nigeria. More efforts should be intensified on this by employing more contact tracers to increase the number of index patients to get screened to avoid missing cases.

OA29 State of the art TB diagnostics

OA29-329-14 The DR Estimator tool: Using state-of-the-art methods to generate clinically actionable outputs for all variants in candidate resistance-conferring genes of M. tuberculosis

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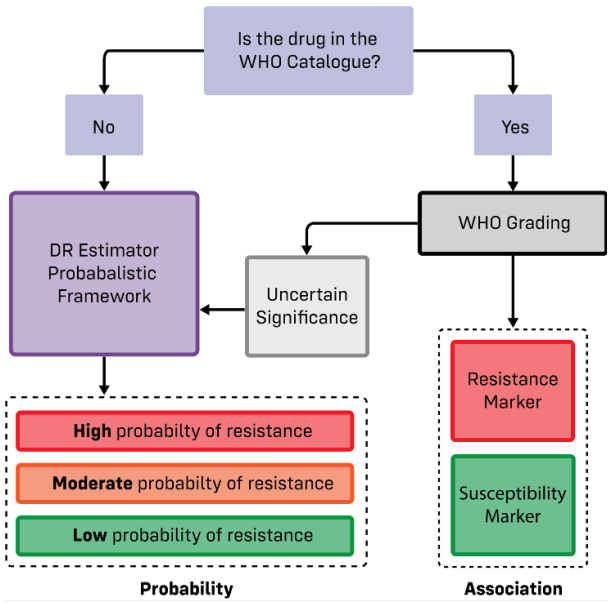
Background: Despite extensive guidance provided by the World Health Organization (WHO) on the resistance-conferring potential of genetic variants in *Mycobacterium tuberculosis* (Mtb) candidate drug resistance genes, many variants fall under the "Uncertain Significance" category, which lacks actionability from a clinical perspective. Moreover, the WHO drug-resistance (DR) catalogue does not include drugs like imipenem, terizidone or para-amino-salicylic acid, commonly used in "rescue" regimens for patients with extensively resistant forms of TB.
Design/Methods: To address these challenges, the *DR Estimator* tool provides additional layers of interpretation. Its probabilistic framework synthesizes data on evolutionary conservation scores, open reading frame analysis and protein structure-function inference studies, as well as expert rules based on extensive literature review, to better understand the phenotypic impact of a genetic

variant. The *DR Estimator* also performs comprehensive analyses of all genes involved in a particular resistance mechanism (i.e. epistatic effect between *mmpL5/mmpS5* efflux pump and its transcriptional repressor *mmpR5* for bedaquiline) to assess their combined effect on the strain's phenotype.

Results: All of the sources of information were condensed into a set of gene-specific, evidence-based rules, and layered in a hierarchical structure to systematically process variants labelled as being of "Uncertain significance" in the WHO catalogue, as well as variants not represented in the catalogue. These variants were assigned an evidence-based probability of being resistance-conferring (see figure).

The performance of this tool is currently being evaluated in a multi-centre validation study to quantify its ability to accurately predict the drug resistance profile of a *Mtb* strain, compare its performance to standard drug susceptibility testing methodologies, and assess effect modification by clinical characteristics and geographical setting.



Conclusions: The *DR Estimator* is a novel tool aimed at improving the predictive capabilities of whole genome sequencing data for accurate drug resistance profiling and enhancing sequencing-guided clinical decision-making for drug-resistant TB management.

OA29-330-14 High-sensitivity detection of M. tuberculosis DNA in tongue swab samples

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Background: Oral swabbing (OS) is a promising alternative to sputum collection for the diagnosis of pulmonary tuberculosis (TB). Swab samples collected from tongue dorsa are assayed for *Mycobacterium tuberculosis* (MTB) DNA using quantitative PCR (qPCR). In this study we evaluated two strategies to maximize sensitivity of tongue swab testing for TB: using novel high-capacity swabs that collect more material from the oral cavity; and separating MTB DNA from excess non-target DNA present. Both strategies were designed specifically for testing oral swab samples, in contrast to previous methods that adapted existing sputum testing platforms.

Design/Methods: Centrifugation was used to concentrate tongue dorsum biomass from 2-mL suspensions eluted from high-capacity foam swabs collected from South African participants (N = 124) with possible TB. The pellets were resuspended as 500-µL suspensions, and then subjected to mechanical lysis prior to qPCR to detect MTB insertion elements IS*6110* and IS*1081*. In the second method, sequence specific magnetic capture was used to concentrate MTB DNA after disruption of MTB cells from archived clinical swab samples (N = 128). Material collected onto Copan FLOQSwabs was eluted into 500 µL buffer. After mechanical lysis of MTB bacilli, the suspensions were digested with proteinase K, hybridized to biotinylated dual-target (IS*6110* and IS*1081*) oligonucleotide probes, then concentrated ~20-fold using magnetic separation.

Results: qPCR on crude lysate from foam swabs exhibited 83% sensitivity (71/86) and 100% specificity (38/38) relative to sputum MRS (microbiological reference standard; sputum culture and/or Xpert positive). qPCR testing of purified, concentrated eluates from FLOQSwabs exhibited 90% sensitivity (83/92) and 97% specificity (35/36) relative to sputum MRS.

Conclusions: Both protocols improved sensitivity relative to previous methods applied to replicate samples collected from this cohort. These results point the way toward automatable, high-sensitivity methods for detecting MTB DNA in tongue swabs.

OA29-331-14 TB self-testing with multi-non-PAM gRNA derived CRISPR assay

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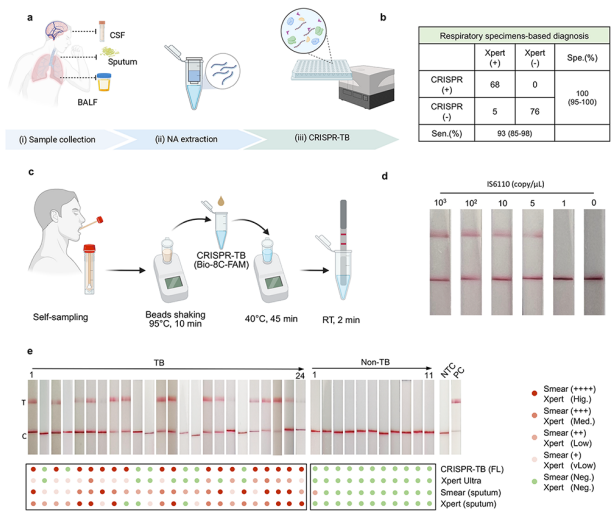
Background: The CRISPR-based tuberculosis assay (CRISPR-TB) has the potential to bridge the diagnostic gap to identify the millions of missing cases. However, its current two-step format is too complex for clinical implementation. Our goal is to develop a high-performance and easy-to-use CRISPR assay for point-of-care TB testing.

Design/Methods: We selected and employed multiple non-protospacer adjacent motifs gRNAs to integrate pre-amplification and post-CRISPR detection and developed a one-step CRISPR-TB assay. This assay was first verified by analyzing archived multi-type of specimens from patients with suspected TB, then adapted to a lateral flow-based self-test, and funally validated using a set of prospectively collected tongue swabs.



Results: We selected and combined 3 gRNAs with strong trans-cleavage and weak cis-cleavage activity to construct a one-step CRISPR-TB assay that can accurately recognize Mtb complex with a limit of detection of 5 copies/μL, allowing detection of Mtb gene in extracted nucleic acid within 15 minutes. In a clinical cohort study of sputum, bronchoalveolar lavage fluid (BALF) and cerebrospinal fluid specimens (**Fig. 1a**), the assay detected 93% of sputum and 94% of BALF with 100% specificity when compared to sputum GeneXpert MTB/RIF testing (**Fig. 1b**) and identified 60% of TB meningitis cases missed by clinical microbiology testing. We also established a simple extraction-free protocol for tongue swabs to accompany the naked-eye readable lateral flow CRISPR-TB (**Fig. 1c**), which allowed us to diagnose TB within 1 hour without specialized equipment. This assay showed same limit of detection of 5 copies/μL (**Fig. 1d**) and identified 17 out of 24 swabs from TB cases and all swabs from non-TB cases, comparable to the sputum GeneXpert MTB/RIF test (**Fig. 1e**).

Conclusions: The developed novel CRISPR-TB assay has the potential to transform the diagnosis of TB: it is sensitive, specific, applicable in a wide range of clinical scenarios, and has great potential for self-testing.

OA29-332-14 Diagnostic accuracy of M. tuberculosis Stool Ultra in detecting TB among adults living with HIV: A multi-centre study

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Background: Tuberculosis (TB) diagnosis and bacteriological confirmation is more challenging in people living with HIV (PLHIV), who often have paucibacillary sputum and, often, are unable to provide good quality sputum samples. In response to the need for alternative samples to diagnose TB, we determined the diagnostic accuracy of stool Xpert MTB/RIF Ultra (Ultra) for TB detection in adult PLHIV in Eswatini, Mozambique and Uganda.

Design/Methods: This prospective diagnostic accuracy study enrolled adult PLHIV presumptive for TB who provided sputum (processed for liquid culture and Ultra), stool (Ultra), blood (CD4) and urine (TB-LAM) samples. We calculated the sensitivity, specificity, and number of additional diagnosed cases of stool Ultra against three individual and composite microbiological reference standards (CRS). We repeated the analysis in patients with CD4 <200 vs. >=200 cells/μl.

Results: A total of 523 participants were enrolled. The number of positive results was highest in TB-LAM (n=62), followed by stool Ultra (n=50), sputum Ultra (n=40), and sputum culture (n=27). The sensitivity of stool Ultra when compared to sputum Ultra, sputum

culture, TB-LAM, and CRS was [% (n/N)]: 66.7 (26/39), 61.5 (16/26), 16.4 (10/60), and 31.6 (30/95), respectively. The specificity was 94.6 (420/444), 92.4 (399/432), 90.7 (392/ 432), and 95.0 (379/399), respectively. The overall sensitivity of stool Ultra was higher in patients with CD4 <200 cells/µl (Figure1). Stool Ultra yielded a total of 19 additional confirmed cases that had negative results in the other three tests. The combination of stool Ultra and TB-LAM yielded 82 bacteriologically-confirmed cases, compared to 44 obtained with stool and sputum Ultra.

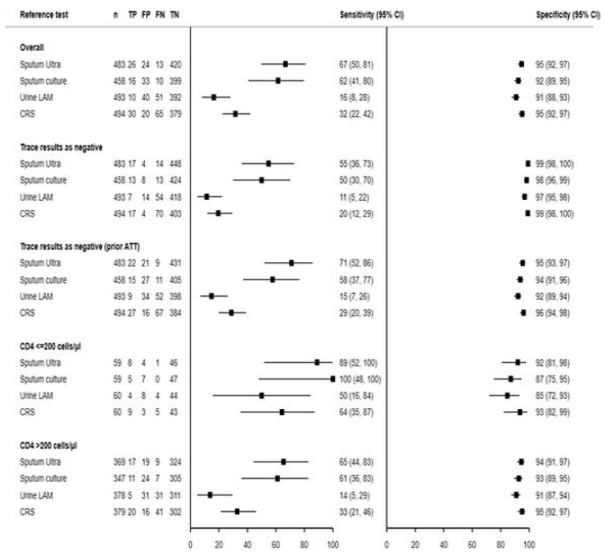

Figure 1: *Forest plots showing the sensitivity and specificity of stool Ultra test compared to Sputum Ultra and culture, Urine TB-LAM and Composite reference standard (CRS). CI: confidence interval; CRS: composite reference standard. CRS for patients with a bacteriological positive test on any of the three tests; sputum Ultra and culture, and urine TB-LAM).*

Conclusions: Stool Ultra in adult PLHIV substantially contributes to TB bacteriological confirmation, yielding a high number of positive results and identifying cases not detected using sputum specimens. These results support its use as a diagnostic TB test among adult PLHIV as a complement of current sputum and urine-based diagnostic tools.

OA29-333-14 Implementation of Xpert MTB/XDR Assay to shorten the delay in drug-resistant TB care cascade of Bangladesh

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Background: Access to Isoniazid (INH) and 2nd line Fluoroquinolone (FLQ) Drug Susceptibility Testing (DST) has always been a great challenge. Only five reference laboratories of at divisional level have the capacity to perform DST using the Line Probe Assay (LPA). This causes delay in reporting (7-15 days) and treatment initiation of the Drug Resistance Tuberculosis (DR TB) patients (7-20 days). Introducing the Xpert MTB/XDR Assay up to the district level has become a game changer to ensure timely testing and treatment.

The main objective of this study is to evaluate the advantage of Xpert MTB/XDR in detecting drug resistance (FLQ & INH) and its impact on treatment initiation.

Design/Methods: Bangladesh National TB Control Program (NTP) has expanded the laboratory network introducing 10Color Xpert system at each districts of Bangladesh. Six reference labs was first trained as trainer adapting the Standard Operating Procedure (SOP) provided by the manufacturer. These six labs later on facilitate the online/offline training of the technicians of Xpert labs (10C). Sensitization on Xpert XDR assay and treatment guideline among clinicians was aided by the divisional NTP focal points.

Results: The assay was implemented from second quarter (Q2) 2023 with 6 reference labs and gradually increased to 110 sites by Q4 2023. Total 1975 TB positive cases were tested in 2023 irrespective of Rifampicin Resistant (RR) cases. 7.6% (151/1975) were found resistant to FLQ and 22% (437/1975) resistant to INH. 336 out of 1975 were found negative in XDR assay.

	Before Implementing Xpert MTB/XDR Assay	After Implementing Xpert MTB/XDR Assay
Turn Around Time (TAT) in Second Line DST Results	7-15 Days	1-4 Days
TAT in DR TB Treatment Initiation	7-20 Days	1-7 Days
Percentage of Isoniazid Resistance Detected	N/A	22%
Percentage of RR TB Patient had access to 2nd line DST	68%	85%

Conclusions: The TAT for 2nd line DST in XDR assay is one day after receiving the sample which impacted the treatment initiation with right regimen significantly. The INH status is an add on for the program. NTP has a plan to expand the Xpert MTB/XDR Assay testing to the sub district level to maximize its benefit further in DR TB care cascade.

OA29-334-14 Accuracy in detecting fluoroquinolone-heteroresistant M. tuberculosis mixtures by Xpert MTB/XDR

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Background: Timely detection of fluoroquinolone resistance is essential for the effective treatment of drug-resistant tuberculosis. Heteroresistance, the co-occurrence of drug-susceptible and drug-resistant populations, can be difficult to detect by molecular methods when the drug-resistant bacilli are in the minority.

We aimed to determine the accuracy of the novel Xpert MTB/XDR assay to detect fluoroquinolone heteroresistance caused by *gyrA*_D94G, the most common variant conferring high-level fluoroquinolone resistance, and *gyrA*_A90V, the most common variant conferring low-level fluoroquinolone resistance.

Design/Methods: Using *gyrA* and *gyrB* wild-type *Mycobacterium tuberculosis* clinical isolates and their isogenic fluoroquinolone-resistant *gyrA*_D94G and *gyrA*_A90V daughter strains, respectively, we experimentally generated quality-controlled heteroresistant mixtures at ratios of 0.5% to 60% resistant bacilli. The mixture ratios were verified with the targeted next-generation sequencing assay, Deeplex Myc-TB.

The accuracy of the detection of resistant minority populations was determined genotypically by the Xpert MTB/XDR assay in duplicate, and phenotypically by minimum inhibitory concentration testing using EUCAST broth microdilution in triplicate.

Results: The Deeplex Myc-TB assay identified intended ratios of resistant populations in all mixtures with resistant bacilli present at >1% for both *gyrA*_D94G and *gyrA*_A90V. The Xpert MTB/XDR assay detected fluoroquinolone resistance when *gyrA*_D94G variants were present at 20-30% and *gyrA*_A90V mutations at 5-10%. Phenotypically, all mixtures were resistant to moxifloxacin and levofloxacin, even those mixtures containing only 0.5% *gyrA*_D94G and A90V bacilli.

Conclusions: The Xpert MTB/XDR assay detects resistance to fluoroquinolones when *gyrA*_D94G variants are present at ≥30% and *gyrA*_A90V variants are present at ≥10%, highlighting its value, and limitation, as a rapid molecular diagnostic for the detection of fluoroquinolone-resistant (minority) populations. The mixtures are included as thermolysates in the Belgian Coordinated Collections of Micro-organisms (BCCM/ITM), serving as a valuable resource for researchers and developers for diagnostic assay.

OA29-335-14 Rapid diagnostic test by Truenat technology for identifying drug-sensitive and drug-resistant TB: A community approach to finding missing people with TB

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Background and challenges to implementation: Tuberculosis (TB) is the leading cause of death globally attributable to a curable infectious disease. Over 95% of new TB cases and deaths occur in developing countries. Bangladesh is still a high burden country for tuberculosis (TB). About 20% of estimated TB cases cannot be identified due to lack of community awareness or access to rapid molecular diagnostic test. To reduce the TB incidence in the country, it is crucial to find out missing cases from the community.

Use of the World Health Organization (WHO) recommended rapid molecular TB diagnostic tool is the key global TB control priority for early diagnosis. WHO has provided conditional recommendation for using Truenat as a rapid molecular diagnostic tool rather than smear microscopy.

Intervention or response: Since July 2022, BRAC a development organization with the support of National TB Control Program has started piloting of Truenat in 20 microscopy centers at peripheral level considering higher presumptive load and distance from the nearest molecular testing site.

However, due to patient load, smear microscopies were also performed in these centers ensuring optimum use of Truenat. Existing laboratory technicians were trained on Truenat testing and implementation.

Results/Impact: During July 2022 to December 2023, a total of 49608 samples were tested by Truenat and 3620 were identified as MTB detected. Among MTB detected samples 04 cases were found RIF resistance (RR). Positivity rate of Truenat testing was 7.3% whereas in smear microscopy the positivity rate is usually 3%.

Conclusions: Performing the Truenat tests in healthcare centers at peripheral level with very limited infrastructure and resource was found feasible and satisfactory. Moreover, Truenat can identify more than 2 times cases compared to the smear microscopy. These machines are expected to play an important role in identifying missing TB cases as well as RR patients.

OA29-336-14 Diagnostic accuracy of LiquidArray MTB-XDR VER1.0 for the detection of TB and second-line drug resistance

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Background: Rapid drug susceptibility testing (DST) for fluoroquinolones and linezolid is crucial to confirm eligibility for the new shorter regimens for rifampicin-resistant tuberculosis (TB).
Design/Methods: This study assessed the diagnostic accuracy of Bruker/Hain Lifescience LiquidArray MTB-XDR (LA-XDR) for the detection of *Mycobacterium tuberculosis* complex (MTBC) and mutations associated with resistance to fluoroquinolones, linezolid, ethambutol and amikacin. For evaluation we used residual diagnostic specimens from people with presumptive TB in South Africa and well characterised drug-resistant specimens from the FIND Specimen Bank.
Liquid culture was used as reference standard for MTBC detection (confirmed by a WHO approved molecular assay), while phenotypic DST and Sanger sequencing were used as composite reference standard for resistance detection.
Results: In total 720 specimens were available for the evaluation. LA-XDR showed an overall sensitivity of 85% (95% CI, 80-89) and specificity of 99% (95% CI, 98-100) for the detection of MTBC. In smear-negative specimens, sensitivity was 79% (95% CI, 71-85). For fluoroquinolone and ethambutol resistance detection, LA-XDR sensitivity was 94% (95% CI, 86-98) and 85% (95% CI, 75-91), respectively.
Sensitivity for amikacin resistance detection was 55% (95% CI, 34-74), due to the inclusion of specimens in which resistance was conferred by *eis* promoter mutations, which are not included in the LA-XDR design. LA-XDR was able to detect linezolid resistance conferring mutations in 6/7 linezolid phenotypic-resistant cultured isolates. Specificity for linezolid resistance detection was 100% (95% CI, 98-100).
Conclusions: LA-XDR met minimal WHO TPP criteria for the detection of MTBC and has the potential to provide rapid DST for two key second-line drugs, linezolid and fluoroquinolone, which may allow for rapid initiation of appropriate regimens to improve treatment outcomes.

OA29-337-14 The second edition of the WHO catalogue of resistance mutations: Achievements, gaps, and future needs

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Background: Genotypic drug-susceptibility testing (gDST) enables rapid DST for *Mycobacterium tuberculosis* complex (MTBC) directly from clinical samples. Unlike phenotypic DST, the performance of gDST depends on an understanding of the genetic basis of antimicrobial resistance. In 2021, WHO published the first edition of its mutation catalogue as a common reference for the interpretation of mutations and to inform the design of new assays.
However, it had several gaps, including no mutations for bedaquiline, but has recently been updated with a second edition.
Design/Methods: The largest collection of multinational MTBC isolates with associated whole-genome sequencing and phenotypic DST data assembled to date (~52,000 compared with 38,000 for the first edition) was analysed with a similar approach employed for the original catalogue. Mutations were stratified into markers of resistance (group 1 or 2), uncertain significance (group 3), and not markers of resistance (group 4 or 5).
Additional grading rules were also developed for interpretation of mutations that did not feature in this collection but will likely be encountered during routine clinical practice.
Results: The second edition of the catalogue was published in 2023 and featured major increases in sensitivity for predicting resistance to bedaquiline, clofazimine, and linezolid (49%, 17%, and 7%, respectively, using a resistant allele frequency of 75%). Importantly, lower frequency variants (i.e. 25%≤ frequency <75%) that can be detected by WHO-recommended targeted next-generation sequencing assays, were found to increase the sensitivity for bedaquiline resistance prediction by an additional 10%. The catalogue also provided guidance for detecting pretomanid and rifapentine resistance.

Conclusions: Given the large spectrum of resistance mutations to bedaquiline and nitroimidazoles, the catalogue will have to be updated at least annually. The analysis for the third edition is currently ongoing. It will include cycloserine for the first time and improve the performance for pretomanid.

OA30 Life after TB: Addressing the problems and needs of TB survivors

OA30-338-14 The association between pulmonary TB disease and long-term all-cause mortality: A retrospective, matched cohort study in Taiwan

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Background: Increasing evidence suggests TB survivors face elevated long-term mortality risks. However, many prior studies could not control for key potential confounders such as smoking, socioeconomic status, and co-morbidities.
In this study, we aimed to quantify the increase in long-term all-cause mortality rates among individuals diagnosed with pulmonary TB compared to individuals without TB, while accounting for all these potential confounders.
Design/Methods: A retrospective, matched cohort study linking the National Health Insurance Research Database, the National TB Registry, the National Mortality Registry, and the MJ Health Management Institution databases in Taiwan.
The study cohort included individuals diagnosed with pulmonary TB (n = 704) with a diagnosis date between January 01, 2006 – December 31, 2013, and matched controls (n = 109,760). Coarsened exact matching on age, sex, BMI, co-morbidities, smoking status (history, duration, intensity), education, and income level was used to identify controls.
The study cohort was followed from TB diagnosis (matched date, for controls) until death or end-of-study on December 31, 2020. Cox proportional hazards models were used to estimate the hazard ratio of all-cause mortality, adjusted for potential confounders.
Results: The study cohort was followed for a median of 11.0 years (IQR: 9.2 – 13.2). The post-TB matching weight-adjusted mortality rates were 33.7 and 17.9 per 1000 person-years in cases and matched controls, respectively. In the fully adjusted model, the hazard ratio of all-cause mortality was found to be 2.25 (95% CI, 1.91 – 2.65) in individuals with a history of TB relative to matched controls.
Subgroup analyses showed that individuals with a history of TB experienced higher long-term mortality rates regardless of their smear and culture results at diagnosis, presence of lung cavitation, and whether they completed TB treatment.
Conclusions: Individuals with a history of pulmonary TB were shown to experience substantially higher mortality rates compared to matched controls, after adjusting for potential confounders.

OA30-339-14 Risk factors associated with post-TB sequelae: A systematic review and meta-analysis

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Background: Post-tuberculosis (TB) sequelae present a significant challenge in the management of TB survivors, often leading to persistent health issues even after successful treatment. This systematic review and meta-analysis aim to identify risk factors associated with long-term physical sequelae among TB survivors.
Design/Methods: We systematically searched Medline, Embase, PROQUEST, and Scopus for studies on long-term physical sequelae among TB survivors up to December 12, 2023. We included all forms of TB patients who experienced long-term physical sequelae (i.e., respiratory, hepatic, hearing, neurological, visual, renal, and musculoskeletal sequelae).
We used narrative synthesis for risk factors reported once and random-effect meta-analysis for primary outcomes with two or more studies.
Results: A total of 73 articles from 28 countries representing 31,553 TB-treated patients were included in the narrative synthesis, with 64 of these studies included in the meta-analysis.
Risk factors associated with post-TB lung sequelae include older age (OR=1.62, 95% CI: 1.07-2.47), previous TB treatment history (OR=3.43, 95% CI: 2.37-4.97), smoking (OR=1.41, 95% CI: 1.09-1.83), alcohol consumption (OR=1.84, 95% CI: 1.04-3.25), bacteriologically positive TB diagnosis (OR=3.11, 95% CI: 1.77-6.44), and the pres-

ence of pulmonary lesions in radiology (OR=2.04, 95% CI: 1.07-3.87). Risk factors associated with post-TB liver injure include pre-existing hepatitis (OR=2.41, 95% CI: 1.16-6.08), previous TB treatment (OR=2.64, 95% CI: 1.22-6.67), hypo-albuminemia (OR=2.10, 95% CI: 1.53-2.88), and HIV co-infection (OR=2.72, 95% CI: 1.66-4.46). Risk factors associated with post-TB hearing loss include baseline hearing problems (OR=1.72, 95% CI: 1.30-2.26) and HIV co-infection (OR=3.02, 95% CI: 1.96-4.64).

Conclusions: This systematic review and meta-analysis found that long-term physical post-TB sequelae such as respiratory, hepatic, and hearing sequelae were associated with a range of socio-demographic, behavioral, and clinical factors. Identification of these risk factors will help to identify patients who will benefit from interventions to reduce the burden of suffering from post-TB treatment.

OA30-340-14 Beyond treatment outcomes: Assessing quality of life among people with multi-drug-resistant TB in Lusaka, Zambia

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Background: Restoring quality of life (QOL) is a key goal of tuberculosis (TB) treatment. Yet, despite prolonged treatments with highly toxic drugs in persons who frequently have advanced TB disease, QOL assessments among patients with rifampicin-/multi-drug- resistant-TB (RR-/MDR-TB) are limited.

Design/Methods: We conducted a cross-sectional survey among adult RR-/MDR-TB patients receiving treatment at six public facilities in Lusaka, Zambia. All participants completed a TB-adapted, WHOQOL-HIV BREF assessment that included 31 questions corresponding to 6 QOL domains. Mean QOL scores (0-100) were calculated for each domain and overall across all domains. A QOL score <60 was considered to be unsatisfactory. Multivariable logistic regression was used to identify variables associated with a low overall QOL score.

Results: Among 102 participants (median age 37 years, 69% male, 43% HIV-positive, 47% prior TB), only 54% directly reported a good quality of life. The overall mean QOL score among all participants was 59.8, while domain-specific QOL scores were: physical health 62.6; psychological health 58.7; level of independence 52.6; social relationships 59.3; environment 48.6; and existential concerns and stigma 77.0.

Compared to those with <1 month of treatment, persons with >6 months of treatment had higher mean physical health (66.7 vs. 58.4, p=0.020) and psychological health (63.7 vs. 54.1, p=0.007) QOL scores, but other domains did not differ by treatment duration. After adjusting for potential confounders, those with the lowest household income (<$0.6USD/day) had 10.5-fold higher odds [95%CI:1.9-59.0] of having a low mean QOL score, while HIV-negative persons and persons with prior TB had a 4.7-fold [95%CI: 1.3-17.6], and 4.1-fold [95%CI: 1.2-14.5] higher odds, respectively (Table).

	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Age, for each year increase	1.02 (0.98-1.07)	0.36	1.02 (0.97-1.08)	0.48
Male sex	2.07 (0.63-6.80)	0.21		
Income per year in Kwacha				
>10,000 (>~$1.1/day)	1.0	0.003	1.0	0.001
6,000-10,000 (~$0.6 to $1.1/day)	1.19 (0.18-7.73)		1.61 (0.23-11.54)	
<6,000 (~$0.6/day)	5.75 (1.19-27.70)		10.53 (1.88-58.98)	
HIV-negative	3.63 (1.12-11.79)	0.020	4.73 (1.27-17.55)	0.013
Prior TB	3.29 (1.15-9.44)	0.021	4.11 (1.17-14.45)	0.022
Current duration of TB treatment, for each month increase		0.27	0.91 (0.78-1.07)	0.24

Conclusions: A large proportion of MDR-TB patients had unsatisfactory QOL across several domains, particularly those who were highly economically vulnerable. While treatment improves QOL, programs should assess QOL among patients and implement strategies to support holistic health and well-being, including psychosocial and financial support.

OA30-341-14 Predicting TB recurrence to help target post-TB screening

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Background: Approximately 10% of people who complete TB treatment in India develop TB again. While post-TB screening is being implemented in India to tackle high TB recurrence, it may not be feasible or cost-effective to implement at scale. Thus, we sought to develop a parsimonious model for predicting recurrence that can help target post-TB screening among high-risk households.

Design/Methods: Through the TB Aftermath trial in India, we are conducting symptom screening among patients with TB and their household contacts at six-month

intervals after treatment completion. The endpoint for our prediction model was recurrent TB within 18 months of treatment completion. Candidate variables were risk factors for recurrence identified a-priori. We used LASSO regression to identify a minimum set of predictors and estimated probability of recurrence using logistic regression.

We conducted internal validation (random 60/40 split) and assessed discrimination (c-statistic) and calibration (hosmer-lemeshow p-value). Using the best-performing model, we identified a cutoff for achieving 90% sensitivity and compared performance for early (<6 months) vs late (≥6 months) recurrence.

Results: Among 1076 participants, we identified 68 (6%) recurrences. The best-performing model included unhealthy alcohol use (AUDIT <8 vs ≥8), peak expiratory flow (<200 vs ≥200 L/min), body mass index (<16.5 vs. ≥16.5 kg/m^2), monthly income (<5000 vs >5000 rupees), and more than one TB episode (Yes vs No).

The 5-item tool had moderate discrimination (c-statistic: 0.76 (95% confidence interval [CI]: 0.67-0.85) and good calibration (p-value: 0.61). A predicted probability cutoff of 4% was 90% sensitive for recurrent TB. Model performance was higher for early compared to late recurrence (c-statistic 0.76 [95% CI: 0.53-0.98] vs 0.64 [95% CI: 0.53-0.76]).

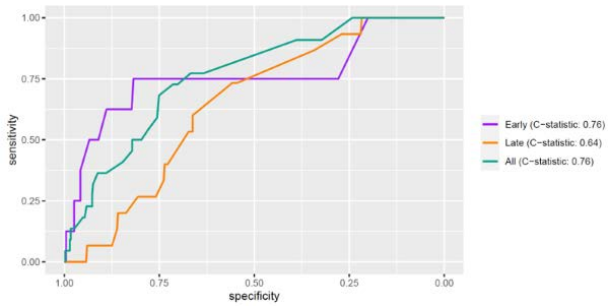

Figure. Receiver Operating Characteristic (ROC) Curve for internally-validated 5-item model predicting early (<6 months) vs late (6-18 months) TB recurrence.

Conclusions: A 5-item tool, measurable at treatment completion, showed moderate predictive accuracy for recurrent TB and performed better for early compared to late recurrence. Using a simple tool for predicting recurrence may increase the efficiency of post-TB screening.

OA30-342-14 Prevalence and factors associated with post-TB lung disease among children and adolescents in Kenya: A multi-centre study

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Background: Tuberculosis (TB) is an infectious disease of global concern. Most patients are surviving TB, but some survivors have residual changes termed Post TB Lung Disease (PTLD) that affect their long-term lung health and quality of life. Data on pediatric PTLD is limited.

Design/Methods: This was a descriptive cross-sectional study done on child/adol <20 years completing treatment for intrathoracic TB in seven health facilities in Nairobi. After obtaining informed consent, we interviewed participants, reviewed their medical records and performed a physical examination. A six-minute walk test (6MWT) was done for children >5 years.

Results: We enrolled 107 child-adol median age 6.3 years, 59% were female, and 12% had HIV co-infection. 29% had persisting respiratory symptoms; commonest being cough (21.5%) and congested chest (9.3%). 51.4% had abnormal respiratory signs; commonest being tachypnea (26.7%), auscultated crackles (14.0%), and suboptimal resting SPO2 (11.2%).

Of the 56 participants who did the 6MWT, 41% walked <70% of their expected distance, while 19.6% experienced oxygen desaturation of ≥4%. Overall, 57.0% (95% CI 47.1-66.5) had at least one while 33.6% (95% CI 23.8-41.6) had two or more persistent symptoms and/or abnormal respiratory signs.

Higher prevalence of PTLD was noted among child/adol hospitalized at TB diagnosis (aOR 4.88, 95% CI 1.08-13.35) and those who were older (median age 6.0 vs 4.3 yr, aOR 1.13, 95% CI 1.02-1.26).

Conclusions: A significant number of children and adolescents have persisting respiratory disease post-TB and it is more common among older children, and those with severe disease at TB diagnosis.

There is need to institute routine assessment of child/adol at the end of treatment to identify those with sequelae, and to provide post-TB care.

OA30-344-14 One-year follow-up outcomes of people with XDR-TB treated with bedaquiline and delamanid +/-carbapenem in Mumbai

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Background: Treating patients with failure of previous anti-tuberculosis drug is a worldwide clinical challenge. We describe 12-month follow-up outcomes of patients who had failed previous regimens and were successfully treated with concurrent bedaquiline (BDQ) and delamanid (DLM) and/or carbapenem based regimens at a Médecins Sans Frontières clinic in Mumbai, India.

Design/Methods: Retrospective analysis of extensive drug-resistant tuberculosis patients initiated on regimens containing concurrent BDQ and DLM +/- carbapenem from January 2016 to December 2019. Individualized regimens were based on drug-susceptibility testing, adverse events, and previous drug exposure.

Patients with successful treatment outcome were assessed clinically, bacteriologically and radiologically at 6 and 12-months post-treatment completion.

Results: Of 222 patients initiated on treatment during the study period ;58 were treated with BDQ/DLM and 164 with BDQ/DLM and carbapenem containing regimens. One-hundred-three (64%) were successfully treated and 79(36%) had unsuccessful outcomes, most frequently death (19%, 43/222). Among patients with successful outcomes, median age was 24 years (Interquartile range, IQR: 20-30); 89(62%) were female, 2 living with HIV.

Characteristics	6-month follow-up n (%)	12-month follow-up (cumulative) n (%)
Total cured or completed treatment	143 (100)	143 (100)
Lost to follow-up	38 (26)	59 (41)
Incomplete TB assessment	6 (4)	8 (6)
Total followed-up	99	76
Died	3 (3)	4 (5.2)
Relapsed	3 (3)	4 (5.2)
Alive and relapse free	93 (94)	68 (89)
Challenges with patients follow up	Treatment fatigue Migrated patients Loss of daily wages Out of pocket expenditure (travel cost)	
Possible solutions	One stop approach in TB management Change in attitude and funding in TB programme Continuous reengagement by community volunteers	

Table 1: Six- and 12-month follow-up outcomes of patients treated with concomitant Bedaquiline and Delamanid +/- carbapenem.

Overall, 122 (85%) patients had pulmonary tuberculosis, 17(12%) had extra-pulmonary tuberculosis and 4(3%) had disseminated tuberculosis. The median treatment duration was 18 months (IQR 19-22); 18 months for BDQ and DLM (IQR 18-20) and 6 months for imipenem (IQR 7-9). At twelve-months post-treatment, 59-(41%) patients were lost-to-follow up. Of the remaining 76, 68(89%) were relapse-free , 4(5.2%) died and 4(5.2%) relapsed.

Table 1 depicts 6- and 12-month follow-up outcomes.

Background and challenges to implementation: Treating patients with failure of previous anti-tuberculosis drug is a worldwide clinical challenge. We describe 12-month follow up outcomes of patients who had failed previous regimens and were successfully treated with concurrent bedaquiline (BDQ) and Delamanid (DLM) and/or carbapenem based regimens at a Médecins Sans Frontières clinic in Mumbai, India

Intervention or response: Retrospective analysis of extensive drug-resistant tuberculosis patients initiated on regimens containing concurrent BDQ and DLM +/- carbapenem from January 2016 to December 2019.

Individualized regimens were based on drug-susceptibility testing, adverse events, and previous drug exposure. Patients with successful treatment outcome were assessed clinically, bacteriologically and radiologically at 6 and 12-months post-treatment completion.

Results/Impact: During study period, 222 patients initiated on treatment;58 patients treated with BDQ and DLM and 164 with BDQ, DLM and carbapenem based regimen. Total 143 (64%) successfully completed treatment and 79 (36%) had unsuccessful outcomes, most frequently death (19%, 43/222).

Among patients with successful outcomes, median age was 24 years (Interquartile range, IQR: 20-30); 89 (62%) were female, 2 living with HIV.

Overall, 122 (85%) patients had pulmonary tuberculosis, 17 (12%) had extra-pulmonary tuberculosis and 4 (3%) had disseminated tuberculosis. The median treatment duration was 18 months (IQR 19-22); 18 months for BDQ and DLM (IQR 18-20) and 6 months for imipenem (IQR 7-9). At twelve months post-treatment, 59 (41%) patients were lost to follow up.

Of the remaining 76, 68 (89%) were relapse-free cured, 4 (5.2%) died and 4 (5.2%) relapsed.

Table 1 depicts 6th and 12th month follow-up outcome of the patients.

Conclusions: Regimens with BDQ and DLM and/or carbapenem showed promising relapse-free survival rates at 12-months post-treatment, warranting further research which includes cost analysis, patient's perspective and quality of life indicators. Programmatic efforts need to be encouraged to follow-up patients for 12 months post-treatment completion.

OA30-345-14 TB death surveillance and response (TBDSR): A step towards zero deaths due to TB - Lessons learned from West Bengal, India

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Background: In accord with the National target, the State of West Bengal has aimed 90% reduction in TB mortality by 2025. West Bengal is a high TB burden state with 100,112 notified cases during 2023 with 5.332 deaths, which translates to more than 100 death a week! In 2022, the state introduced a robust system of TB death review named TB Death Surveillance and Response (TBDSR). Since then, death rate has been reduced from 6% in 2021 to 5.1% in 2022 and 5.3% in 2023 though it's still above the national average (4%). The State has developed a dedicated TBDSR portal for TB death information management. We aimed to explore the findings of TBDSR.
Design/Methods: Secondary analysis was done on the routinely collected data from Nikshay as well as from the TBDSR portal. Among the notified patients in 2023, a total of 5,332 patients died due to any reason before completion of treatment. This was the study population.
Results: Mean age was 53.6 years (SD=17.1), 43.9% were elderly, 74.9% were males, 59.6 % had BMI<18.5 kg/m^2, 6.6% were DRTB. Average time of death was 44.9 days (SD=44.7) after treatment initiation. 9.5% died before treatment initiation, 45.9% died within one month, another 19.3% died within 1-2 month (Fig-1).
78.8% patient died at home and 1.7% during transit. Factors related to TB deaths were- Delay in care seeking mainly due to self-perceived stigma, comorbidities, lack of bed/TB isolation ward for DSTB patients, unavailability of transport and lack of ITU setup for critically ill TB patients.

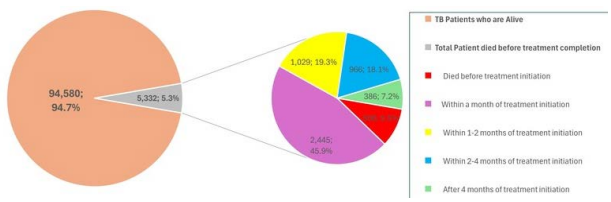

Figure 1. Timing of death among notified TB patients during January-December 2023 in West Bengal, India.

Conclusions: TB death surveillance took a pace in West Bengal and now its time to focus on the 'response' part of the TBDSR. Arrangements of differentiated TB care, TB isolation ward in tertiary care hospitals, ITU set-up and dedicated transport service for TB patients are few of the recommended initial steps.

OA30-346-14 Reducing deaths in elderly with drug-sensitive TB: Lessons from the high altitude region of Ladakh, India

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Background and challenges to implementation: Ladakh is a high-altitude cold desert located in northernmost region of India. In 2021, tuberculosis (TB) program recorded high rates of death in persons with drug-sensitive TB (PwTB) (6.9%) (national average: 4.1%).
Further analysis revealed that 21 deaths (95%) occurred in elderly (≥ 60 years). Based on a follow-up survey which highlighted the predictors of death, a multi-pronged strategy was devised.
The study aims to assess the impact of this strategy on trends in deaths rates among elderly PwTB and improvement in quality of TB care.
Intervention or response: The multi-pronged strategy for elderly PwTB consisted of:
(a) doorstep provision of TB services like sample collection and treatment support
(b) engagement of *Amchis* (practitioners of Tibetan medical system) for referral and treatment
(c) free all-weather transport services (air ambulance) for visits to health facility
(d) involvement of religious/political representatives for community awareness
(e) nutritional support kits disbursal.
Parameters used to assess the impact were trends in:
(i) death rates among PwTB
(ii) referral from *Amchis*
(iii) coverage of doorstep services
(iv) usage of free air ambulance
(v) community meetings undertaken
(vi) nutrition support kits disbursed during 2021-2023.
Analysis was done using SPSS ver21.
Results/Impact: There was reduction in death rates among all PwTB from 22 (6.9%) in 2021 to 8 (4%) in 2023 (z-score:1.35, p-value:0.17).
Further, deaths among elderly PwTB reduced from 21 (95%) in 2021 to 3 (38%) in 2023 (z-score:3.50, p-value:<0.001). Referral from *Amchis* led to 12% increase in total TB notification.
There were 1731 instances of doorstep delivery, 3.5-fold rise in free-ambulance usage, 59 community meetings held and 123 nutritional support kits to elderly PwTB.

Conclusions: Multi-pronged strategy was successful in reducing deaths among elderly PwTB. Provision of doorstep delivery of health care and free air ambulance have been adopted by other health programs for extreme weather conditions and hard-to-reach desert villages.

OA31 Safeguards for the caregivers

OA31-347-14 Burden of bacteriologically confirmed pulmonary TB in Uganda's prisons system: Results of a 2023 nationally representative prevalence survey

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Background: The burden of tuberculosis (TB) in prison facilities is higher than in the general population. The population-based survey in Uganda (2014-2015) showed prevalence of active TB in the general population of 0.253%. Uganda Prisons Service conducts periodic TB symptom screening among persons in prisons (PIP) for early detection and treatment initiation to reduce transmission.
We conducted a survey among PIP and staff to assess TB prevalence and risk factors.
Design/Methods: The survey used a two-stage stratified cluster sampling design. Survey procedures included TB symptom screening using a standardized questionnaire, a digital chest X-ray (CAD4TB software), and collection of a morning sputum sample for GeneXpert and a second sample for drug susceptibility testing and culture.
Data were collected using Open Data Kit (ODK) software on a secure, private network and analyzed using STATA 16. The survey received ethical and scientific approval.
Results: A total of 5,981 PIP (5,200 males, 87%) and 711 prison staff from 38 prisons consented to participate in the survey. Among the 5,214 PIP tested with GeneXpert 4,517 were males and 697 were females. Of the 4,517 males, 85 (1.9%) had active TB and among the 697 females, three (0.4%) had active TB. The overall weighted TB prevalence was 1.9% (95% CI: 1.6-2.4). TB prevalence was 3.5% (95% CI; 2.5-4.8) among PIP who were in the prison for less than one year, 1.5% (95% CI; 1.0–2.3) for 1-2 years, and 1.2% (95% CI; 0.8-1.9) for those who had stayed for over two years. Among the 689 staff tested, 5 (0.73%) had active TB.
Conclusions: TB prevalence in Uganda prisons is over eight times greater than that of the general population. Enhanced TB screening, testing and treatment in prisons, particularly among PIP admitted over the past year, could help ending TB transmission in correctional facilities in Uganda.

OA31-348-14 TB screening among healthcare workers in Zambia: A key to the attainment of healthcare worker safety 2018-2022

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Background and challenges to implementation: Healthcare workers (HCWs) play a pivotal role in providing essential medical care, yet they face heightened vulnerability to infectious diseases. Historically, systematic TB screening among HCWs was lacking leading to undiagnosed cases and increased risk of TB transmission.
This paper discusses the implementation and outcomes of a national TB screening program for HCWs initiated in 2018, revealing a high TB incidence rate of 434/100,000 population among HCWs. This prompted the establishment of a policy on bi-annual TB screening of HCWs aiming to ensure a healthy workforce.
Intervention or response: From 2018 to 2022, HCWs underwent bi-annual tuberculosis symptom-based tuberculosis screening, which included chest X-ray and sputum examination. Data on HCW screening was extracted from facility presumptive and treatment registers from 2018 to 2022. Routine TB Screening protocols for HCW were issued to all health facilities.The analysis highlighted the positive outcomes of maintaining regular screening protocols and implementing targeted awareness campaigns.
These efforts were instrumental in addressing hesitancy and bolstering the demand for tuberculosis screening among healthcare workers.
Results/Impact: Since 2018, there have been 594 HCWs notified to have tuberculosis out of total of 219,187 notifications. An upward trend in notifications among HCWs was observed, with a notable increase observed in 2022. This trend reaffirms the heightened risk of tuberculosis among healthcare workers.

Conclusions: Zambia has demonstrated remarkable progress in tuberculosis screening among healthcare workers from only 53 in 2018 to 267 in 2022 (a 5 fold increase).
The proactive approach to TB screening among healthcare workers emphasizes the paramount importance of safeguarding their health and minimizing the risks of nosocomial TB transmission.
This trend reaffirms the heightened risk of tuberculosis among healthcare workers. Important lessons learned from this analysis include the significance of implementing routine screening protocols awareness raising to eliminate stigma.

OA31-349-14 Collaborative strategies for TB elimination: Insights from employer-led model for occupational health interventions in Rajasthan, India

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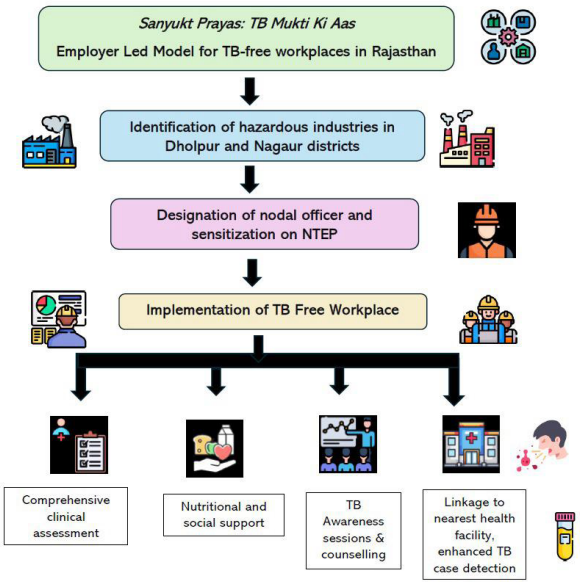
Background and challenges to implementation: Dholpur and Nagaur districts of Rajasthan are hubs of thermal power, chemical-explosive, and cement industries that employ daily-wage workers from lower socio-economic strata. These workers are exposed to occupational hazards which compromise their lung health, increase susceptibility to tuberculosis (TB), thus increase the risk of TB transmission. Employer-led collaborative interventions were deployed in these districts for regular health assessment.
This study assessed the impact of these interventions on TB care cascade in high-risk settings.
Intervention or response: A joint initiative between the Directorate of Industrial Safety and Health Department called "*Sanyukt prayas: TB mukti ki aas*" was implemented using a TB-free workplace policy in identified industries of Dholpur and Nagaur districts in 2023.
A nodal person was designated, and TB-related sensitization was done for all employees.
Comprehensive health assessments were conducted, with focus on screening for TB, measuring blood pressure and blood glucose levels.
TB program parameters assessed were:
(i) presumptive TB testing
(ii) TB case detection
(iii) co-morbidity screening
(iv) timely treatment initiation and follow-up.
Data was analyzed in R version 4.2.3.



Results/Impact: Out of 2500 employees, 1985 (79%) attended screening camps, among them 320 (13%) persons with presumed TB were found and 4 persons were diagnosed with TB. The diagnosed persons with TB (PwTB) were initiated on treatment within five days of diagnosis. Employers provided social and nutritional support to PwTB. Following this intervention, presumptive TB testing at linked health facilities increased by 1.5-fold fold (2716 tests in 2023 vs. 1050 tests in 2022; p value<0.001).
Additionally, comprehensive health assessment identified 70 individuals with raised blood pressure and 32 individuals with impaired blood glucose levels among presumptive TB, who were counselled and linked to non-communicable disease programs.
Conclusions: Employer-led collaborative strategies for occupational health interventions augment TB care cascade and should be implemented in similar high-risk settings to achieve end TB goals.

OA31-350-14 Latent TB infection among healthcare workers in a tertiary care hospital of Puducherry, South India, 2023

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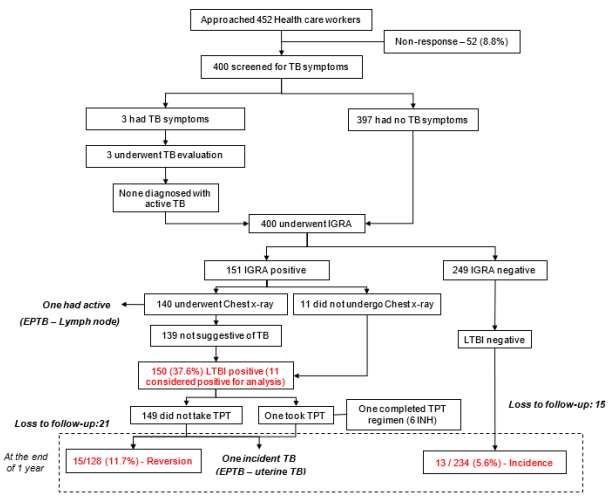
Background: Healthcare workers (HCWs) face an increased risk for tuberculosis (TB). This study aimed to assess LTBI prevalence, reversion, and conversion rates over a year among HCWs in India.
Design/Methods: A cohort study was conducted among HCWs of a tertiary hospital in 2022. The socio-demographic, behavioural and anthropometric details were collected. About 6 ml of blood was drawn for LTBI testing using IGRA (4th generation QuantiFerron – TB gold plus kits (QIAGEN, Germany)) respectively after excluding active TB. HCWs were followed for one year. Reversion was defined as a positive IGRA test at the baseline and has values less than 0.2 IU/L in TB1 and TB2 tubes during follow-up. The conversion was defined as a negative IGRA result at the baseline and had values of more than 0.7 IU/L in TB1 or TB2 tubes during follow-up. Prevalence, conversion and reversion were described as frequency and proportion with 95% confidence interval.
Results: Of the total 400 HCWs included, the mean (SD) age was 37 (7) years. Median (IQR) work experience was 15.7 (10-21) years. Of 400 HCWs, 150 had LTBI (37.7%, 95% CI:33.0-42.7). The prevalence was higher in persons with pre-diabetes (46.0% Vs 32.3% Vs 34.9%) as compared to persons with and without diabetes respectively. 128/150 with LTBI at baseline were followed up, and 15 had reversion (20.3%; 95% CI:6.7-18.5). 235/249 with no LTBI at baseline was followed up, and 13 (5.6%; 95% CI: 3.3-9.8) had a conversion. One reported incident TB at baseline and one during follow-up.



Conclusions: More than one-third of HCWs had LTBI. Considering the high prevalence of LTBI, the "test and treat" approach can be extended to HCWs as recommended by the National TB program. Reversion and conversion were observed in 4/20 and 1/20 HCWs respectively over one year.

OA31-352-14 TB among healthcare workers in 24 USAID supported high-burden countries for TB

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Background: The risk of TB among healthcare workers (HCWs) and community-based front line workers is high and poses serious health risks to them, their families and the broader community. In 2021, WHO received reports of 16,931 HCWs with TB from 69 countries and a systematic review in 2019 of countries with a TB incidence of >300 per 100,000 estimated an annual TB infection (TBI) incidence of 38% (CI 24,55) among HCWs. While the source of HCW exposure to TB cannot be determined with certainty, establishing an Infection Prevention and Control (IPC) Plan with administrative, environmental and engineering control is essential to protecting workers and patients in healthcare settings.
Design/Methods: We analyzed routinely collected WHO data from 2018-2022 on TB cases reported among HCWs in 24 USAID-supported countries.
Results: Between 2018 and 2022, 50,464 HCWs were reported with TB from 11 of 24 USAID supported countries. The average annual incidence of TB among HCWs during this 5-year period was 1.5-times higher (209 cases per 100,000 HCWs) than the general population (134 per 100,000). Despite a steady increase in the number of

HCWs and a decline in reported cases, annual incidence remained higher than the general population in each year except 2022 when the number of reported HCWs nearly doubled.

Year	HCW with TB	Total HCW	HCW TB Incidence	TB Notification Gen Population	Estimated Population	TB incidence Gen Population
2018	14,307	3,176,981	450	2,278,437	1,773,317,175	128
2019	12,743	3,261,964	391	3,124,270	2,066,294,716	151
2020	8,013	3,874,165	207	2,420,635	2,091,296,192	116
2021	8,077	4,931,749	164	2,894,018	2,113,850,411	137
2022	7,324	8,949,566	82	2,880,474	2,079,768,962	138
5 Yr Total	50,464	24,194,425	209	13,597,834	10,124,527,456	134

*[India, Indonesia, Kyrgyzstan, Mozambique, Nigeria, Tajikistan, Uganda, Ukraine, United Republic of Tanzania, Uzbekistan, Zambia, Zimbabwe]

*Table. Annual TB incidence among HCW and general population in 11 USAID supported countries, 2018-2022**

Conclusions: HCWs are at high risk of occupational exposures to TB in the workplace and reporting of occupationally acquired TB is unavailable or incomplete in many countries. There is an urgent need to establish education linked to IPC plans to reduce occupational hazard.
In addition, it is crucial to establish active surveillance for TB and TBI and provide employee health services that includes screening of HCWs upon employment, when symptomatic, and annually for TB and TBI with WHO recommended antigen-based skin tests, immune-gamma release assays or chest x-ray, and provide TB treatment or TPT as needed.

OA31-353-14 Prevalence of TB among prisoners in incarcerated populations in Indonesia

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Background: Incarcerated individuals represent a high-risk group for TB where significant detection gaps exist. This study outlines the active TB case finding efforts within Indonesian correctional facilities as an integral part of the National TB Program.
Design/Methods: From July to November 2023, a comprehensive TB screening protocol integrating symptom screenings, CXR, and Xpert tests was administered to 206,345 individuals across 376 detention centers, prisons, and juvenile detention centers in 33 provinces of Indonesia. All underwent symptom screening and CXR, with Xpert testing reserved for those exhibiting TB symptoms, a CAD4TB score >40 (indicative of TB), or risk factors. Persons with bacteriologically confirmed and clinically diagnosed TB received anti-TB treatment.
Results: The screened population predominantly consisted of males (95.5%), aged 25–54 (78.3%), without prior TB contact (84.8%). Among children (<15 years), only 3 of 35 (8.6%) showed TB symptoms. In adolescents and adults, 10.2% reported coughing, with additional symptoms like hemoptysis (0.2%), weight loss (3.4%), unexplained fever (2.5%), night sweats (2.0%), and lymph node enlargement (0.3%). A CAD4TB score of >40 was reported for 17,638 (8.5%) individuals, and radiologist interpretation indicated TB-related abnormalities in 70.7%, non-TB abnormalities in 14.0%, and were normal in 15.4%.
Out of 42,560 persons with presumptive TB, 39,597 (93.0%) underwent Xpert testing, with 92.5% negative for MTB/RIF, 6.6% rifampicin-sensitive, 0.2% rifampicin-resistant, 0.3% indeterminate, and 0.4% failed or missing data. TB diagnosis was confirmed in 4,890 individuals, comprised of 2,691 bacteriologically confirmed TB (55.0%) and 2,199 clinically diagnosed TB (45.0%), indicating a prevalence of 2,369 per 100,000 population. Anti-TB treatment was initiated in 96.7% of cases.
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Results/Impact: The screened population predominantly consisted of males (95.5%), aged 25–54 (78.3%), without prior TB contact (84.8%). Among children (<15 years), only 3 of 35 (8.6%) showed TB symptoms. In adolescents and adults, 10.2% reported coughing, with additional symptoms like hemoptysis (0.2%), weight loss (3.4%), unexplained fever (2.5%), night sweats (2.0%), and lymph node enlargement (0.3%). A CAD4TB score of >40 was reported for 17,638 (8.5%) individuals, and radiologist interpretation indicated TB-related abnormalities in 70.7%, non-TB abnormalities in 14.0%, and were normal in 15.4%. Out of 42,560 persons with presumptive TB, 39,597 (93.0%) underwent Xpert testing, with 92.5% negative for MTB/RIF, 6.6% rifampicin-sensitive, 0.2% rifampicin-resistant, 0.3% indeterminate, and 0.4% failed or missing data.
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Conclusions: TB prevalence in Indonesian prisons surpasses WHO South-East Asia region estimates. Regular comprehensive TB screening with X-rays and Xpert testing upon admissions and throughout detention time is crucial for early detection and ending TB in this vulnerable population.

SHORT ORAL ABSTRACT SESSION (OA)

SOA04 The sleeper must not awaken: Detecting and preventing TB

SOA04-630-14 TPT for PLHIV in Mozambique: Eligibility, coverage, completion, April 2021–September 2023

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Background and challenges to implementation: In 2022, tuberculosis (TB) remained one of the leading causes of morbidity and mortality globally, especially among people living with HIV (PLHIV). TB preventive treatment (TPT) lowers TB incidence and mortality. Mozambique has high burdens of HIV and TB. Although TPT for PLHIV was introduced in 2007, only 40% of eligible PLHIV received a full TPT course by March 2021. We analyzed data from 2021 to 2023.

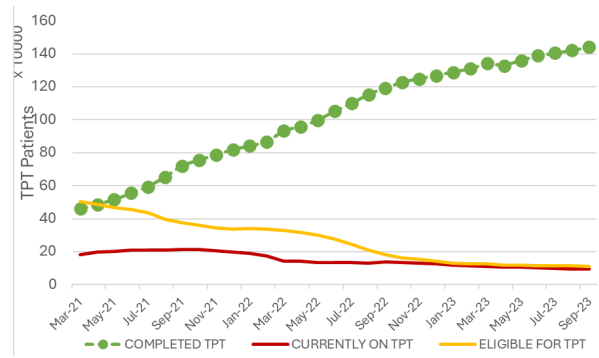
Intervention or response: We conducted trainings and supervision visits; provided technical assistance; implemented TPT short regimen (3HP) and 3-month drug dispensing (3MDD) as part of patient-centered services; reviewed HIV clinical files and used reminder tickets; and created TPT electronic queries, patients line lists, and monitoring dashboards.

We analyzed monthly aggregated routine data from 586 health facilities in Mozambique's Electronic Patient Tracking System from April 2021–September 2023 to describe TPT trends.

We defined: TPT-eligible individuals as PLHIV enrolled in HIV treatment without active TB, who had not received TPT or had a new TB exposure; TPT coverage as proportion of people who initiated TPT among TPT-eligible; TPT completion rate as proportion of enrolled PLHIV who completed any course of TPT among those initiated. We conducted descriptive temporal trend analyses by sex and age (<15 and ≥15 years).

Results/Impact: From April–September 2021 to April–September 2023, the number of enrolled PLHIV increased by 34% to 1,604,126; TPT-eligible decreased by 78% to 106,230; TPT coverage rate increased from 58% to 93%; and TPT completion rate increased from 42% to 88%.

By September 2023, TPT completion rates were similar between men and women (90% and 89%, respectively) and between adults and children (90% and 87%, respectively).



Conclusions: Observed improvements in TPT indicators among PLHIV from 2021–2023 may have resulted from a system-wide approach, including people-centered service delivery, program and data system improvements, and multidisciplinary supervision.

SOA04-631-14 Impact of repeat courses of TB preventive treatment among people living with HIV in Nairobi, Kenya 2012-2021

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Background: Isoniazid preventive therapy (IPT) prevents tuberculosis (TB) in people living with HIV (PLHIV) and has been scaled-up in Kenya since 2012. Prior to 2018, repeating IPT every two years was recommended before this was changed to once. Data supporting periodically repeated IPT courses are lacking. We examined the impact of repeated IPT courses among PLHIV in Kenya.

Design/Methods: We retrospectively analyzed data for adult PLHIV in the electronic medical records of 14 EDARP clinics in Nairobi. PLHIV who started antiretroviral therapy (ART) from 2012 and did not have active TB disease at ART initiation were followed through December 2021. We calculated proportions and fitted a Cox Proportional hazard model to determine the risk of developing TB disease among PLHIV who received no IPT,

one course of IPT, or two or more courses adjusting for sex, religion, year tested HIV positive, age, marital status, education, viral load, CD4 cell count, and WHO clinical stage.

Results: Overall, 39,907 PLHIV initiated ART. Among 29,073 PLHIV who were eligible and included in the study, 65.1% were female, median age was 31.3 years [interquartile range: 25.5-38.8], baseline CD4 cell count 270.0. In total, 11,456 (39.4%) received no IPT, 16,196 (55.7%) received one course IPT, and 1,421 (4.9%) received ≥2 courses IPT. Overall, median follow-up time was 2.07 years (IQR: 0.24-6.35), median time from ART initiation to IPT initiation was 0.0 days (IQR: 0.0-1718 days).

Compared to no IPT, persons receiving one IPT course were 1.8 times less likely (HR: 0.56, 95% CI: 0.44-0.70) and persons receiving >2 courses were 8.3 times less likely (HR: 0.12, 95% CI: 0.08-0.18) to develop TB.

Conclusions: IPT was associated with reduction in the risk of TB among PLHIV. Two or more courses conferred better protection against TB than single course, supporting consideration for repeat IPT among PLHIV in high TB burden settings.

SOA04-632-14 Coverage of TB preventive treatment cascade among people living with HIV in two districts in Yogyakarta Special Region, Indonesia

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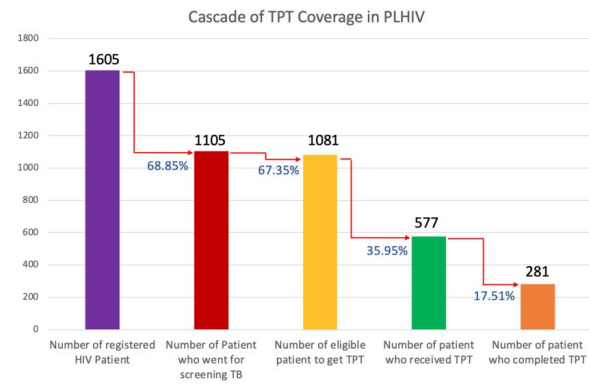
Background: People living with HIV (PLHIV) have 18 times increased susceptibility to developing Tuberculosis (TB) disease. Tuberculosis Preventive Treatment (TPT) has emerged as a pivotal intervention to prevent the development of TB disease among at-risk populations, including PLHIV. Since the TPT program implementation, there has been a scarcity of evidence of its systemic evaluation. The objective of this study is to measure the TPT delivery among PLHIV in the study area, particularly the TPT cascade coverage, comprising of TB screenings, provision of TPT, and TPT completion.

Design/Methods: Using a robust quantitative approach, this study detailed the TPT cascade for HIV patients, analyzing demographic data, implementation steps, and adherence from January 2020 to September 2023. Data from 2020 – 2023 were collected from patient medical records and HIV-related service records from 10 Primary Health Care (PHC) in Sleman District and Yogyakarta City of Special Region of Yogyakarta, Indonesia.

Results: The TPT program began in Yogyakarta City in 2016 and in Sleman District in 2017. From 2020 to 2023, there were 1,605 HIV patients, predominantly male (89.22%), with an average age of 29, mostly aged 21-30, well-educated, employed, and identifying homosexual contact as the primary HIV risk factor (55.89%).

Using a single denominator, coverage of TB screening, TPT provision, and TPT completion rates were 68.85%, 35.95%, and 17.51%, respectively. TPT initiation ranges from <1 month until > 2 years (most were patients who had already been on ART before the TPT program).

For patients who started ART after TPT started, the length of time between HIV diagnosis and TPT initiation was mostly at 1-3 months.



Conclusions: Our study showed that TPT cascade coverage was low, particularly on the provision of TPT among those eligible and worse on TPT drug completion.

SOA04-633-14 Sex differences in M. tuberculosis immunoreactivity risk in Blantyre, Malawi: A community-based prevalence survey

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Background: Sex differences in *Mycobacterium tuberculosis* (*Mtb*) infection risk influence differences in tuberculosis (TB) disease distribution and could inform targeted strategies to prevent infection and progression to disease. We investigated age- and sex-specific *Mtb* immunoreactivity prevalence among adults and adolescents in Blantyre, Malawi, where TB disease prevalence is rapidly declining.

Design/Methods: Households were randomly sampled from 33 clusters in three peri-urban townships. Consenting household members aged 10-40 years completed a questionnaire and provided a 5mL venous blood sample for QuantiFERON-TB Gold Plus (QFT-Plus) interferon gamma-release assay (IGRA) testing. We used Bayesian regression modelling to estimate age- and sex-specific trajectories in *Mtb* immunoreactivity prevalence.

Results: Between 17/01/2023 and 23/03/2024, we recruited and obtained valid QFT-plus results for 2,656 participants (40.0% male; 60.0% adolescents), excluding 58 (2.1%) participants with indeterminate results. Overall, 460/2656 (17.3%) were IGRA-positive. The posterior mean probability of IGRA-positivity was 17.4% (95% credible interval (CrI): 16.0-18.7%). The posterior probability of IGRA-positivity was high among adults 18-40 years old compared to adolescents 10-17 years old. At older ages, men had higher risk of IGRA positivity compared to women (at 35 years, 40.1% [95% CrI: 21.6-59.6] vs. 19.0% [95% CrI: 10.4-30.0%]) men vs women, respectively. The male-to-female sex ratio increased at older ages: 0.92 times (95% CI: 0.41-1.71) among adolescents aged 17 years; whereas it was 2.28 (95% CrI: 1.14-3.87) times among adults aged 35 years.

Conclusions: In this rigorously conducted community-based survey, we found a high prevalence of *Mtb* immunoreactivity overall, with divergence in sex-specific trends during adolescence, consistent with men having a substantially greater cumulative prevalence. Possible reasons include sex differences in TB natural history, contact patterns during adolescence, and exposure to TB risk factors.

Greater understanding of *Mtb* immunoreactivity prevalence will help direct targeted strategies to prevent progression of TB infection to disease such as preventive therapy and new vaccines.

SOA04-634-14 Enhancing asymptomatic TB detection through mobile active case finding initiatives

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Background and challenges to implementation: Myanmar faces challenges in combating tuberculosis (TB) due to the COVID-19 pandemic and political instability. Despite a notable increase in TB detection in 2022, the WHO's estimated 257,000 cases remain unmet. Myanmar has emphasized the importance of accelerated efforts to close the TB notification gap. Myanmar Anti-TB Association (MATA) and Myanmar Medical Association (MMA) are implementing mobile Active Case Finding (ACF) initiatives in Yangon, Myanmar's most TB-endemic region, to enhance accessibility and coverage of TB services.

Intervention or response: MATA and MMA are implementing ACF mobile clinics across seven townships within Yangon, where urban poor, migrants, factory workers and internally displaced persons are concentrated. The mobile teams are equipped with portable digital chest X-ray (CXR) 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: In 2022 and 2023, both partners screened 8473 attendees using CXR CAD, in which 1600 cases were flagged as presumptive TB by CAD or local TB experts. After evaluating CXR findings, clinical presentation, and bacteriological results, 557 people were diagnosed with TB, and 315 of them were bacteriologically confirmed (BC).

Of the 557 people with TB, 112 (20%) had no TB symptoms, whereas 26 were BC. The findings revealed the high occurrence of subclinical TB and the efficacy of CXR in detecting it.

Conclusions: Asymptomatic TB cases are less likely to seek medical care, resulting in delayed diagnosis and treatment and increasing the risk of unintentional spread of infection. Therefore, implementing TB screening activities using CXR with or without CAD in mobile clinics can significantly improve TB case detection, including subclinical TB, by bringing it closer to the community. This proactive approach is crucial for achieving the END TB goals and effectively reducing the country's TB burden.

SOA04-635-14 Prevalence of subclinical pulmonary TB in Mozambique: Implications for TB screening

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Background and challenges to implementation: TB remains the leading cause of death from an infectious disease worldwide. Not all individuals with bacteriologically confirmed TB will present with or be aware of (clinical) symptoms. Subclinical disease is difficult to detect, resulting in key gap for its understanding.
Intervention or response: A nationwide cross-sectional survey with multistage stratified cluster sampling in rural and urban areas across all 3 regions (South, Center, North) was conducted. Adults (≥15 years) and residents or temporal visitors were invited. All consenting participants were screened for symptoms and CXR (human reader and CAD4TB), those screened positive were asked to submit sputum samples for TB examination.
Results/Impact: A total of 70,114 individuals were listed during the survey census, of whom 43,442 were eligible and 32,445 (74.9%) participated in the survey. Amongst the participants, 12,031 (37.1%) were eligible for sputum collection and 10,187 (84.7%) submitted a sputum sample. TB confirmed cases by Xpert MTB RIF were 92 and 65 by culture. After medical panel review, a total of 89 participants were considered survey TB cases and used for the TB burden estimates, of whom 49 cases had clinical symptoms. More than half of prevalent bacteriologically confirmed TB was subclinical.
Conclusions: The study found a high prevalence of subclinical pulmonary TB disease. The results suggest that the TB endemic settings, should prompt TB screening by CXR.

SOA04-636-14 Sub-clinical TB in participants of a national prevalence survey in Timor-Leste

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Background: The burden of sub-clinical tuberculosis (TB) is becoming increasingly recognized, both in terms of the significant global prevalence of sub-clinical disease and its potential contribution to transmission. TB prevalence surveys provide a unique opportunity to investigate sub-clinical TB. Using data from the first National TB Prevalence Survey of Timor-Leste, we aimed to describe the characteristics of people with sub-clinical TB identified through survey screening.
Design/Methods: The National TB Prevalence Survey of Timor-Leste was a nationally representative cross-sectional random cluster survey. Survey participants were screened using an algorithm consisting of symptom screening and chest X-Ray, followed by sputum examination with Xpert Ultra and culture. We extracted data on participants with bacteriological evidence of TB (either Xpert Ultra or culture) and determined the proportion with sub-clinical TB and factors associated with sub-clinical versus symptomatic TB.
Results: Based on preliminary survey data, a total of 162 participants were found to have bacteriological evidence of TB. Among these, 49 (30%) did not report cough of more than two weeks duration, 38 (23%) did not report cough of any duration, and 31 (19%) did not report any symptoms of TB, including cough, fever, weight loss or night sweats. Sub-clinical disease was more common among female participants.
Conclusions: A substantial proportion of people with bacteriological evidence of TB had sub-clinical or asymptomatic disease. These findings highlight that symptom screening alone is likely to miss a substantial proportion of people with TB. Complete results are anticipated by mid-2024.

SOA04-637-14 Lung structure and function are relatively well-preserved, post-treatment, in subclinical pulmonary TB

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Background: Functional abnormalities in pulmonary tuberculosis (PTB) are known to correlate with extent of disease and cavitary volume at diagnosis. In truly asymptomatic (subclinical) PTB patients the chest radiograph is usually normal or minimally abnormal at diagnosis.
We aim to determine the structural and functional residua of subclinical PTB in high-income countries when it is strictly defined.
Design/Methods: A prospective cohort study of consecutively diagnosed subclinical PTB patients was performed in a dedicated public health TB clinic in Canada. Each patient was described in detail and treated with directly-observed therapy. Diagnostic and end-of-treatment chest radiographs were re-read by a panel of expert readers. Post-treatment radiographic findings were augmented by quantitative computed tomographic (QCT) scan data in a convenience sample of consenting patients. Full pulmonary functions tests (PFTs) were sought in all patients.
Results: Over a 30-month period beginning November 1, 2020, a total of 35 adolescent and adult patients were diagnosed with culture-positive subclinical PTB. Their mean (+/- SD) age was 39.6 years; 23 (65.7%) were female. Full PFTs were performed on 26 (74.3%) of patients. Completion-of-treatment chest radiographs was normal or minimally abnormal in 24 (92.3%).
Using the most rigorous international reference standards, only one of the subclinical PTB patients in the present study had obstruction; five others had restriction alone. QCT findings
indicated that moderately-advanced disease at diagnosis could result in subtle, post-treatment structural abnormalities in the absence of functional impairment.
Conclusions: Post-treatment lung structure and function are relatively well-preserved in strictly-defined subclinical PTB patients diagnosed and treated in high-income countries.

SOA04-638-14 The prevalence of asymptomatic TB among participants of community-based case-finding activities and common risk factors in 3 provinces in the Philippines

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Background and challenges to implementation: Across multiple infectious diseases, asymptomatic individuals significantly contribute to pathogen transmission. Drain PK et al. (2018) define Subclinical TB as a "disease due to viable M. tuberculosis bacteria that do not cause clinical TB-related symptoms but causes other abnormalities that can be detected using existing radiologic or microbiologic assays." These cases constitute around half of all prevalent TB cases and perpetuate ongoing transmission. To meet the EndTB targets, countries need early identification and treatment protocols to identify cases and reduce transmission.
Our study explored the prevalence of subclinical TB among participants of community screening activities to inform targeted interventions.
Intervention or response: We retrospectively analyzed community-based screening data from 33,508 participants with a negative symptom screen and underwent a chest x-ray with Artificial Intelligence (AI) powered computer-aided detection (CAD) for TB. The data was analyzed descriptively. An Odd's ratio was calculated for each risk factor.
Results/Impact: Of the 33,508 participants, 2,045 (800 female and 1,245 male) had an AI score for high TB probability. Of these, 1,803 (88%) underwent rapid molecular TB testing, and 205 (135 male and 70 female) were positive for mycobacterium tuberculosis, of which 13 (6.3%, six female and seven male) were rifampicin resistant. The average age was 51.5 years. The risk factors associated with higher risk of subclinical TB included crowded living quarters (OR=1.59, p=0.0049) and a history of TB (OR=0.55, p=0.0013). Other common risk factors but not associated with an increased disease probability included smoking (24.9%), older than 60 years (37.6%), and 2% having at least four risk factors.
Conclusions: Our study highlights a substantial prevalence of subclinical TB among asymptomatic individuals in the general population with an estimate of 612 cases per 100,000 population. The use of AI-powered CAD enhanced early detection among these individuals. Targeted interventions should prioritize those living in crowded conditions to mitigate transmission risks.

SOA04-639-14 Are diabetics at very high risk for TB infection? Learnings from B.E.S.T. undertaking, Mumbai, India

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Background and challenges to implementation: Tuberculosis Infection (TBI) indicates exposure to TB bacteria without active symptoms. Detecting TBI is vital to prevent progression to active TB. Diabetics, with compromised immunity, have increased TB risk, emphasizing tailored prevention efforts. Certain workplaces, particularly those with close personal contact, heighten TB transmission risks. The intersection of diabetes, specific occupations, and TBI presents complex health challenges, necessitating comprehensive strategies. The Bombay Electric Supply and Transport B.E.S.T. undertaking (B.E.S.T) underscores the importance of targeted health measures in similar settings with extensive employee and commuter interactions.
Intervention or response: Since 2012, B.E.S.T. is dedicated to eliminating TB, developing a holistic strategy addressing TB and related comorbidities. In November-December 2023, B.E.S.T. conducted screenings for TB and TBI among its diabetic employees, with the objective of identifying employees with TBI and initiating them on preventive treatment, using a combination of symptom screening, clinical evaluation, IGRA, X-ray, NAAT, and other blood tests.
Results/Impact: In January 2024, a retrospective analysis of 160 male diabetic employees (mean HbA1C, 7.7%) was conducted. The median age was 54 (range 34-58). IGRA tests were positive in 72 (45%) cases. Following a comprehensive diagnostic process, incidentally, 1 (0.6%) employee was diagnosed with active TB and was initiated on TB treatment. 71 (99%) IGRA positive employees were initiated on TB Preventive Treatment.

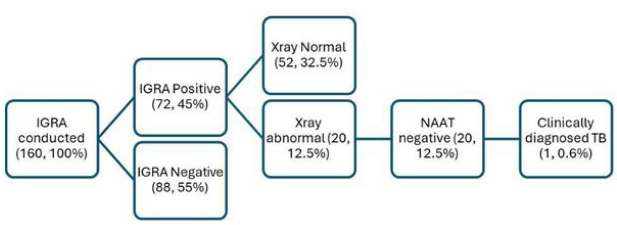

Figure 1: Care cascade for TBI and TB among diabetic employees in B.E.S.T.

Conclusions: B.E.S.T champions the screening for TB and TBI among all employees, especially in high-risk environments, focusing on those with comorbidities. Employees are receptive to such health-beneficial policies, showing high acceptance for TB and TBI screening. B.E.S.T also endorses TB Preventive Treatment for TBI-positive employees, ensuring adherence through regular monitoring. This approach not only interrupts TB transmission but also reduces the potential for active TB development, ultimately lowering the community's TB burden.

SOA05 Looking through the lens on drug-resistant TB: Operational research perspective

SOA05-640-14 Adverse event-free time while on short oral treatment for rifampicin-resistant TB

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Background: Treatment for rifampicin-resistant tuberculosis (RR-TB) is now shortened, but still includes multiple drugs and is associated with frequent adverse events. Safety of tuberculosis treatment regimens is usually reported by number of experienced adverse events (episodes) and their severity, often focusing on severe adverse events. However, people with RR-TB experience multiple episodes of adverse events throughout their treatment, caused by anti-tuberculosis drugs. The objective of our study is to estimate adverse event-free time during RR-TB treatment.
Design/Methods: Médecins Sans Frontières conducted one-arm clinical trial to study effectiveness and safety of nine months oral regimens for RR-TB in the period of 2019 – 2022. Adverse events were recorded, including date and end of the episode, description, intervention, and the outcome. We calculated duration of each adverse event (days) and estimated total number of days each participant suffered from adverse events. Adverse event-free time was reported as a proportion: total number of days without experiencing adverse events, over the total number of days of treatment.
Results: Among 112 (112/115, 97%) trial participants, at least one episode of adverse events during the treatment was recorded. Number of experienced episodes was 753 with the median duration of 227 days (IQR 158 – 270). Median duration of treatment was 275 days (274 – 281).

Participants suffered from adverse events during 1.5 % to 100% of their treatment time. Among 97 (87%) participants we observed adverse event-free time, with a median of 21% (IQR 9.0 – 42.0) of total RR-TB treatment duration.

Conclusions: Adverse events among people on RR-TB treatment are frequent and adverse event-free time during treatment is short. Frequency, severity, but also longevity of adverse events will impact adherence to treatment and its outcomes and ultimately, quality of life among people with RR-TB. Estimating adverse-event free time, could be an improved method to measure safety and acceptability of RR-TB treatment.

SOA05-641-14 Efficacy and safety of BDL/M regimens for multi-drug-resistant and pre-extensively drug-resistant TB: Preliminary results from a multi-centre dual single-arm study

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Background: The treatment of multidrug-resistant tuberculosis (MDR-TB) and pre-extensively drug-resistant tuberculosis (pre-XDR-TB) is a major global challenge. The WHO prioritizes the BPaL/M regimen (bedaquiline, pretomanid, linezolid, and moxifloxacin) for their treatment. Delamanid (D) and pretomanid are drugs in the same class, and one of WHO's key research priorities is to compare their effectiveness. Pretomanid is not available in China, while delamanid is. Clinical trials of the BDL/M regimens have not yet been conducted in China.

Design/Methods: A dual single-arm study was conducted to evaluate the 6-month BDLM regimen for MDR-TB and the 6-month BDL regimen for pre-XDR-TB. This interim analysis includes both efficacy and safety endpoints.

Results: From January to December 2023, 49 patients were enrolled at Shenzhen's Third People's Hospital and Tianjin Haihe Hospital, 28 on the BDLM regimen and 21 on the BDL regimen. Of these, 35 patients completed 2 months of treatment. The 2-month culture conversion rate was 94.7% (18/19) for the BDLM regimen and 93.8% (15/16) for the BDL regimen. Twenty-six patients completed 6 months of treatment. The 6-month culture conversion rate for the BDLM regimen was 100% (13/13), with one patient discontinuing treatment due to adverse events and no treatment failures, resulting in a cure rate of 92.3% (12/13). The 6-month culture conversion rate for the BDL regimen was 92.3% (12/13), with one patient discontinuing due to adverse events and one having treatment failure, resulting in a cure rate of 84.6% (11/13). Fourteen patients completed 6 months of post-treatment follow-up, with no cases of loss to follow-up, death, relapse, reinfection, or cases deemed unassessable in the cohort.

	BDeLM (N = 28)	BDeL (N = 21)
Culture conversion at 2 months, n (%)	18/19 (94.7)	15/16 (93.8)
Culture conversion at 6 months, n (%)	13/13 (100)	12/13 (92.3)
Curing at 6 months, n (%)	12/13 (92.3)	11/13 (84.6)
6 months after treatment completion, n	6	8
Unfavorable outcome, n	1	2
Treatment failure	0	1
Treatment discontinuation	1	1
Loss-to-follow up	0	0
Relapse	0	0

Conclusions: Preliminary results suggest that the BDL/M regimens are effective and safe treatment options for MDR-TB and pre-XDR-TB. Further studies with larger sample sizes are needed to validate their long-term effects and safety.

SOA05-642-14 Safety of new second-line drug-resistant TB medicine in children diagnosed with drug-resistant TB in KwaZulu Natal, South Africa

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Background: Novel short course treatment regimens with new and repurposed medicine have been recommended for drug resistant tuberculosis (DR-TB) since 2016. Medicine was re prioritized into Group A, B and C based on emerging safety and efficacy evidence. Newer evidence resulted in revised inclusion criteria for children <6 years for bedaquiline and delamanid. Few studies have documented adverse events in children that received new and repurposed medicine for DR-TB.

Therefore, our objective was to report adverse events in children through chart audits and focus group discussions with caregivers of children.

Design/Methods: Retrospective chart review of children <15 years receiving treatment for DR-TB between 2018 – 2022 at a centralized DR-TB hospital in KwaZulu Natal, South Africa and focus group discussions of caregivers conducted in 2022. Medicine prescribed, dose, adverse

event and outcomes was extracted from the clinical folders and are presented. Thematic analysis was conducted for qualitative interviews.

Results: One-hundred forty-two children were included for quantitative and 7 interviews for qualitative analysis. Ninety-five percent (n=135) of children had a successful treatment outcome.

However, 92% (n=131) experienced at least one side effect during TB treatment, regardless of regimen. The most common adverse event was hypothyroidism (53.52%), rash (40.14%), nausea and vomiting (27.46%) and visual problems (9.86%).

Most adverse events were grade 2 and below and was treated with adjuvant medicine, however a few children experienced grade 3 or 4 adverse events that required regimen changes. Caregivers reported mild side effects of individual medications and mixed medications with minimal treatment interruptions.

Conclusions: Despite excellent treatment outcomes, a high rate of mild side effects was noted in children receiving DR-TB medicines. Acceptability was also high among caregivers, although taste, lack of dispersible medicine and mild side effects were common themes.

Urgent attention must be given to pediatric-specific TB regimens to decrease side effects in this vulnerable population.

SOA05-643-14 Differentiated service delivery model in the treatment of people with drug-susceptible TB: Results from a prospective cohort study in Ethiopia

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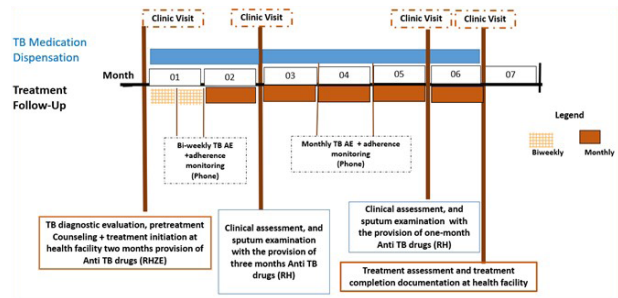
Background: Ethiopia is among the 30 countries with the highest burden of tuberculosis (TB) globally. It remains a leading cause of mortality among people living with HIV (PLHIV). The conventional TB health service delivery using directly observed therapy (DOT) has remained unchanged for over three decades. During the COVID-19 pandemic, Differentiated Service Delivery (DSD) using the muti-month dispensing approach was adopted. This study aimed to assess the acceptability and effectiveness of this approach.

Design/Methods: This was a prospective cohort study conducted from March 8, 2023, to March 7, 2024, at 18 health facilities. Persons with drug-susceptible TB across all age groups who met the eligibility criteria were provided with treatment counseling and a two-month supply of intensive-phase TB medications (i.e. rifampin, isoniazid, pyrazinamide, and ethambutol). Patients were monitored for adherence and adverse events (AEs) by phone bi-weekly during the 1st month and at the 3rd & 4th month. Patient in-person visits were scheduled at months 2, 5, and 6 (see Figure). The data were analyzed using descriptive statistics.



Results: Of 1073 patients eligible for TB treatment, 1072 (99.9%) consented and were enrolled in DSD and initiated on anti-TB medications, of which 989 (92.3%) were adults and 83 (7.7%) were children less than 15 years old. The median (IQR) age was 29 (22-28) years and males comprised 568 (53%). The majority 998 (93.1%) were new, and 477 (44.5%) had bacteriologically confirmed pulmonary TB and 185 (17.3%) tested positive for HIV. The treatment success rate was 98.2% and 25 (2.3%) reported minor AEs.

Conclusions: Provision of TB treatment using the DSD model for drug-susceptible TB patients is feasible and acceptable. The treatment success rate was high. The DSD approach has the potential to decrease TB transmission and exposure to contagious diseases like COVID-19 and enhance scale-up of TB treatment.

SOA05-644-14 Integrated TB and leprosy screening among key populations in Northeast Nigeria

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Background and challenges to implementation: Integrated service delivery (ISD) increases access to care for tuberculosis and other diseases. We implemented an intervention to improve access to TB and leprosy services, among different key vulnerable populations (KVPs) in northeast Nigeria including nomadic communities, internally displaced people (IDPs) and mining communities, covering three states.
Intervention or response: We used a strategic community participation approach to recruit and train community health promoters and influencers (CHIPs) among the target communities. A multistakeholder committee was formed for coordination and advocacy across the 3 states. The CHIPs conducted door-to-door screening and community outreach events, where they screened for both TB and leprosy using an integrated tool. Leveraging on the existing sputum transportation network, sputum samples for TB were tested on Xpert, while people identified as needing testing for leprosy were referred for laboratory confirmation. All people with confirmed TB or leprosy were linked to treatment.
Results/Impact: 30,975 people including 12,957 nomads, 11,032 IDPs, and 6,989 miners were screened for TB and leprosy using the integrated tool. Among people screened, 3,556 (17%) were presumed to have TB and tested. A total of 363 (1.2% of those screened) people had Bac+ TB and 353 (97%) were started on treatment. An additional 46 people including 22 children were diagnosed clinically.
Of the 399 people with all forms of TB notified, 38% were Nomads, 43% were IDPs while 19% were miners. Amongst the same population, 141 people were presumed to have leprosy; 48 were confirmed and started on treatment.
Conclusions: KVPs have very high rates of TB compared to the general population. The implementation of integrated TB and leprosy screening outreach activities could enhance the detection of TB and leprosy among KVPs in Nigeria. The efficacy of these approaches could potentially be further enhanced through integrating other diseases as well. Further studies should investigate costs and effectiveness of such interventions.

SOA05-645-14 It is not only the duration of DR-TB treatment that counts but also the pill burden: Insights of people with DR-TB in Zambia

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Background: In 2022, Zambia's National Tuberculosis and Leprosy Programme (NTLP) adopted the WHO-recommended Shorter Treatment Regimen (STR) for drug-resistant tuberculosis (DR-TB) patients. The goal was to have over 75% of DR-TB patients on the STR.
However, routine programme data showed that only 15% of DR-TB patients were receiving the STR. The STR consists of 4–6-months of Bedaquiline (Bdq), Levofloxacin (Lfx), Linezolid (Lzd), Ethambutol (E), Pyrazinamide (Z), Isoniazid high dose (Hh), Clofazimine (Cfz), followed by 5 months of Levofloxacin (Lfx), Clofazimine (Cfz), Pyrazinamide (Z), Ethambutol (E).
The Longer Treatment Regimen (LTR) consists of 6-month Bdq, Lfx, Lzd, and Cfz, followed by 12-months Lfx, Lzd, and Cfz. We assessed DR-TB patients' preferences for either the LTR or the STR.
Design/Methods: Exit interviews were conducted among newly diagnosed rifampicin-resistant/multi-drug resistant (RR/MDR) TB patients in 17 treatment centers in Zambia. Participants were randomly assigned to a hypothetical scenario of receiving the LTR or STR. On a 0-10 Likert scale, participants rated their intention and confidence in completing the LTR or STR.
Results: We enrolled 187 participants, and 82 completed the survey. Their ages ranged from 22 to 69 years. The majority were male (56%) and HIV-negative (57%). Specifically, 91% (40/44) of those who were assigned to the LTR treatment expressed their intention to complete the treatment, compared to only 58% (22/38) who were assigned to the STR. Overall, 90% (74/82) of the participants preferred the LTR treatment over the STR treatment.
Conclusions: The LTR was the preferred regimen. The hindering factor was not the duration of treatment but the pill burden. These insights have informed the country's introduction of the BPaL/M (Bedaquiline, Pretomanid, Linezolid/ Moxifloxacin) regimen.

SOA05-646-14 Drug-resistant TB in Morobe Province, Papua New Guinea, 2012-2021

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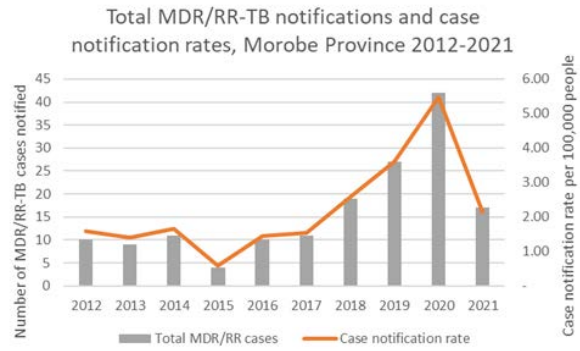
Background: Papua New Guinea (PNG) is a high burden country for multidrug-resistant or rifampicin-resistant tuberculosis (MDR/RR-TB). There's limited data on MDR/RR-TB notifications and treatment, outside of two "hotspot" provinces, Western and Central Provinces. Morobe Province is the most populous province, however no data has previously been published on the epidemiology and treatment outcomes of MDR/RR-TB.
Design/Methods: This retrospective cohort study investigated trends in MDR/RR-TB detection over time, treatment outcomes in Morobe province, the impact of the COVID-19 pandemic and factors associated with unfavourable treatment outcomes. MDR/RR-TB data was collected between 2012-2021 from programmatic management of drug-resistant TB (PMDT) and laboratory registers.
The data variables that were collected included: sex, age, urban/rural residence, HIV status, registration category, site of TB infection, TB resistance type, regimen used for treatment and treatment outcomes. The standard definitions of treatment outcomes were used as defined in the national TB guidelines.
Favourable outcomes (treatment success and complete) were compared to unfavourable outcomes (failure, treatment lost-to-follow up, death) using multivariable regression. People with unknown treatment outcomes ("Not evaluated or transferred out") were excluded. Pre-treatment lost-to-follow-up is not programmatically reported.
Results: Between 2012-2021, 160 people were bacteriologically confirmed to have MDR-TB. Few diagnoses were made among children (2.5%), extrapulmonary cases (0.6%) or rural residents (38%).
Case notifications rose sharply from 2016 after introduction of GeneXpert to 5.6 cases per 100,000 population in 2020 prior to a reduction in 2021 coinciding with COVID-19 disruptions. Lost to follow-up (27.5%) and death (8.1%) were common.
Unfavourable treatment outcomes were more common among males (aOR 3.00, 95% CI 1.38-6.45) and those treated with longer injectable-containing regimens (aOR 3.39, 95%CI 1.30-8.80).



Conclusions: MDR/RR-TB detection increased in Morobe province since 2012 but low treatment success rates persist. There was under-detection among children, extrapulmonary cases and rural populations. Enhanced decentralised diagnostic capacity and treatment is needed.

SOA05-647-14 Determinants of unsuccessful treatment outcomes among people with TB in West Java 2020 – 2022

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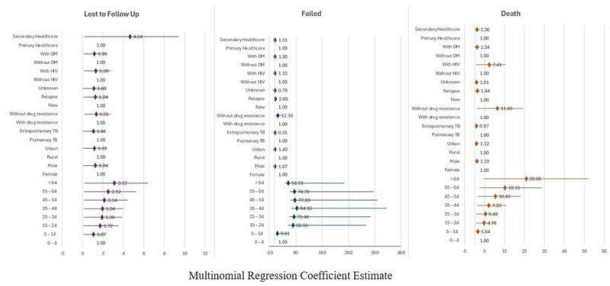
Background: West Java reports the highest number of tuberculosis (TB) cases and the 9th lowest successful treatment outcome rate (83,4% in 2022) in Indonesia. Little published research focused on large-scale determinants of unsuccessful TB treatment outcomes in this province. This study aims to identify factors associated with unsuccessful TB treatment outcomes (Lost to Follow up "LTFU", failed, and death) in West Java.
Design/Methods: This study adopts a retrospective cohort study design, analyzing all TB patients in West Java treated and recorded in the Tuberculosis Information System (SITB) from 2020 to 2022. The total sample size meeting inclusion criteria and analyzed was 303,100 patients. Multinomial logistic regression analysis was used to determine factors associated with various categories of unsuccessful TB treatment outcomes, with coefficient expressed as relative risk ratio (RRR).
Results: Age, gender, residential area, TB anatomical location, drug resistance, previous treatment history, HIV status, DM status, and healthcare facility type were significantly associated with TB treatment outcomes (LTFU, failed, and death) in West Java. The risk of unsuccessful treatment increases with age. Males have a higher risk than females, particularly in the LTFU category (RR:1.24, CI: 1.21–1.28). Urban recidency poses a higher risk than rural (RR: 1.4, CI:1.18 – 1.7) in the failed category. Pulmonary TB show similar risk to extrapulmonary TB for LTFU category (RR:1.04, CI:1.0–1.08). Drug resistance have the highest risk for failure at (RR:12.16, CI: 9.74–15.17), followed by relapse at (RR:2.69, CI:2.27–3.17).

HIV and DM statuses are associated with increased risk, respectively, death category (RR:7.41, CI:6.71–8.19) and failed (RR:1.95, CI:1.62–2.34). Patients treated at secondary healthcare also have a higher risk, particularly for LTFU (RR:4.64, CI:4.48–4.81).



Conclusions: These research findings should inform governmental considerations to enhance TB control programs and health policies. The complexity of factors needs to be considered to improve TB treatment effectiveness.

SOA05-648-14 The treatment success rate of BPaL/M regimen among the first cohort of people with rifampicin-resistant TB in Pakistan

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Background: World Health Organization in May 2022 issued advice on programmatic rollout of BPaL/M regimen for treatment of Rifampicin resistant TB (RRTB).
Design/Methods: Immediately after WHO advisory, NTP developed a plan to implement novel treatment regimen in Pakistan, protocol was developed, training module was updated and staff was trained. B PaL/M regimen rollout started at 10 sites. RRTB patients above 14 years having no previous exposure to SLDs were offered BPal/M regimen. Here we present treatment outcomes of the first cohort enrolled on B PaL/M regimen from October 2022 till September 2023.
Results: During the study period, 3645 patients were notified and among these 472 patients were initiated on B PaL/M regimen. At the time of analysis 431 patients including 8 EPTB and 4 with concurrent PTB and EPTB had completed treatment and 400 were successfully treated (92.8%). Treatment success rate (TSR) was equally high for patients on BPaLM (93%) and BPaL (92%). A high TSR above 90% was reported regardless of age (15-54yrs), gender and previous history of TB treatment and site of the disease. A low TSR was reported in patents having concurrent pulmonary and EPTB (50%) and those above 55 years of age (83%).

Death rate in study cohort was 4% (n=16) compared to 15% in RRTB patients in previous cohorts. Of these, 4 patients died within 1 months, 6 within 1-3 months and 6 after 3 months of treatment. Failure rate among the BPaL/M cohort was 1% (n=6) compared to 5% among other. In study cohort, treatment was stopped because of resistance to bedaquline in two patients, severe side effects to Linezolid (thrombocytopenia and retinopathy) in two, failure to convert in one and in one after confirmation of pregnancy.

		Total Enrolment on BPaL/M Regimen	Successfully Treated (n)	Successfully Treated (%)	Unsuccessful Outcome (n)	Unsuccessful Outcome (%)
ALL	ALL	431	400	93	31	7
Treatment Regimen	BPaLM	281	263	94	18	6
	BPaL	150	137	91	13	9
Age Group (years)	15-34	228	218	96	10	4
	35-54	125	117	94	8	6
	55+	78	65	83	13	17
Site	Pulmonary	419	390	93	29	7
	Extra-Pulmonary	8	8	100	0	0
	Pulmonary plus Extrapulmonary	4	2	50	2	50

Conclusions: Short all oral novel treatment for RRTB offer a promising result and warrants expansion on large scale.

SOA06 From prevention to management of TB

SOA06-649-14 Prevalence of latent TB infection and the associated factors in correctional institutions in Taiwan, 2019 - 2023

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Background: Tuberculosis(TB) incidence in prisons has been estimated 4-5 times of the general population and estimated 25% of LTBI prevalence by IGRA in Taiwan. While the TB incidence in Taiwan declined to lower than 30 per 100,000 population, Taiwan CDC has collaborated with Ministry of Justice to roll out LTBI screening and Tuberculosis preventive therapy(TPT) added on existing entry and annual chest X-ray since 2019. The aim of the study is to analyze the prevalence and factors associated with LTBI in this setting.

Design/Methods: We retrospectively analyzed the participating inmates and workers from 2019 to 2023. The education regarding IGRA testing and TPT were provided by local health authorities and health service providers in prisons. TPT(9H, 3HP, and 1HP after 2022) was provided for free to those with positive IGRA results. The demographics of gender, age, and TB contact history were collected from national TB registry. Logistic regression model was applied to estimate the odds of positive IGRA results and 95% confidence interval among covariates.
Results: A total of 25,373 participants were enrolled and 96.5% receiving IGRA testing from 33 correctional institutions/prisons, including 2,825(11.5%) workers and 21,671(88.5%) inmates. The median age was 46 years(IQR: 38.0-53.0) and 89% were male. Reasons for not testing IGRA included previous active TB(3.5%), previous positive IGRA or ever receiving TPT(0.8%), refusing/transferring out or unknown(95.7%). The overall LTBI rate was 13.3% with indeterminate result of 0.3%. The prevalence of LTBI among inmates was significantly higher than workers(14.3% vs 6.0%, p<0.001). Age groups of 30-59 and 60 years or older, and recorded TB contact history were more likely to have LTBI in the multivariate analysis (Table 1).

	Total (n=24,496)	IGRA positive n(%)	Uni-variate analysis OR(95% CI)	Multi-variate analysis adjusted OR(95% CI)
Male	21,761	2946 (13.5%)	1.19 (1.05-1.35)	1.09 (0.96-1.24)
Age group(years)				
<30	2,409	92 (3.8%)	1	1
30-59	19,733	2525 (12.8%)	3.70 (3.01-4.60)	3.68 (2.99-4.58)
60+	2,354	647(27.5%)	9.55 (7.65-12.06)	9.17 (7.34-11.59)
Facilities: prisons	21,742	2967(13.7%)	1.31 (1.15-1.48)	1.07 (0.94-1.22)
other correctional facilities	2,754	297 (10.8%)	1	1
Inmates	21,671	3094 (14.3%)	2.60 (2.22-3.05)	2.48 (2.11-2.92)
Having TB contact history	5,083	845 (16.6%)	1.40 (1.29-1.53)	1.26 (1.16-1.38)

Conclusions: Latent TB infection was prevalent among inmates in Taiwan. Screening of LTBI and offering TPT might help to reduce risk of subsequent incident TB disease and further transmission.

SOA06-650-14 Detection of LTBI and uptake of TB preventive therapy among contacts of people with PTB in a high-burden low-resource setting

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Background: In high-TB burden settings like Nigeria, the uptake of TB preventive therapy (TPT) among eligible persons has remained below 1% due to a combination of factors including lack of a fast and reliable laboratory test to diagnose latent TB infection (LTBI). This study investigated the prevalence and determinants of LTBI among contacts of TB; and assessed its effect on the uptake of TPT among the participants.
Design/Methods: This was a cross-sectional study carried out under routine settings in three states Anambra, Rivers and Sokoto States. Eligible household contacts of patients with PTB and general health care workers were enrolled. The participants underwent testing for LTBI using the QIAreach QuantiFERON-TB assay, and those with LTBI were offered TPT in line with national and international guidelines.
Results: A total of 888 participants completed the test. The mean age of the participants was 32.3 (20.6) years, and 239 (26.9%) of them were children. A total of 281 (31.6%) of the participants were diagnosed with LTBI; with rates of LTBI varying from 19.0%, 29.2% and 45.9% (p <0.001) in Rivers, Sokoto and Anambra State, respectively (**Figure** 1). Predictors of LTBI were belonging to the 41 to 65 years age group, aOR 1.60 (95% C.I. 1.06 – 2.44) and male sex aOR 1.43 (1.05 – 1.94). Overall, all 281 (100%) participants diagnosed with LTBI were offered TPT; and they all (100%) accepted and started TPT. None of the participants refused TPT following LTBI diagnosis.

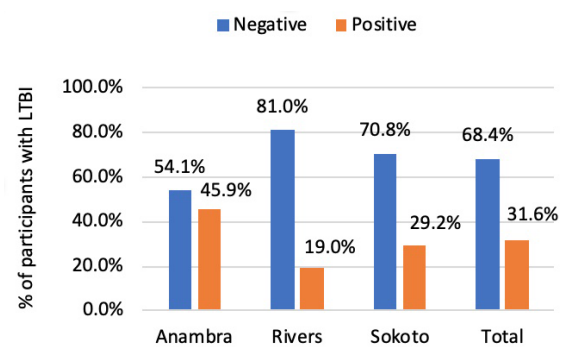

Figure 1. Proportion of participants with LTBI.

Conclusions: The use of QIAreach QuantiFERON-TB assay for LTBI diagnosis among contacts of TB is feasible and effective under routine conditions; and LTBI testing improved the uptake and acceptability of TPT by the contacts. The NTP should consider a phased roll-out of the assay, and other means of screening such as verbal and Mantoux should still be utilized in resource-limited settings.

SOA06-651-14 Barriers to integrating LTBI screening with population-level active TB case finding in peri-urban Uganda

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Background: Active case finding for tuberculosis (TB) is often performed without screening for latent TB infection (LTBI). Feasibility is a key challenge to LTBI screening with the tuberculin skin test (TST). Understanding the participant-level barriers to accepting and completing TST could facilitate integration of LTBI screening into active case finding.

Design/Methods: We conducted TB screening using mobile X-ray (with Xpert Ultra for confirmation) at facility- and community-based sites in peri-urban Uganda. Eligible participants were offered TST, and those who had positive results at 48-96 hours were referred for TB preventive treatment (TPT).

All participants completed brief demographic and clinical surveys, and a subset of 600 people were asked about perceived barriers to TST/TPT. Participant progress was tracked through the TST/TPT cascade.

We summarized participant-reported barriers to TST placement and used multiple logistic regression to assess factors influencing the decision to have a TST placed.

Results: Of 17,166 eligible participants, 11% (n=1884) agreed to TST placement; 57% (n=1080) had their TST read within 96 hours. Participants were significantly more likely to accept TST placement if they were symptomatic (adjusted odds ratio, aOR=1.39, 95% CI 1.25-1.54), were screened in the community rather than at health facilities (aOR=2.11, 95% CI 1.91-2.33), had previous TB testing (aOR=1.86, 95% CI 1.44-2.41) or reported close contact with a person with active TB (aOR=1.18, 95% CI 1.09-1.28).

Primary reasons for declining TST were inability to return for reading (67%) and concerns regarding safety/discomfort (24%).

The main challenges to returning for TST reading were competing commitments, financial costs, and remembering when to return *(Table 1)*.

Challenge	Cited as challenge, n (%) (out of n=600)	
	Cited at all	Top challenge
Being busy with other responsibilities	471 (79%)	259 (43%)
Financial cost of returning	267 (45%)	155 (26%)
Remembering when to return	189 (32%)	76 (13%)
Being fearful or stressed about the results	188 (31%)	32 (5.3%)
Influence from family or friends	102 (17%)	15 (2.5%)
Feeling like the test results are important to my health	35 (5.8%)	10 (1.7%)
Not understanding the purpose of the results	21 (3.5%)	5 (0.83%)
Trusting the team to give the right results	17 (2.8%)	2 (0.33%)

Table 1. Self-reported challenges to returning for TST reading.

Conclusions: Despite interest in TPT, clients experience substantial barriers to LTBI screening when integrated with active case finding. Potential interventions to overcome these barriers include making TST reading more convenient, offsetting financial costs, and implementing reminder systems.

SOA06-652-14 From symptoms to treatment: A narrative study exploring the journey of older adults with TB in the English Midlands, United Kingdom

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Background: Adults aged 65 years or older who are affected by tuberculosis (TB) have atypical symptoms, experience treatment delays, need extra support during treatment and have poorer outcomes. However, little is known about their healthcare journey. We aimed to fill this gap, taking a narrative approach.

Design/Methods: A purposive sample of English, Urdu and Punjabi speaking participants aged 65 years or older and receiving treatment for active disease were recruited from TB clinics in the English Midlands. Narratives were collected using a single in-depth interview. Data collection started in October 2023 and is ongoing.

Interviews were analysed using a framework based on the patient journey (symptom onset, appraisal, decision to seek health care, receiving diagnosis and starting treatment). Arthur Frank's narrative types (restitution, chaos, and quest) were used to identify narrative themes.

Results: Five English-language interviews are completed to date. Severity and persistence of symptoms or functional challenges triggered healthcare seeking. Partici-

pants felt ignored in primary care and to a lesser extent in secondary care. For most, getting a diagnosis was a relief. For some there was also guilt about potential spread of disease to loved ones.
There was a mix of narrative types. Restitution narratives (where a return to the norm is expected) resulted in delays in presenting to healthcare. All participants experienced chaos narratives (where recovery was not thought possible). Chaos was triggered by a breakdown in trust with healthcare staff, severity of symptoms or medication side effects. All participants took part in the study to help others, enacting a quest narrative (where a person wished to make use of their illness).
Conclusions: Work is needed to encourage early presentation to and considered responses from healthcare providers. Chaos narratives identify areas for improvement. Our ongoing study will furnish more details to confirm these findings and inform potential interventions.

SOA06-653-14 Understanding barriers to TB service uptake in Kano State: Applying behavior change theory perspectives

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Background: To enhance tuberculosis service uptake in Kano State, it is crucial to identify and address the barriers hindering individuals from accessing tuberculosis care. In this study, we aimed to assess, explore, and understand these barriers across four selected LGAs (Dala, Gwale, Nasarawa & Faggae) in the state. Employing the COM-B Model, we mapped these barriers to understand the role of support systems and healthcare providers in mitigating them.
Additionally, we sought to gain insight into the motivations of key influencers and key informants, shedding light on potential strategies to improve tuberculosis service uptake.
Design/Methods: The assessment utilized a qualitative approach. Focus Group Discussions (FGDs) were conducted with TB survivors (n=40), TB patients (n=40), and their treatment supporters (n=40) to explore their perspectives and experiences. Additionally, Key Informant Interviews (KIIs) were carried out with Directly Observed Treatment Short-course (DOTs) providers (n=4) and linkage coordinators (n=4) selected from two randomly chosen facilities in each of the four LGAs.
Results: The findings revealed various barriers hindering tuberculosis service uptake. Four overarching themes emerged from the research: **stigma & discrimination, misconceptions about TB, health system related barriers** and **inadequate information on tuberculosis**.
Other identified barriers which were sub-sets of the four overarching themes were access issues and strong support systems. Community responses like social accountability and gender programs were identified as potential intervention functions to address these barriers and enhance service uptake.
Conclusions: Utilizing an established implementation framework in conjunction with a validated behavioral change theory offered a thorough method for systematically recognizing obstacles and enablers for TB service uptake. Identified interventions and strategies obtained from the participant responses include, advocacy, training, communication, education, access to information, community mobilization, policies to address stigma, improved access to healthcare and ownership. These interventions have the potential to lead to improved tuberculosis service uptake.

SOA06-654-14 Brighter horizons: free chest X-ray services illuminate tuberculosis diagnosis in Kenyan children under 15

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Background and challenges to implementation: Despite advancements in TB control initiatives, children under 15 years old remain disproportionately affected, encountering difficulties of actual diagnosis through molecular tests, timely diagnosis and treatment initiation. Although chest X-rays have proven effective in diagnosing paediatric cases, ensuring optimal access to this technology remains hindered by cost considerations. To address this issue, Amref implemented Chest X-ray services with funding support from the Global Fund, thereby expanding accessibility to this vital diagnostic tool.
Intervention or response: To address the gap in TB diagnosis among children under 15 years old in Kenya, a targeted intervention was launched beginning of 2023 providing free chest X-ray services for children under 15 years using the voucher system. This initiative aimed to improve access to accurate and timely TB diagnosis for young children by leveraging chest X-ray technology. These results were compared with cases reported in 2022. Children under 15 years presenting with symptoms suggestive of TB were offered free chest X-ray examinations at participating health facilities across Kenya. This was made possible through partnerships with 33 sub recipients in the counties.
Results/Impact: In 2023, a total of 12,884 children were notified to the national programme. This was an increase by 26% from 2022. Compared to pre-intervention period, age groups of under 5, 5-9 and 10-14 saw an increase in

identification by 27%, 23% and 26% respectively. The implementation of free chest X-ray services led to a notable improvement in diagnostic yield, with a higher number of TB cases detected during the post-intervention period. This contributed to reduced disease progression and transmission within communities.

Conclusions: The intervention proved to be an effective strategy in identification of TB cases in this vulnerable population. By addressing the gap in TB diagnosis among young children, this has the potential to significantly impact TB control efforts and improve health outcomes in Kenya.

SOA06-655-14 Video-supported treatment of tuberculosis in Tashkent: is it possible to control adverse events?

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Background: Monitoring of adverse events (AEs) is a crucial component of tuberculosis (TB) treatment. The World Health Organization recommends video-supported treatment (VST) as a method to improve adherence to TB treatment without daily visits to medical facilities.

Design/Methods: A comparative cohort study included 60 TB treatment patients, controlled via video observation (VO) (30 patients aged 41.0±2.6) and standard directly observed treatment (sDOT) approach (30 patients aged 46.3±2.6). Information on AEs during TB treatment was gathered by analyzing documents in DOT rooms and patient surveys.

Results: It was noted that the number of TB patients reporting AE symptoms in VO-controlled treatment was 16 (53.3%) patients, while in sDOT it was 19 (63.3%) patients. The reliability of AE control in VO was 1.42 times lower than in sDOT, determined by the frequency of AEs, being 0.77 in VO and 1.1 in sDOT. Differences were also noted in the AE structure depending on treatment control, where symptoms „nausea, vomiting, headaches, joint pain" were 1.5-3 times more frequently observed in sDOT, and symptoms „allergy and weakness" only in sDOT, while symptoms „diarrhea, seizures, and insomnia" – only in VO.

Evaluating the number of AEs in TB treatment, it was noted that in VO control, single AEs were more frequently observed, accounting for 36.7% (11 cases) versus 26.7% (8 cases) in sDOT. Meanwhile, the number of AEs with 2 or more symptoms was significantly more often observed in sDOT, 36.7% (11 cases) versus 16.7% (5 cases) in VO.

Conclusions: Preliminary data from a limited comparative cohort study revealed weak sides in video-observed treatment for controlling AE cases. Video-supported treatment needs to be strengthened with approaches for monitoring organ and system damage, including developing „organ pathology visualization cards" and mechanisms for video reporting on them. These measures will strengthen the national TB program in overcoming the burden of tuberculosis.

SOA06-656-14 Tuberculosis in liver transplant recipients: IGRA-based pre-transplant screening performance and active tuberculosis post-transplant

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Background: Liver transplant (LT) recipients are a high-risk group for tuberculosis (TB), however, TB infection screening and prevention is not ideal under the current policy.

This study aims to understand the prevalence of latent tuberculosis infection (LTBI) among liver transplant candidates and identify the risk factors.

Design/Methods: We retrospectively reviewed preoperative data from liver transplant patients at the Liver Transplantation Center of Huashan Hospital in Shanghai between 2019 and 2022. Patients who underwent pre-operative LTBI screening were included in this study.

Pre-operative LTBI screening includes clinical interviews, radiograph, and interferon-gamma release assay (IGRA) testing. Follow-up was conducted through outpatient visit, online questionnaires or phone calls.

Results: A total of 685 LT patients were reviewed, and 480 (70.0%) screened for TB infection before LT. After ruling out active TB disease, 11.5% (55/480) subjects were IGRA-positive indicating LTBI. Indeterminate IGRA results were seen in 57 (11.9%) patients who underwent Quantiferon-TB Gold (QFT) test.

Multivariate analyses identified lung calcification lesions (OR 6.15; 95% CI, 2.11-17.94; P=0.001) and TB history (OR 37.68; 95% CI, 5.98-237.4; P<0.001) as significant risk factors for LTBI.

Immunosuppressant therapy, moderate or severe anemia, low serum albumin level (<30g/L) and higher Model for End-Stage Liver Disease (MELD) score (>20) are significantly more frequent in the IGRA negative group.

Follow-up revealed 3 cases of TB reactivation after liver transplantation. The median follow-up time is 678 days (IQR 409-934). The overall incidence of TB was 350 cases per 100,000 patient-year.

Multivariate analyses of risk factors for IGRA positive result.

	OR	95%CI	*P*
TB history	37.684	5.982-237.396	<0.001
Lung calcification lesions	6.153	2.11-17.944	0.001
Moderate or severe anemia	0.305	0.016-0.803	0.016
Immunosuppressant therapy	0.268	0.076-0.949	0.041
Albumin<30g/L	0.324	0.105-1.001	0.05
MELDNa>20	0.171	0.055-0.533	0.002

TB:Tuberculosis; MELDNa: Model For End-Stage Liver Disease

Multivariate analyses of risk factors for QFT indeterminate result.

	OR	95%CI	*P*
LT cause: Alcoholic Hepatitis	7.796	1.632-37.236	0.01
LT performed wihin three days of IGRA test	2.607	1.038-6.548	0.041
Moderate or severe anemia	3.857	1.749-8.508	0.001
CD4<200*(10^6)/dL	3.598	1.607-8.055	0.002
Albumin<30g/L	3.412	1.272-9.155	0.015
MELDNa>20	7.658	3.335-17.584	<0.001

LT: Liver Transplantation; IGRA: Interferon Gamma Release Assay; MELDNa: Model For End-Stage Liver Disease

Conclusions: IGRA based LTBI screening yielded moderate LTBI prevalence (11.5%) among LT patients, with a high indeterminate rate undergoing QFT tests. LT recipients need effective LTBI screening. Clinicians should be vigilant in monitoring immune status and testing for LTBI in LT patients, particularly those with TB history or calcification lesions on lung CT.

SOA06-657-14 Substance use patterns among people undergoing drug-resistant tuberculosis treatment in South Africa

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Background: Substance use is associated with reduced care engagement and poor TB outcomes. The syndemic of substance use and TB is well noted in the literature, but understudied in South Africa (SA). We explored the epidemiology of substances used during drug-resistant (DR-TB) treatment in SA to develop strategies for co-management of TB and substance.

Design/Methods: Participants were sampled consecutively from within a parent study testing the integration of DR-TB treatment in primary care in KwaZulu-Natal and Eastern Cape provinces. 94 of 100 intended participants provided urine samples for one-time analysis. Duplicate results were excluded. Research assistants used a 12-panel point-of-care drug test to conduct urinalysis, results were verified by a clinician. Results are presented using descriptive statistics and x^2.

Results: Of 94 participants tested, 61.7% (n=58) were male, 75.5% (n=71) identified as Black African, 60.2% (n=56) were HIV co-infected, and average age was 38 (IQR31.6-44.5). 60.4% tested positive for any substance, while 31.9% tested positive for polysubstance use. Fentanyl (32%), alcohol (25.5%) and marijuana (24.5%) were most frequently positive while cocaine, oxycodone, and barbiturates were absent. Only 6% of the sample self-reported marijuana use and one individual disclosed opiate use. People who tested positive for substances were more likely to identify as non-Black (p=0.03), substance use did not differ by HIV status.

Fentanyl	**Frequency**	**Percent**	**Methamphetamine**	**Frequency**	**Percent**
Negative	63	67%	Negative	83	88.30%
Positive	31	32%	Positive	11	11.70%
Alcohol	**Frequency**	**Percent**	**Morphine**	**Frequency**	**Percent**
Negative	70	74.50%	Negative	84	89.36%
Positive	24	25.50%	Positive	10	10.64%
Marijuana	**Frequency**	**Percent**	**Buprenorphine**	**Frequency**	**Percent**
Negative	71	75.50%	Negative	84	89.36%
Positive	23	24.50%	Positive	10	10.64%

Table 1. Most frequently positive substances on urine-based point-of-care test.

Conclusions: These results indicate high levels of substance use among people undergoing DR-TB treatment. As participants reach TB outcome, we will explore whether particular substance use patterns are associated with loss from TB care. We have not seen fentanyl use documented with such frequency in South Africa. Standardized medical TB histories include self-report of alcohol, marijuana, methamphetamine, and methaquinolone but do not systematically assess opiate use. The high risk of fentanyl-related overdose makes this a priority area for future research.

SOA06-658-14 TB preventive treatment follow up and completion matters to end TB

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Background and challenges to implementation: Tuberculosis preventive treatment(TPT) for latent tuberculosis infection (LTBI) is managed by tuberculosis (TB) dispensaries in Turkey. Close contacts (CCs) are recorded individually to the file of index TB patient. ID/passport numbers are used for TB and TPT registration to match CCs with index case. All recordings are archived endlessly.
In 2018, National Electronical Recording and Reporting System (NTS) was updated to enable TB Dispensary

health care workers (HCWs) to reach or call all household contacts. When CCs registered at a dispensary for screening, HCWs can follow up them via NTS all over the country ensuring continuation of TPT.

Intervention or response: According to updated Turkish National TB Guideline; -regardless of age- TPT can be given to CCs under monitoring. Both household and other (workplace,school, hospital) CCs are screened periodically throughout treatment. All CCs (both native and foreign citizens) are informed about TB and TPT, followed up monthly.

In this study, 01.01.2013-31.12.2022 annual TPT registration data of CCs who started TPT at Ankara Altındağ TB Dispensary evaluated retrospectively. TPT follow up and post TPT period were analyzed.

Results/Impact: In 10 years, 3147 TPT were initiated and 1683 (53.5%) of them registered as CCs. Later, 69/1683 were excluded from the study because the index cases diagnosed NTM. TPT with isoniazid: taking 180 days in 9 months and TPT with rifampisin: taking 120 days in 6 months accepted as completion.

According to DST of index case, 1647 CCs were received isoniazid and 30 were rifampisin. TPT completion results are shown in Figure 1.

AGE	TOTAL TPT INITIATION	TPT COMPLETION	LOST TO FOLLOW UP	TB DISEASE DURING TPT	ADVERSE EFFECTS	TB DISEASE AFTER LOST TO FOLLOW UP TPT	TRANSFERRED	TB DISEASE AFTER TPT COMPLETION	OTHERS
0-15	481	404 (84%)	61 (12,7%)	3	0	0	7	0	6
16-35	569	437 (76,8%)	117 (20,6%)	0	3	1	7	1	3
36 and over	564	459 (81,4%)	79 (14%)	2	8	0	6	1	9
TOTAL	1614	1300 (80,5%)	257 (15,9%)	5 (0,3%)	11 (0,7%)	1 (0,06%)	20 (1,2%)	2 (0,1%)	(1,1%)

Conclusions: Although 80% TPT completion rate is acceptable; when TPT lost to follow up rates according to age is analyzed we found that it is significantly high at young adults. To improve TPT completion at all groups, we need more national and international collaboration. More research and new policies are essential to END TB.

SOA07 Motivation through communication

SOA07-659-14 Referral of persons with presumptive TB by the community influencers using pictorial referral slips: A pilot from selected tribal districts of India

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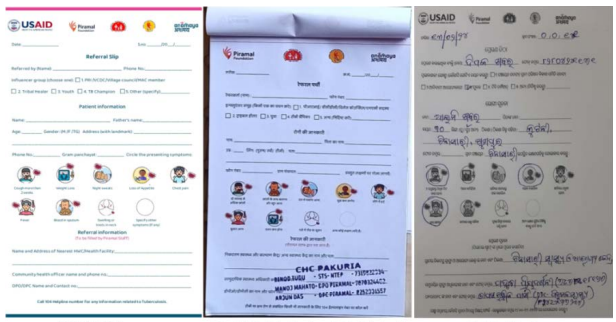
Background and challenges to implementation: To foster community ownership in the effort to eliminate TB, it is crucial to educate them about disease to a point where they can readily recognize individuals who are affected by it. The information education communication (IEC) material displayed in health facilities and public places are often verbose. So, in a country where literacy rate of tribal population is 59% against the countries' 74%, impact of such material is difficult to assess.

Intervention or response: To facilitate identification of a person with presumptive TB and their referral, a referral slip cum IEC material was designed where symptoms of TB were given in picture. It was created in English and translated in eight other languages, including, Assamese, Garo, Hindi, Khasi, Marathi, Mizo, Nagamese, Odiya. Each village was mapped with functional testing facility and its details were given on slip. The facility staff was onboarded for prompt testing of referred individuals. Across 74 districts in 10 states, community influencers (CIs) were oriented on basics of TB, program schemes, services and referral of person with presumptive TB to nearest facility. With their commitment to support project, they were given a referral slip booklet and requested to share a video on producing good sputum sample with persons with presumptive TB.

Results/Impact: Between May 2023 and February 2024, a total of 2,493 CIs referred 13,247 persons with presumptive TB. Of those referred, 98% were tested at facility indicated on referral slip. Pilot diagnosed 376 (3%) TB cases including two cases of extra-pulmonary TB. In this process, none of CIs were given any monetary benefit.



Referral slip in English | Referral Slip in Hindi with address of mapped testing facility stamped | Filled referral slip in Odiya

Conclusions: Transition of a pilot to a sustainable solution depends upon simplicity of innovation, manner of imparting the knowledge and capability of system to cater demand thus generated. Accordingly, this pilot is able to demonstrate how continuous efforts from an informed community can contribute to program.

SOA07-660-14 The role of civil society organisations in ensuring the implementation of the UNHLM on TB 2023

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Background and challenges to implementation: In 2023, United Nation (UN) Member States reconvened to assess progress from the 2018 UN High-Level Meeting (UNHLM) Political Declaration. Civil society, including TB affected communities, played a pivotal role in ensuring inclusivity and in country ambition throughout the UNHLM process. Their engagement ensured that TB priorities were at the forefront of discussions, holding member states accountable for their commitments.
Intervention or response: Stop TB Partnership Indonesia (STPI) conducted pre- and post- UNHLM engagement activities, including surveys to gather inputs on priorities for the UN Political Declaration on TB from non-government stakeholders. During the UNHLM on TB, STPI supported a side event focused on post-pandemic lessons and sustainable financing for impactful TB investments. The post-UNHLM activities involved disseminating outcomes and learnings to multi stakeholders.
Results/Impact: The pre-UNHLM survey engaged 85 respondents, primarily from CSOs and TB communities. The survey results were used to inform key government bodies, including the Ministry of Foreign Affairs and the Ministry of Health. During the UNHLM, a joint side event hosted by the Governments of Indonesia and Poland, in partnership with STPI, was attended by 78 senior level participants. The in-country post-UNHLM dissemination involved 192 attendees, primarily CSOs, who formulated capacity enhancement themes for government and stakeholders' real actions' oversight in implementing the UN Political Declaration outcomes. As part of dissemination, STPI held a dialogue with Presidential Candidate Teams, attended by 168 offline and 8,376 online participants, resulting in political commitments to achieve TB elimination targets.
Conclusions: Civil society's engagement in the UNHLM on TB 2023 process was instrumental in advocating commitments and ensuring that community voices were heard. Collaborative efforts between government and non-government stakeholders are essential for translating political commitments into tangible actions. The active participation of TB communities and civil society remains crucial for achieving the goals of the UN Political Declaration.

SOA07-661-14 Re-imagining TB care: A multi-platform communications initiative to improve understanding of TB and mitigate stigma in Vietnam

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Background and challenges to implementation: Tuberculosis (TB) poses a significant public health challenge in Vietnam, and it is exacerbated by widespread misconceptions and social stigmas associated with the disease. Stigma causes people with TB disease to conceal their health status, limit their access to social support, posing risks to their overall well-being and leading to incomplete contact investigations.
Intervention or response: We co-designed a communications campaign with local partners to deliver educational information through emotionally engaging, personal stories of TB-affected individuals, targeting different age groups through specific media channels. Under 25s were engaged with a TikTok dance challenge that collaborated with social media influencers. The campaign's Facebook page targeted the 25-64 age group due to their higher TB incidence rates in Vietnam. We also developed Chuyenvelao.vn (Story of TB), the first website in Vietnam dedicated to spreading awareness about TB through easy-to-understand content and personal stories. The intervention was evaluated by monitoring reach, views, impressions, and comment responses.
Results/Impact: Over nine months, the campaign achieved 1,115,923 impressions on Facebook, 563,991 views on TikTok and 8,853 website visits. Qualitative data collected from over 110 comments indicated that

the campaign fostered empathy and dispelled misconceptions. Two examples include: *„You're stronger than you know! Remember, TB is beatable with the right treatment regimen and determination. Keep pushing forward!" & „Even the strongest among us need support. Don't hesitate to seek medical help and start your journey towards healing. We're here for you, sending love."*

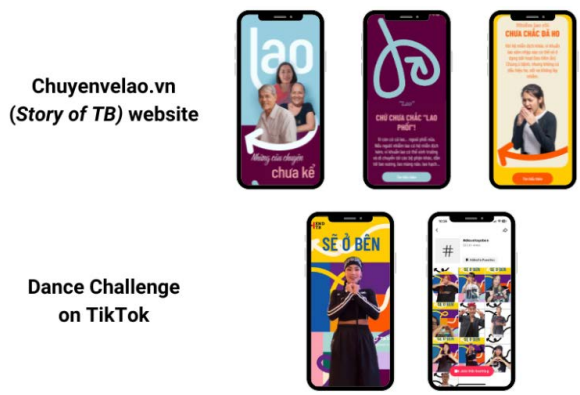

Figure. The campaign website and TikTok challenge.

Conclusions: The communication campaign leveraged multiple platforms to disseminate TB-related information and mitigate stigmas, tailoring content to specific age groups. The results suggest that a multi-platform, age-tailored approach is crucial for successful health communication campaigns, especially when dealing with stigmatized diseases like TB.
This intervention serves as a model for future efforts to engage diverse audiences and combat health-related stigmas.

SOA07-662-14 The role of Pidgin English in TB awareness creation: A study of KNCV Nigeria's online radio program, THE TB TORI

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Background and challenges to implementation: Pidgin English is a language in Nigeria that consists of words and phrases derived mainly from the Queen's English, as well as various local languages. It was created during the 17th and 18th centuries to facilitate communication between European pioneer explorers/traders and the various native tribes they encountered along the way.
Due to the country's multilingual and multicultural nature, effectively communicating TB messages can be challenging. This study seeks to explore how people can take appropriate action when TB messages are conveyed in a language they understand.

Intervention or response: The study compared the effectiveness of TB awareness messages in Pidgin English on the TB Tori program, an online radio program supported by KNCV Nigeria that airs every Saturday on WAZOBIA FM, with other TB awareness content published by the communication team in English.
The responses to these posts on KNCV Nigeria's Facebook page were tracked and categorized based on reach, comments, and health-seeking questions requiring feedback. The period under review was from July to August 2023.
Results/Impact: During the specified period, KNCV Nigeria's Facebook page published four TB Tori program flyers and four TB Tori questions in Pidgin English. These posts reached 12,799 people, eliciting 329 post reactions, 64 comments, and 3 inbox messages from people who were seeking information about TB disease and how to obtain help by calling the TB hotline 3340.
In comparison, KNCV Nigeria's six organizational posts reached 4,706 people, receiving 201 post reactions and 18 comments and 0 inbox messages.
Conclusions: The study concludes that Pidgin English is more effective in communicating TB messages in Nigeria, as evidenced by the higher reach and engagement of TB Tori program posts compared to the organizational posts in English.
Therefore, the study recommends that TB messages be tailored to the language people are most likely to understand.

SOA07-663-14 Addressing TB myths through social media campaigns: Lessons from KNCV Nigeria LinkedIn page

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Background and challenges to implementation: Myth is a widely held but false belief or idea, with synonyms including misconception, fallacy, fantasy, and fiction. Tuberculosis is the eight most common cause of death among communicable, maternal, neonatal, and nutritional diseases. In Nigeria, many factors contribute to the prevalence of tuberculosis, including myths that have taken hold in communities and become reasons for people to avoid testing and treatment.
These myths include beliefs such as „it's just an ordinary cough," „two shots of herbal medicine can make you better," and „TB is a disease of the poor."
Intervention or response: KNCV Nigeria published a series of strategic tuberculosis social media campaigns on their LinkedIn page to debunk these myths and mis-

information. Responses to these posts were tracked and categorized by impressions, reactions, and reposts during the period of January to March 2024.
Results/Impact: The results showed that the nine posts addressing TB myths and misinformation reached 5,375 people and received 356 reactions and 25 reposts. Interestingly, healthcare workers were among the most active in sharing and reposting these messages, which helped to spread awareness of TB to their connections. In comparison, the nine organizational posts shared during the same period reached 2,602 people, received 333 reactions, and were reposted 10 times.
Conclusions: By targeting healthcare workers, the social media campaigns were able to reach more people and generate more engagement than traditional organizational posts. The study revealed that LinkedIn is an effective platform for addressing tuberculosis myths and misinformation. This approach can help to increase awareness of tuberculosis and encourage more people to seek testing and treatment.

SOA07-664-14 The impact of the TB community on policy formation and implementation of TB prevention and care measures in Ukraine

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Background and challenges to implementation: Despite significant efforts in the fight against TB in Ukraine, there are a number of factors that affect the TB control measures introduced in response to the epidemic. War, insufficient human and financial resources, stigma, lack of multisectoral accountability and interaction slow progress in overcoming TB.
Intervention or response: With the leadership of NTP, the TB community in Ukraine is actively involved in solving these challenges. The community's actions cover a wide range of interventions on measures to promote the detection of people with TB, integrated testing, including close to war zones, caring for children with TB and accompanying people with TB in their path to cure, and the results obtained are transformed and become the basis for advocacy at different levels.
Results/Impact: Main achievements for 2023:
- Formation of proposals for strategic guidance documents based on the UN Political Declaration and MAF-TB.
- Development of draft standard „Algorithm for the provision of medical services to people with TB without identity documents," „Guidelines for European NGOs on participation in the process of identifying people with TB and a possible role in their further treatment" and manual „What Journalists Need to Know about TB."
- Active engagement of the TB community in UN Multi-stakeholder Hearing on TB and national processes for UNHLM preparation.
- Sustained representation of TBPeopleUkraine at various regional and national levels, including CCM.
- Successful implementation of the training course „Formation of a tolerant attitude of medical workers to TB patients and KVPs," reaching 4799 medical workers by December.

Conclusions: Thus, the efforts of the TB community in Ukraine are able to provide not only a significant impact and positive contribution to the processes of policy-making and implementation of TB control measures, but also a change in attitude, which has been based on prejudice and discrimination for a long time, which will contribute to progress in this area.

SOA07-665-14 Voices of the community for people-centered TB care services: Findings from the first-round community-led monitoring data in three urban settings of Ethiopia, 2023

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Background and challenges to implementation: Ending TB demands putting people first. Millions face ignored challenges like weak healthcare, stigma, and service access. Community-led monitoring empowers them to report these issues, hold governments accountable, and advocate for better care. By sharing their experiences, they drive change and ensure their rights are upheld. It's people at the heart of ending TB.
The objective of this articles was to analyze the community led monitoring data and generating evidence on untouched aspect of the program and identifying way to strengthen community led monitoring activity.
Intervention or response: Paper-based structured assessment tool was used for affected communities to report challenges and analyse trends in TB care barriers, human rights violations, and stigma. Data collection involved procedure observations and interviews with service providers and TB patients across three urban settings in Ethiopia. Community representatives, including civil society members and religious leaders, participated. Collected data was entered into an Excel database to track trends. Debriefing events were held at regional health bureaus to discuss findings and propose solutions.
Results/Impact: Community groups monitored 48 health facilities (37 in Addis Ababa, 6 in Dire Dawa, and 5 in Harar). In 65% of facilities observed high malnutrition, particularly among DS-TB patients particularly acute in Harar (80%), compared to Dire Dawa (50%) and Addis

Ababa (65%). Stigma was observed in 5 facilities. Accessing DOTs was hindered by transportation costs, time constraints, and long waits. Only 20% of facilities were clean and safe, and 18% of patients lacked financial support for X-ray/biopsy. GeneXpert delays were reported in 18% of facilities, higher in Harar (20%).
Conclusions: Community monitoring activities assist in identifying program challenges which are not captured in routine health information systems, providing communities with insights into service provision and their role in the TB program. This synthesizing of the monitoring data revealed critical challenges requiring urgent responses from the program.

SOA07-666-14 Detecting asymptomatic TB in contact investigation activities employing CXR-CAD in Yangon, Myanmar

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Background and challenges to implementation: The 2018 national prevalence survey highlighted the existence of subclinical TB. In Myanmar, Yangon region has a high TB prevalence, with 79% of symptomatic people seeking private sector medical care, necessitating urban-specific measures like strengthening public-private mix (PPM). The Myanmar Medical Association (MMA), with PATH's technical assistance, is conducting contact investigation activities among households and close contacts to ensure people at risk of TB have access to quality TB services under the HIV/TB Agency, Information and Services Activity project.
Intervention or response: MMA engaged 117 PPM general practitioner clinics, which networked with CXR facilities, augmented with computer-aided detection (CAD) and 34 volunteers in 12 townships. Volunteers conducted contact investigations in all contacts of people with TB for both bacteriologically confirmed (BC) and clinically diagnosed cases, referring them to take CXR regardless of signs and symptoms.
Results/Impact: Between October 2022 and September 2023, MMA identified 4531 contacts and screened 2968 (65%) contacts using CXR CAD and identified 240 (8%) as presumptive TB. Following the evaluation of CXR findings, clinical presentation, and bacteriological results, 49 people were diagnosed with TB, nine of whom were BC. Of the 49 people with TB, 29 (59%) showed no TB symptoms and three were BC. The data highlighted the widespread occurrence and the role of CAD in detection of subclinical TB.
Conclusions: Individuals without recognizable symptoms may unknowingly spread the TB infection. Asymptomatic individuals are less likely to seek medical care, lead to delayed diagnosis and treatment, and can progress to active TB disease. Early detection and treatment of subclinical TB can stop the transmission and spread of TB. Therefore, high-risk groups should undergo parallel screening with symptom and CXR CAD, as relying solely on symptom screening may overlook subclinical TB cases. Detecting subclinical TB is critical for enhancing TB case notifications, achieving the END TB goals, and reducing TB burden.

SOA07-667-14 All for one, but one for all? Combining computer-aided radiography and specimen pooling to optimise TB diagnostic algorithms

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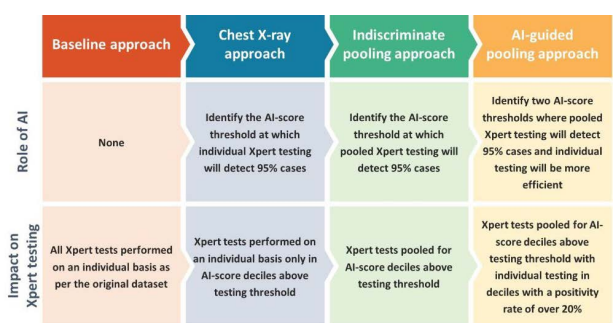
Background: Less than 50% of people with tuberculosis (TB) were diagnosed using rapid molecular diagnostic tests due to resource-constrained public health budgets. The use of chest X-ray (CXR), artificial intelligence (AI) and pooling each have the potential to optimize testing. We modeled the savings and potential expansion of testing coverage from the combined use of these strategies.
Design/Methods: We used Xpert MTB/RIF Ultra (Xpert) test positivity rates segmented into 10 AI probability score bands for TB using CAD4TB v7 (Delft Imaging, The Netherlands) or qXR v3 (Qure.ai, India) from active case finding conducted in Bangladesh, Nigeria, Vietnam and Zambia. Four incremental approaches were modeled involving CXR interpretation using AI software to indicate individual and pooled testing with a sensitivity of 95%. We calculated additional and cumulative savings over the baseline of universal Xpert testing, as well as the theoretical expansion in diagnostic coverage.



Results: For all four countries, CXR screening alone yielded the highest cartridge savings. The optimal combination was to use AI to triage out individuals in low AI score bands, indicate pooled testing in persons with moderate AI scores and recommend persons with high AI scores for individual testing. This approach resulted in cumulative Xpert test savings over baseline ranging from 50.8% in Zambia to 57.5% in Nigeria and 61.5% in Bangladesh and Viet Nam. Using these savings, diagnostic coverage theoretically could be expanded by 34% to 160% across the different approaches and countries.
Conclusions: Using a combination of CXR, AI and pooling can reduce the use of TB diagnostic consumables to extend molecular tests to more people in need. However, finding the optimal AI thresholds and pooled testing strategy is highly country-specific, so that prior local calibration towards bespoke combination approaches may be needed for differing populations and settings.

SOA08 Advanced HIV

SOA08-668-14 Sepsis in adults living with HIV in Africa: Informing new empiric therapy

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Background: An estimated 3.5 million deaths from sepsis occur annually in sub-Saharan Africa. Sepsis is associated with high mortality, especially in people living with HIV (PLWH). Mycobacterium tuberculosis (TB) is being increasingly recognized as the causative sepsis pathogen in Africa. Although early antimicrobial therapy decreases sepsis mortality, the optimal empiric treatment for sepsis in high HIV and TB settings is unknown. We performed an interim analysis of the ATLAS multi-site trial to elucidate sepsis etiology in PLWH in East Africa and to inform a new empiric antimicrobial regimen for sepsis.
Design/Methods: The ATLAS trial is a multicenter, randomized trial of early and/or high dose empiric anti-TB therapy in addition to ceftriaxone in PLWH admitted with sepsis to hospitals in Tanzania and Uganda (#NCT 0461898). Participants included in the analysis were assessed for TB by urine LAM (Alere), mycobacterial blood culture, sputum smear or culture, and sputum or urine Xpert MTB/Rif Ultra (Cepheid). Participants were also evaluated for other pathogens with routine aerobic blood and urine cultures with drug susceptibility testing.
Results: Of 207 participants included in the analysis, 115 (56%) were positive for TB by >=1 diagnostic test. Overall, 44 (21%) had positive blood cultures and of those, 29 (66%) grew TB. Among non-TB pathogens identified from blood (n=15) and urine (n=59) cultures, the most common pathogens identified were *Klebsiella pneumoniae* (25/74, 34%), *Staphylococcus aureus* (17/74, 23%), *Escherichia coli* (11/74, 15%) and *Pseudomonas aeruginosa* (5/74, 7%). Of 19 Gram-negative pathogens for which susceptibility testing was available, 6 were ceftriaxone-resistant, and 12 were amoxicillin-clavulanate resistant. A proposed empiric sepsis regimen is depicted in *Figure 1.*

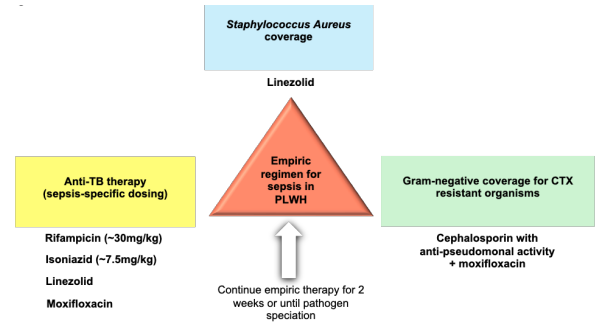

Figure 1.

Conclusions: Our results strongly suggest that anti-TB agents should be included in the initial empiric treatment of sepsis in HIV positive adults in Africa. Additionally, anti-staphylococcal and ceftriaxone-resistant Gram-negative coverage should be considered.

SOA08-669-14 The association of *NAT2* genetic polymorphisms with TB treatment outcomes and mortality in persons living with HIV in Thailand

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Background: *NAT2* polymorphisms affect isoniazid metabolism, potentially leading to tuberculosis (TB) treatment failure in rapid acetylators. Its impact on treatment-related outcomes in persons living with HIV (PLWH) is unknown.

Design/Methods: This study assessed the association of *NAT2* genotypes with TB treatment outcomes and mortality among PLWH starting isoniazid-containing regimens. In this prospective cohort study (2005-2011) in Chiang Rai province, Thailand, we analyzed clinical and host genetic data of TB patients with mortality data from the national vital registration system. *NAT2* genotypes—rapid, intermediate, and slow acetylator (RA, IA, SA) types—were determined based on single nucleotide polymorphisms from six loci. Multivariable logistic regression model was used to estimate adjusted odds ratios (aORs) for unfavorable outcomes (failure/default/died) based on the World Health Organization's definitions for TB treatment outcome, as well as for 6-month and 1-year all-cause mortality, comparing RA and SA types to IA.
Results: Of 132 individuals analyzed, unfavorable outcomes occurred in 25 (19%) and deaths occurred in 21 (16%) within 6 months and 31 (23%) within 1 year. Baseline characteristics were evenly distributed across genotypes (RA: 30 [23%], IA: 50 [38%], SA: 52 [39%]), except for imprisonment history and chest radiographic findings. Adjusting for these factors, PLWH with RA (aOR: 2.05, 95% confidence interval [CI]: 0.60-6.96) or SA (aOR: 1.78, 95%CI: 0.61-5.20) types were more likely to have unfavorable outcomes compared with IA type, although not significant.
Notably, those with RA type had 3 times higher odds of 1-year mortality (aOR: 3.16, 95%CI: 1.01-9.94) compared with IA type carriers. Furthermore, PLWH carrying RA or SA types were at an increased risk of death within 6 months (RA, aOR: 3.64, 95%CI: 0.94-14.0; SA, aOR: 1.86, 95%CI: 0.55-6.26) and 1 year.
Conclusions: In PLWH, the *NAT2* RA type may independently predict higher 1-year mortality under isoniazid treatment, emphasizing the need for tailored treatment strategies.

SOA08-670-14 Cepheid TB host response measurements as prognostic biomarkers in TB meningitis: A prospective cohort study

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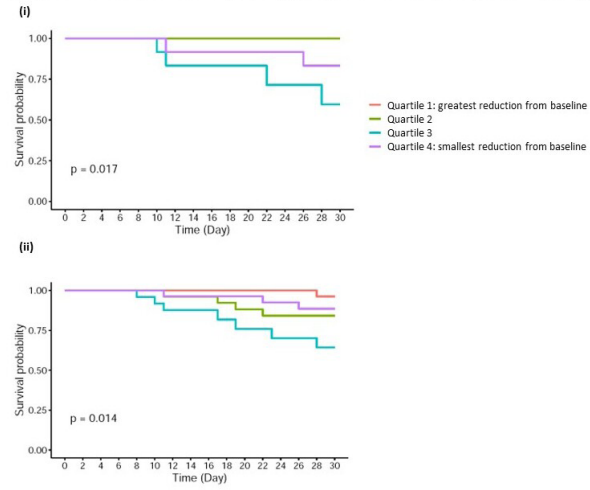
Background: Biomarkers of effective treatment response in TB meningitis (TBM) do not exist. The Cepheid blood-based Xpert MTB-host response (HR) test generates a 'MTB score' based on mRNA expression of 3 genes. We investigated whether MTB HR scores could be used as predictive prognostic biomarkers.

Design/Methods: We prospectively recruited adults with definite/probable TBM from two hospitals in Kampala, Uganda. Whole blood was collected at baseline and day7 of TBM treatment for Xpert MTB-HR testing. Whole blood was run prospectively. We investigated for associations with mortality by baseline and day-7 MTB HR Cepheid scores and change from baseline in MTB HR score at day-7 (as a continuous variable by quartiles). We assessed 30-day mortality.
Results: From June 2022 to March 2024, we recruited 197 participants with definite (n=78) or probable TBM (n=119). Participants' median age was 35 years, 52% were female, and 88% were HIV-positive, of whom 29% were receiving anti-retroviral therapy. Overall, 30-day mortality was 26.7% (95%CI: 19.7%-33.2%). Participants who died vs. survived to 30-days did not differ in their MTB HR scores either at baseline (p=0.74) or at day 7 (p=0.25). There was possible evidence (p=0.081) that the decrease in MTB HR score was greater amongst participants with definite TBM who survived (median MTB HR day 7 score change =-0.33 units) vs. those who died (median change=+0.35 units). Among TBM participants surviving 7 days, those in the quartile with the greatest reduction from baseline had the lowest 30-day mortality of 3.7% (95%CI: 0%-10.6%) as compared to the other quartiles (p=0.02).

Figure 1: 30-day mortality stratified by change in Cepheid TB host response score from baseline quartile (i) amongst 50 adults with definite TB meningitis and (ii) amongst 115 adults with definite/probable TB meningitis:



Conclusions: Our data suggest that serial Xpert MTB HR measurements with decrease in 7-day Xpert HR score may have utility to predict 30-day survival based on among participants with either definite or probable TBM, whereas a single measurement was not predictive.

SOA08-671-14 The accuracy of the Bandim TBscore as a screening tool for TB disease among severely ill inpatients with HIV in Ghana

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Background: Accurate screening tools for tuberculosis (TB) signs and symptoms are crucial to inform clinical decisions for patients living with HIV (PWH) in high TB prevalence settings, particularly where access to triage and confirmatory testing is limited. We evaluated the Bandim TBscore as a screening tool for TB disease in a cohort of severely ill PWH on medical admission in Ghana.

Design/Methods: The TBPOC-cohort (ClinicalTrials.gov NCT04122404) enrolled adult PWH with signs and symptoms of TB, and/or severely ill, and/or with advanced HIV, admitted to the medical wards of three hospitals in Ghana from October 2019 to January 2022.

Upon admission, we assessed self-reported symptoms and clinical signs included in the 13-point Bandim TBscore. The TB reference standard used was a composite of confirmed TB (sputum culture-positive or any sample Xpert MTB/Rif-positive or urine Determine LF-LAM-positive) and clinical TB (sputum smear microscopy-positive or referred for TB treatment or TB diagnosed at death).

Results: In this cohort, 382/419 (91.2%) patients had a TBscore, with a median score of 5 (IQR 3-7). Among those with a TBscore, the TB prevalence was 100/382 (26.2%, 95%CI 21.8-30.9) for composite TB, 61/382 (16.0%, 95%CI 12.4-20.0) for confirmed TB, and 39/382 (10.2%, 95%CI 7.4-13.7) for clinical TB.

The area under the ROC curve for the TBscore to distinguish composite TB from no TB was 0.71. At a TBscore cut-off ≥3, the accuracy against composite TB was 95.0% (95%CI 88.5-97.9) sensitivity and 19.9% (95%CI 15.6-24.9) specificity (Table).

The screening sensitivity and specificity was 100% and 1.6% for WHO-recommended 4-symptom screening and 87.7% and 39.8% for chest X-ray.

TB screening strategy	Population	Patients with composite TB identified (true positive)	Patients with composite TB missed (false negative)	Sensitivity (95%CI)	Patients without TB screened negative (true negative)	Patients without TB screened positive (false positive)	Specificity (95%CI)
W4SS (one or more symptoms)	419/419 (100%) patients with a W4SS screening	109/109	0/109	100 (NR)	5/310	305/310	1.6 (0.7-3.8)
Chest X-ray (any abnormality)	204/419 (48.7%) patients with a chest x-ray	71/81	10/81	87.7 (78.5-93.2)	49/123	74/123	39.8 (31.5-48.8)
TBscore ≥3	382/419 (91.2%) patients with a TBscore	95/100	5/100	95 (88.5-97.9)	56/282	226/282	19.9 (15.6-24.9)
TBscore ≥4	382/419 (91.2%) patients with a TBscore	90/100	10/100	90 (82.4-94.5)	103/282	179/282	36.5 (31.1-42.3)

Abbreviations and definitions: TB=Tuberculosis; CI=Confidence interval; W4SS=WHO recommended 4 symptom screening; Xpert=Xpert MTB/Rif, Cepheid, Sunnyvale, California; Bandim TBscore=A 13-point clinical score consisting of 6 signs (anaemia, tachycardia, lung-auscultation finding, fever, low body-mass index below 18 and 16 km/m^2, low mid-upper arm circumference below 220 mm and 200 mm) and 5 symptoms (cough, dyspnoea, night sweats, haemoptysis, chest pain).
Data are n (%). Number of participants with missing values per variable excluded from analysis: chest X-ray (215 patients did not have a chest X-ray or had unavailable chest X-ray results); Bandim TBscore (37 patients had missing Bandim TBscore, mainly explained by not being able to stand for the body weight measurement).

Table. Patients with composite TB identified and missed if different TB screening strategies had been used, n=419.

Conclusions: The Bandim TBscore had suboptimal accuracy to correctly identify patients with presumed HIV-associated TB in our population. To increase screening specificity and facilitate diagnosis in this very ill population with high TB prevalence, systematic molecular rapid diagnostic testing is needed already at the screening level.

SOA08-672-14 Advanced HIV as an ongoing driver of incident TB in Tongaat, KwaZulu-Natal, South Africa

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Background: Tuberculosis (TB) incidence and mortality have been declining in people living with HIV, due in part to the expansion of a universal test and treat policy for HIV in South Africa since 2016. This policy that ensures early access to antiretroviral therapy (ART) regardless of clinical stage, has been a significant intervention aimed at reducing the burden of opportunistic infections such as

HIV-associated TB. We assessed the burden and drivers of HIV-associated TB in a cross-sectional community-based study.

Design/Methods: We reviewed data from an ongoing cross-sectional TB study, that included all adults diagnosed with TB at community health clinics in Tongaat, South Africa. Demographic, clinical, laboratory, and radiological data were extracted from clinical records and study-related case report forms.

We performed a multivariate analysis to identify factors associated with 'recent' or 'no prior' ART exposure in people with TB/HIV co-infection. Ethics approval was obtained from the biomedical research ethics committee of the University of KwaZulu-Natal (BREC/00003408/2021).

Results: Between July 2022 and March 2024, 406 people were diagnosed with TB, 228 (56%) of whom were also living with HIV. Of those presenting with TB/HIV co-infection, 59 (26%) were ART naïve, 22 (10%) had recently initiated ART (<3 months), and 147 (64%) had been on ART for more than 3 months.

Compared with ART-experienced people presenting with TB, recent ART initiation and ART naivety were associated with younger age (aOR 1.05, 95%CI 1.03 – 1.07), lower CD4 count (aOR 4.34, 95%CI 1.84-10.23), and higher sputum smear grade (aOR 3.19, 95%CI 1.32 – 7.77).

Conclusions: Despite a mature universal test and treat strategy for HIV, more than a third of people presenting with TB were either ART naïve or only recently initiated on ART, with advanced immunosuppression. The sociodemographic profile of these individuals may inform targeted interventions for promoting earlier entry into HIV care.

SOA08-673-14 Secondary prevention of TB: Experience from a cohort of people living with HIV on ART in program settings in Nairobi, Kenya, 2012-2021

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Background and challenges to implementation: High tuberculosis (TB) recurrence and mortality rates are observed among people living with HIV (PLHIV). The World Health Organization (WHO) recommends isoniazid preventive therapy (IPT) for PLHIV post-TB treatment. However, limited data exists regarding the impact of IPT on TB recurrence among PLHIV previously treated for TB. This study examines TB recurrence among PLHIV on IPT in 14 clinics in high transmission slums of Nairobi, Kenya.

Intervention or response: This was a retrospective analysis of longitudinal case-based data for PLHIV enrolled on HIV treatment from 2012-2021. We included PLHIV with clinical and bacteriologically diagnosed TB and excluded those with drug-resistant TB, treatment failure, loss to follow-up, or death during TB treatment. Exposure of interest was a six-month course of IPT after completion of TB treatment with outcomes being TB diagnosis after the previous TB episode. We calculated frequencies, median with interquartile range (IQR) and TB incidence per 1000-person-years (1000-PY) and hazard ratios (HR) with 95% confidence intervals (CI). An extended Cox proportional hazard model was fitted accounting for demographics and clinical time varying covariates.

Results/Impact: Among 33,636 PLHIV enrolled from 2012-2021, 3,012 (9.0%), median age 35 years IQR:(29.0-42.0), 52.0% male were eligible and included in the analysis including 1,781(51.4%), who received IPT post-TB. Among those who received IPT post-TB, 14.9/1000-PY had recurrent TB compared with 42.5/1000-PY among those who did not receive IPT. The median time to TB was 6.0 years IQR:(3.6-8.2) among those who received and 2.0 years IQR:(1.0-4.9) among those who never had IPT. Being male and virally non-suppressed were associated with increased TB hazard. HR 2.4, 95% CI:(1.8-3.3) and 1.5, 95% CI:(1.1-2.0) respectively. Post-TB IPT was associated with 88% lower TB hazard: adjusted HR, 0.12, 95% CI:(0.06-0.23).

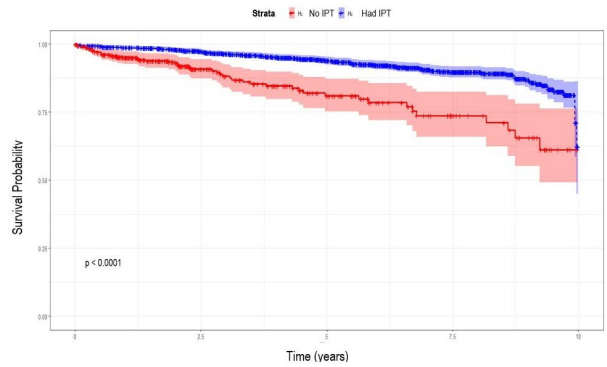

Figure. Tuberculosis free survival among PLHIV stratified by exposure to IPT and duration of follow-up.

Conclusions: Post-TB IPT was associated a lower risk of TB among PLHIV in high transmission setting supporting consideration for the scale-up of this intervention.

SOA08-674-14 Parallel use of low-complexity automated nucleic acid amplification tests and urine lateral-flow lipoarabinomannan assays to detect TB disease in people with HIV: A systematic review

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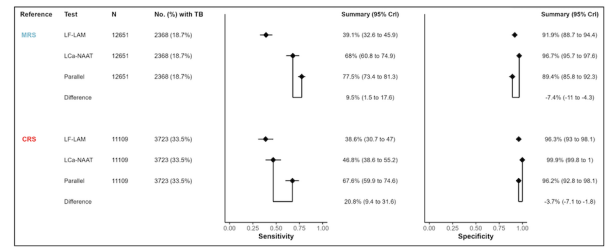
Background: Tuberculosis diagnostic accuracy reviews typically assess individual tests, yet, in clinical practice, tests are often used in parallel. We conducted a systematic review of the diagnostic accuracy of the parallel use of respiratory low complexity automated nucleic acid amplification (LC-aNAAT) tests and urine lateral flow lipoarabinomannan (LF-LAM) assays for detection of tuberculosis disease in people with HIV.

Design/Methods: We searched multiple databases up to 3 November 2023, and reached out to authors of primary diagnostic accuracy studies that paired LC-aNAAT and LF-LAM testing. We assessed study quality using QUADAS-2 and QUADAS-C and performed meta-analyses using a bivariate random-effects model. We used a Bayesian approach to determine the pooled sensitivity and specificity using a culture-based microbiological reference standard (MRS) and composite reference standard (CRS) that also included clinical diagnosis.

Results: We included 27 studies involving 12,651 participants, 2,368 (18.7%) with tuberculosis based on the MRS. Parallel use of respiratory LC-aNAAT and urine LF-LAM had a pooled sensitivity and specificity (95% credible interval) of 77.5% (73.4 to 81.3) and 89.4% (85.8 to 92.3), respectively. Compared to respiratory LC-aNAAT alone, parallel testing increased sensitivity by absolute 9.5% (1.5 to 17.6) and decreased specificity by absolute 7.4% (4.3 to 11.0%). Based on the CRS, pooled sensitivity and specificity of parallel testing was 67.6% (59.9 to 74.6%) and 96.2% (92.8 to 98.1%). Compared to respiratory LC-aNAAT alone, parallel testing increased sensitivity by absolute 20.8% (9.4 to 31.6) and decreased specificity by absolute 3.7% (1.8 to 7.1).

Figure 1. Forest plot of pooled accuracy (all studies combined) by index test: LF-LAM, LCa-NAAT, and their parallel use. The squares represent the pooled sensitivity and specificity, the black horizontal line its 95% credible interval (CrI). The difference in pooled accuracy between parallel testing and LC-aNAAT alone is indicated by a line connecting two squares.



Conclusions: Parallel use of respiratory LC-aNAAT and urine LF-LAM increased overall diagnostic sensitivity to detect tuberculosis disease in people with HIV compared to a single test approach. Especially in settings with high tuberculosis prevalence, the advantage gained in sensitivity might mitigate concerns regarding the loss in specificity.

SOA08-675-14 Pilot programmatic introduction of lateral flow urine lipoarabinomannan assay for diagnosis of TB in people living with HIV: The Philippines experience

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Background and challenges to implementation: Although efforts have been made to address the high burden of human immunodeficiency virus (HIV)-associated tuberculosis (TB) in the Philippines, TB diagnosis in people living with HIV (PLHIV) remains challenging due to difficulties in expectorating sputum and collecting presumptive extrapulmonary (EP) TB specimens, the paucibacillary nature of TB, and lack of timely access to diagnostic services.

Intervention or response: In 2023, TB diagnosis using lateral flow urine lipoarabinomannan (LF-LAM), a simple point-of-care test with improved sensitivity in PLHIV, was piloted in seven HIV care facilities, complementing existing molecular World Health Organization (WHO)-

recommended rapid diagnostic tests (mWRD). PLHIV were assessed for LF-LAM testing eligibility based on WHO criteria and managed according to the specific algorithm by patient setting. LF-LAM and mWRD results defined test positivity and guided treatment initiation. Case detection rate was then compared to a baseline period (July-December 2022).

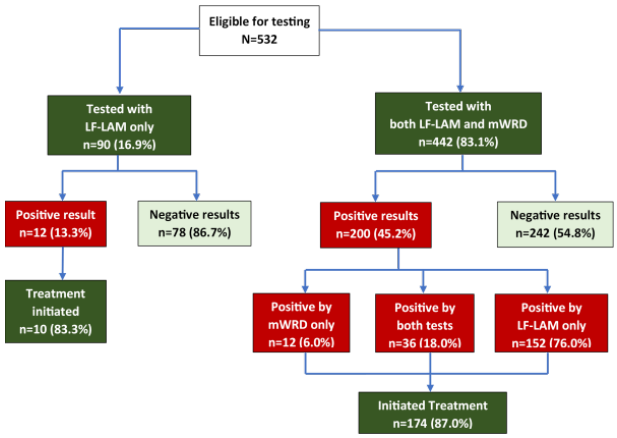

Figure. Distribution of eligible PLHIV per testing type, results and treatment initiation.

Results/Impact: Between July-December 2023, 532 eligible PLHIV received LF-LAM testing. More than 80% were tested with both LF-LAM and mWRD, and 200 (45%) tested positive for TB (of whom 18% were positive on both tests and 76% were positive on LF-LAM only). Ninety patients were tested with LF-LAM only, and 12 (13%) had positive results. The bacteriologically confirmed TB case detection rate increased by almost 20% between pilot and baseline data, highlighting the additive effect of using both tests. Eighty-seven percent of PLHIV with positive LF-LAM results initiated treatment. Turnaround-times from urine specimen submission to diagnosis to treatment initiation were fast with an average of <1 day and 3.5 days, respectively.

Conclusions: LF-LAM may contribute to increasing TB case detection and notification, ultimately improving health outcomes among PLHIV. LF-LAM is feasible to implement under routine programmatic conditions provided that health systems support is in place including training of all relevant healthcare workers.

SOA08-676-14 Diagnostic performance of tNGS and mNGS on TB in a HIV-positive cohort

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Background: Tuberculosis (TB) presents an exacerbated risk due to compromised immune systems in person living with HIV, making TB the leading cause of death among people with HIV. In 2022, around 167,000 people died from HIV-associated TB. Advanced diagnostic technologies such as targeted next-generation sequencing (tNGS) and metagenomic next-generation sequencing (mNGS) offer hope for better management and treatment outcomes for TB.

Our study evaluated in-house mNGS and tNGS TB diagnostic performance in HIV individuals.

Design/Methods: BAL specimens from HIV patients were collected from Beijing Youan Hospital with real-world standard of care (SOC) results, including in-house smear+culture, TB-DNA PCR, Xpert, Interferon Gamma Release Assay (IGRA) and external MALDI-TOF, mNGS from commercial labs.

In-house mNGS was blinded tested. tNGS was blinded tested with Illumina Respiratory Pathogen ID / AMR Panel (RPIP), followed by DRAGEN™ Explify® Pipeline for analysis. Bacteriologically confirmed TB case was defined as culture or GeneXpert MTB/RIF or TB-DNA positive.

Clinically diagnosed TB case was defined as by clinicians basing on signs, symptoms, imaging, lab testing, or diagnostic treatment effectiveness, but not bacteriologically confirmed.

Results: This pilot study recruited 88 samples from 85 HIV individuals. We tested 27 TB samples from 25 individuals and 61 non-TB samples from 60 individuals with tNGS. 16 were confirmed TB and 11 were clinically diagnosed TB. tNGS, mNGS, Xpert and IGRA positive rate in confirmed TB were 0.873(14/16), 0.643(9/14), 0.643(9/14), 0.533(8/15) respectively. Xpert reported 3 DR-TB cases and tNGS reported 2 cases. tNGS reported with extra 1st and 2nd line drug resistance in one case. Both mNGS and tNGS helped differentiate 7 NTM infections.

Conclusions: In our preliminary data tNGS showed higher positive rate than mNGS and Xpert in TB diagnosis. Both tNGS and mNGS showed good differential diagnostic capability on NTM. A study with a larger sample size will be continued.

SOA08-677-14 Immunological predictors of mortality among advanced HIV adults with TB in India

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Background: One of the most common causes of mortality among people with advanced HIV disease is tuberculosis (TB), yet the diagnostic markers are poorly explored. We assessed T-cell activation markers CD38, HLA-DR, and plasma cytokines and compared deaths versus survivors among adults with HIV-only(HIV) and with TB-HIV co-infection (TBHIV) groups.

Design/Methods: We enrolled 30 adults with advanced HIV (CD4 <100 cells/mm^3), 16 with microbiologically confirmed active pulmonary TB, and 14 without. All were TB treatment-naive with or without antiretroviral treatment (ART) at entry. CD38 and HLA-DR expression on CD4+/CD8+ T cells was evaluated by flow cytometry and plasma cytokines were measured by Luminex at entry and week 24 of anti-TB therapy.

Comparison of medians between HIV versus TBHIV and death versus survivors was performed using the Mann-Whitney *U* test. All analyses were performed in R 4.2.1.

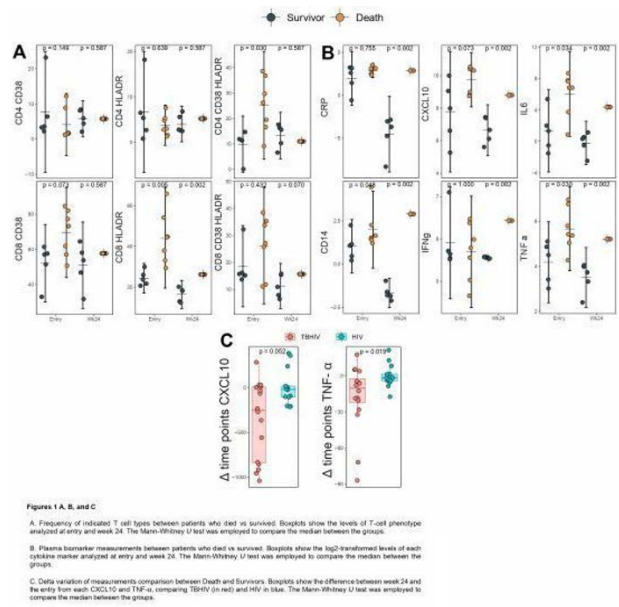
Results: Of the 30 enrolled, 23 (77%) were male, the median age was 44 (IQR, 35–52), and there were 7 (23%) deaths.

All deaths occurred before the week 24 follow-up. At entry, the frequency of CD8+CD38+(p=0.0073) and CD8+HLA-DR+(p=0.005) T cells were higher, in those who died compared to survivors (Fig1A).

Comparing plasma biomarkers among those who died vs survived, we observed no statistical difference for CRP, CXCL10, and

IFNg at entry, however, the levels of IL6(p=0,034), CD14(p=0.048), and TNFα (p=0.030) were significantly higher among those who died (Fig1B).

Delta variation of measurements compared among deaths and survivors showed differences only for CXCL10 (p=0.052) and TNFα (p=0.019) between HIV and TBHIV (Fig1C).



Figures 1 A, B, and C

A. Frequency of indicated T cell types between patients who died vs survived. Boxplots show the levels of T-cell phenotype analyzed at entry and week 24. The Mann-Whitney *U* test was employed to compare the median between the groups.

B. Plasma biomarker measurements between patients who died vs survived. Boxplots show the log2-transformed levels of each cytokine marker analyzed at entry and week 24. The Mann-Whitney *U* test was employed to compare the median between the groups.

C. Delta variation of measurements comparison between Death and Survivors. Boxplots show the difference between week 24 and the entry from each CXCL10 and TNF-α, comparing TBHIV (in red) and HIV in blue. The Mann-Whitney *U* test was employed to compare the median between the groups.

Conclusions: Despite being on ART and TB treatments, elevated and sustained activation of CD8+CD38+HLADR+ T cells was associated with death**.** Plasma markers, IL-6, CD14, and TNFα of inflammation were also associated with subsequent death.

PRINTED POSTER SESSION (PP)

PP19 Finding the missing people with TB

PP19-978-14 Strengthening TB detection and treatment adherence through social contact invitations in Kikuyu and Kabete Sub County, Kiambu County, Kenya

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Background and challenges to implementation: Over the years, contact tracing has primarily focused on identifying household contacts for screening and investigating tuberculosis (TB). However, the yield has not been optimal, especially among men in urban and peri-urban areas. Many of them live alone, with their families residing in villages, posing a challenge in reaching them for TB screening. Additionally, those residing in villages often spend their time with peers in town centers or workplaces. The Mount Kenya region faces a significant challenge of high rates of unmarried men, particularly those with alcohol use disorder.
Intervention or response: We implemented a strategy to engage social contacts by educating TB patients about TB transmission modes and risk factors. All TB patients were tasked with bringing at least one social contact for TB screening, after educating them on identifying symptoms in their social contacts. Community sensitization efforts were also conducted. Patients were informed about the risk of reinfection if they failed to recognize TB symptoms in their friends and family. For those uncomfortable talking to their friends, they invited us to their social gathering areas for TB sensitization and screening. By providing information on transmission and risk factors, we aimed to reduce stigma, a significant hindrance to social contact linkage.
Results/Impact: The implementation of social contact invitations for TB screening yielded 32 patients between November 2022 and December 2023, with the majority being men with alcohol use disorder. Adherence also improved, as these patients held each other accountable, ensuring treatment completion.
Conclusions: Social contact invitation is an effective strategy to increase TB patient yield and enhance treatment adherence. Proper implementation creates awareness, reduces stigma, and improves TB treatment uptake, thereby reducing community-level transmission. This strategy is also effective for active case finding (ACF), empowering clients with the knowledge to link others in their social network early for TB diagnosis.

PP19-976-14 Quantifying sputum production challenges as a barrier to community-based TB screening: Experiences from Uganda

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Background: Sputum-based diagnostics are the primary method of confirmatory testing during systematic screening for tuberculosis (TB) but can miss TB if individuals are unable to expectorate. Most data on the yield of sputum collection come from symptomatic populations in healthcare settings; quantifying the yield of sputum collection during population-based screening can inform approaches to active case-finding and development of novel diagnostic tests.
Design/Methods: We conducted chest-X-ray (CXR) based TB screening in peri-urban Uganda as part of a pragmatic cluster-randomized trial of active case-finding. Non-pregnant individuals ≥15 years old who had evidence of possible TB on CXR (qXR TB score ≥0.1, Qure.ai) were requested to provide sputum for confirmatory molecular testing. Participants unable to expectorate were coached as to effective sputum production using a standardized approach that emphasized controlled breathing techniques and, if necessary, exercising briefly and drinking water (without formal sputum induction). We estimated the proportion of participants who failed or declined to produce sputum and described their characteristics in comparison to those who successfully provided sputum specimens.
Results: Of 49,452 consenting participants with valid CXR results, 7,511 (15%) were asked to provide sputum. Of these, 213 (3%) declined to provide a sample, 551 (7%) were willing but unable to expectorate, and 6,746 (90%) provided expectorated sputum, which yielded valid Xpert Ultra results in all but 18 participants. Successful sputum production was weakly associated with self-reported cough (sputum obtained from 92% reporting cough versus 88% reporting no cough, $p < 0.01$) and male sex (91% if male vs 88% if female, $p < 0.01$) and was not significantly associated with HIV or contact status (Table 1).

Characteristic	Group 1: Unable to expectorate n= 551 (7%)	Group 2: Declined to provide sputum n= 213 (3%)	Group 3: Provided expectorated sputum n=6,746 (90%)	*p-value* (Group 1+2 vs 3)*	*p-value* (Group 1 vs 3)*
Female sex (n=3,540)	312 (9%)	114 (3%)	3,114 (88%)	***<0.01***	***<0.01***
Median Age, years (IQR) (n=7,510)	50 (35– 65)	50 (38– 62)	51 (38 – 65)	*0.08*	*0.17*
Prior Tuberculosis (n=432)	20 (5%)	13 (3%)	399 (92%)	*0.07*	***0.03***
Contact person⁺ (n=93)	10 (11%)	2 (2%)	81 (87%)	*0.38*	*0.21*
Cough (n=3,310)	190 (6%)	83 (3%)	3,037 (92%)	***<0.01***	***<0.01***
Fever (subjective) (n=1,750)	126 (7%)	60 (3%)	1,564 (89%)	*0.47*	*0.87*
Night sweats (n=471)	39 (8%)	12 (3%)	420 (89%)	*0.63*	*0.43*
Weight loss (n=309)	27 (9%)	6 (2%)	276 (89%)	*0.76*	*0.36*
Known HIV infection‡ (n=645)	46 (7%)	24 (4%)	575 (89%)	*0.55*	*0.89*

⁺ known contact person within the past year
** from chi-squared test for categorical variables and t-test for a continuous variable*
‡ by self-report

Table 1. Characteristics of participants with abnormal chest x-ray results in eight communities in Uganda, by their bility and willingness to provide expectorated sputum.

Conclusions: Sputum can be successfully obtained from 90% of adults with abnormal X-rays during community-based TB screening, including similarly high proportions of people reporting TB symptoms, recent TB contact, or known HIV infection.

PP19-979-14 Community outreach for enhanced TB detection and preventive treatment initiation in the National Capital District of Papua New Guinea

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Background: In Papua New Guinea TB claims more lives than any other infectious disease, with children constituting a disproportionately high percentage (26%) of total TB cases. To address this, the Paediatric Society of Papua New Guinea (PSPNG) launched the Child TB-HIV Project (CTHP) to improve care and treatment of children with TB.
Design/Methods: This is a retrospective study on outreach-based contact investigation activities from January 2021 to December 2023 at a busy Port Moresby General Hospital (PMGH). Once an adult or child TB index case (IC) was identified, an outreach team performed family education, contact investigation, and biological specimen collection. This process started at PMGH and extended into the home.
Eligible children under 5 years were initiated on TPT either at home in the community or the facility. The outreach team included a coordinator, nurse, counsellor and community health care worker.
In parallel, facility-based TB Preventive Therapy (TPT) initiation among multiple points of entry was done by the outreach team and CTHP staff. TPT consisted of 6-months of daily isoniazid, and 3-months of daily rifampicin-isoniazid (3RH) starting in mid June 2022.
Results: Over 3 years, 1212 adult and child TB index cases (IC) completed contact investigation, identifying 5744 close contacts (4.7 contacts/IC). Of these, 1484/5744 (26%) were symptom screened.
Among those screened, 104/1484 (7.0%) cases of TB were confirmed by GeneXpert and linked to care. There were 339 children under 5 years who screened negative for TB, but only 76/339 (22%) initiated TPT.
In parallel, the total facility-based TPT initiation increased by 142% from 99 children in 2021 to 240 in 2023. Improved treatment completion rates followed from 23/99 (23.2%) in 2021 to 118/189 (62.4%) in 2022.
Conclusions: Community and facility-based screening in conjunction with simplified TPT regiments (3RH) improved TPT initiation and outcomes. A high proportion of undiagnosed TB cases was noted.

PP19-977-14 Innovative strategies for active TB case finding in NYSC camp: A study of the WoW and WoK Mobile Diagnostic Units in Nigeria

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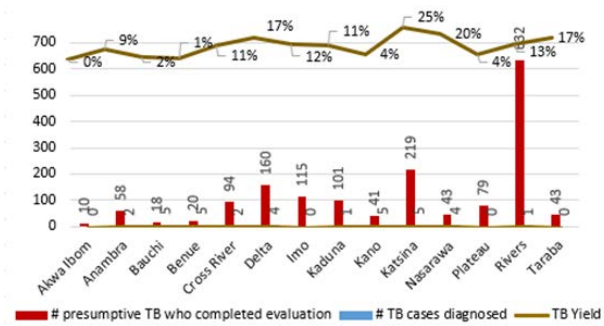
Background and challenges to implementation: Nigeria is ranked sixth in TB burden globally and Nigeria alone accounted for 23% of deaths resulting from TB in Africa. To bridge the gap in TB case notification, the National TB Program adopted innovative active TB case finding (ACF) strategies. Implemented by KNCV Nigeria in the USAID-funded TB LON 1 & 2 projects, Wellness on Wheels (WoW) and Wellness on Keke (WoK) are innovative mobile diagnostics units leveraging trucks and tricycles respectively to provide comprehensive TB screening and diagnostic services, which contain PDX machine, with DELFT LIFE BACKPACK (DLB), trueNat or TB-LAMP machine for testing sputum samples, Personal Computer and a battery, especially in remote hard-to-reach areas and to refer those who test positive.

Intervention or response: Through guidance by USAID Nigeria, the TB LON 1&2 team deployed various strategies, key among which were the WoW & WoK-driven diagnostic platforms, to conduct a project-wide TB screening in Imo, Taraba, Kaduna, Bauchi, Cross River, Anambra, and Kano supported states targeting the 2023 Batch A & B National Youth Service Corp (NYSC) camp locations in a congregate setting. Each WOW and Wok-Keke was assigned to a trained radiographer and an assistant, and awareness creation on TB was done. All clients were screened using the screening algorithm and every identified presumptive was evaluated using the TB LAMP or Truenat machine.

Results/Impact: 22,131 people in attendance were sensitized on TB, of which 95% were screened. 1641 presumptive TB (yield of 8%) were identified, and 1633 were evaluated for TB. At a yield of 2%, 34 TB clients were diagnosed with 47% bacteriologically. 31 (91%) of diagnosed TB clients have been linked to treatment.



Conclusions: The mobile diagnostics units, Wellness on Wheels and Wellness on Keke present an innovative strategy to bridge the TB case notification gap, especially among congregate settings.

PP19-972-14 Bridging gaps in child TB detection through innovative testing week in Nigeria

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Background and challenges to implementation: Child Tuberculosis (TB) notification has been a critical programmatic gap in Nigeria's TB programme. Only 20,411 (35%) of estimated 58,000 children with TB were notified in Nigeria in 2022. Can periodic, nationwide, intensified, innovative active TB case finding targeted at high-risk children be a game-changer in finding the missing children with TB?

Intervention or response: The objective was to increase child TB detection through facility- and community-based screening of high-risk children (0 - 14 years) for TB across the 36 States and Federal Capital Territory in Nigeria. The maiden National Child TB week dedicated to screening high-risk children for TB held from 22nd - 26th, May 2023. Prior mapping was done to identify sites to target the high-risk groups which included malnourished and HIV positive children, street children and children in hard-to-reach communities. Stakeholder mapping and engagement was done, with resource mobilization and logistic support to reach the expected needs. TB screening of high-risk children were conducted by healthcare workers utilizing both symptoms screening and mobile digital x-ray with artificial intelligence where available. Data analysis was conducted using excel spreadsheet.

Results/Impact: In the 5-day period, a total of 331,595, 91,406, 82,086 and 4,054 children were screened, presumptive TB identified, presumptive TB evaluated and diagnosed with TB respectively. This showed a yield of 4.9% of child TB among presumptive TB evaluated. Analysis of performance of the geopolitical zones showed North-west reporting the highest number (1,929) of diagnosed children while the South-east had the lowest number (257) of diagnosed children (See Table 1). State-level comparison of TB notification ranged from 829 children reported in Sokoto State to 3 reported in Yobe State.

Geo-political zone	Total number of children screened	Total number of presumptives identified	Total number of presumptives evaluated	Total number of children diagnosed with TB
North West	54,298	35,583	29,695	1,929
North Central	83,010	17,563	16,670	456
North East	14,931	4,781	4,490	605
South South	60,254	19,307	18,094	276
South East	49,021	5,470	4,803	257
South West	70,081	8,702	8,334	531
Total	331,595	91,406	82,086	4,054

Table 1.

Conclusions: This intervention suggests that targeted, active case finding in children can bridge child TB detection gaps. Strategic planning, resource mobilization and good stakeholder engagement are crucial to the success of this intervention.

PP19-980-14 Using spatial network analysis to identify potential locales of community transmission of drug-resistant TB in two high-burden settings in South Africa

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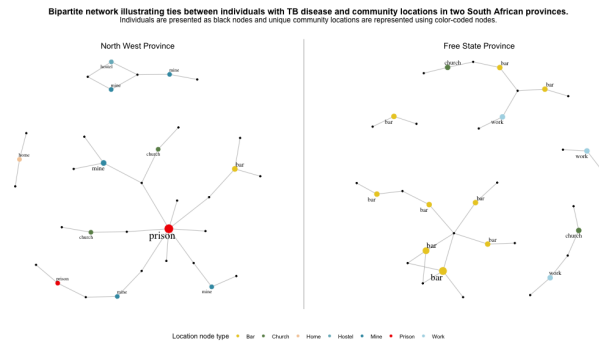
Background: Despite the majority of *Mycobacterium tuberculosis* (TB) transmission in high-burden settings occurring in the community, specific locales of transmission remain unclear.
The objective of this study is to use social spatial network analysis to inform targeted strategies for TB community active case finding (ACF).
Design/Methods: We constructed a bipartite location-contact network to identify areas of spatial overlap between people with recently diagnosed TB disease. Location contact interviews were conducted in adults diagnosed with rifampin-resistant (RR-TB) disease in communities in North West (NW) and Free State (FS) provinces in South Africa.
Enrollment was limited to RR-TB cases to ensure comprehensive sampling. Each unique location was classified by type (e.g. home, bar, prison) and mapped. Ties were defined as unique locations named by two or more individuals.
Results: From August 2020 to March 2024, 133 individuals with RR-TB were enrolled in the study, 59% in NW and 41% in the FS. Their median age was 41 (IQR 34 – 49), 63% were male and 73% had HIV co-infection with a median CD4 count of 138 (IQR 65 – 354). Among 795 unique mapped locations, 71 spatial ties were identified between 49 individuals. The remaining participants (84/133, 63%) had no identified ties.
The mean degree centrality (3.7 vs 3.6) was similar in both communities. In the NW, the locations ranked by highest degree centrality (i.e. the most ties) were a prison followed by a mine, bar, and a workplace.
In the FS, the locations with highest centrality were all bars.



Conclusions: This study underscores the need for community ACF strategies to be tailored to specific settings. The network in NW province demonstrated prominent connectivity relating to prisons, mines, and bars. Whereas the FS had smaller, more fragmented components centered predominantly around bars. Future genomic sequencing of TB isolates will clarify if these network ties correspond to transmission clusters.

PP19-971-14 Addressing TB pretreatment LTFU associated with outreach activities in congregate settings in Nigeria

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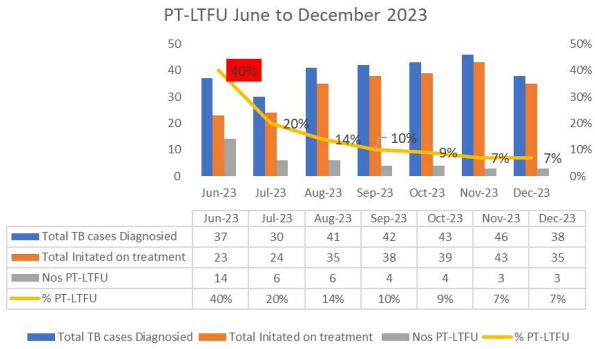
Background and challenges to implementation: Active tuberculosis (TB) case finding (ACF) involves sensitization and screening activities at the community level, especially in congregate settings like markets, churches and schools. These venues are advantageous for health education and reaching a wider audience. However, high rates of pre-treatment loss to follow-up (PT-LTFU) among people diagnosed with TB using ACF have been observed. Caritas Nigeria implemented a community-based ACF project that employed AI-enabled X-ray screening for TB targeting rural markets through TB REACH funding.
We report on the effectiveness of strategies deployed to address the challenge of pre-treatment LTFU from these outreach activities.
Intervention or response: After the first month of Outreach activities June 2023, a review showed that 40% of people diagnosed with TB had not been initiated on anti-TB treatment. A root cause analysis revealed wrong non-traceable addresses as a major challenge. To address this barrier, we adjusted our pre-outreach activities to include mapping of all communities that attended the markets

and engaged community volunteers (CVs) from mapped communities. This approach provided a familiar presence for the attendees, and the CVs assisted in collecting reliable contact information, also utilizing their local connections to link people with TB to care

Results/Impact: Outreach activities were conducted from June to December 2023, A Monthly review of outcomes was done at the end of each month. June 2023 was the pre-intervention period while from July to December 2023 was the post-implementation period . As at the end of December PTLTFU had reduced from 40% to 7%, we also noticed that the average meantime for treatment initiation reduced appreciably.



	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Total TB cases Diagnosied	37	30	41	42	43	46	38
Total Initated on treatment	23	24	35	38	39	43	35
Nos PT-LTFU	14	6	6	4	4	3	3
% PT-LTFU	40%	20%	14%	10%	9%	7%	7%

Conclusions: The engagement of community volunteers from local communities was a pivotal strategy in addressing the issue of pre-treatment LTFU in ACF efforts. This approach not only enhances TB case notification rates but also could be a replicable approach to improving TB response efforts in similar contexts

PP19-975-14 A tale of two cities: Comparing the yield of three active case finding strategies in the Erase TB project

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Background and challenges to implementation: Closing the treatment coverage gap is critical to stop transmission and end TB. Persons with TB missed by the National TB Program (NTP) represent the main source for sustained transmission.

Intervention or response: Three active case finding (ACF) interventions, two community-based and one facility-based, were simultaneously deployed from Q1-2020 to Q1-2023 in 10 districts of Hanoi and Ho Chi Minh City, Vietnam. The strategies entailed enhanced investigation of household and close contacts (ENHANCE), mass screening in the community using mobile/ultraportable x-ray systems (SWEEP), and systematic screening in healthcare facilities (REPORT). We followed Vietnam's double-X algorithm, whereby persons were screened with chest x-ray (CXR) and provided follow-on testing with the Xpert MTB/RIF assay.

Results/Impact: We screened 314,566 people by CXR to detect 3,150 persons with TB. Through ENHANCE, 7,414 contacts were screened by CXR and 214 were found with active TB. Through SWEEP, 92,223 vulnerable persons were screened to yield 506 persons with TB. Lastly, through REPORT, 214,929 were screened with CXR for 2,439 TB detections. The respective yield was 2.8%, 0.5% and 1.1%, for an overall yield of 1.0%. These yields were 3x-16x higher than the national incidence rate (173 per 100 000). The yields for SWEEP and REPORT are higher in HCMC than Hanoi by 1.64 and 1.26 times, while ENHANCE is 1.23 times higher in Hanoi.

	Contact investigation (ENHANCE)	Community mass screening (SWEEP)	Facility-based screening (REPORT)	Total
	Total (Hanoi / HCMC)	Total (Hanoi / HCMC)	Total (Hanoi / HCMC)	
Screened by CXR	7,414 (2,568 / 4,846)	92,223 (46,665 / 45,558)	214,929 (71,193 / 143,736)	314,566
Bac(+) TB detected after abnormal CXR	153 (45 / 108)	412 (131 / 281)	1,980 (556 / 1,424)	2,545
Bac(+) TB detected outside Double-X	16 (6 / 10)	22 (4 / 18)	32 (7 / 25)	70
All Bac(+) TB detected	169 (51 / 118)	434 (135 / 299)	2,012 (563 / 1,449)	2,615
Clinically diagnosed TB	36 (30 / 6)	72 (59 / 13)	427 (124 / 303)	535
All Forms of TB detected	205 (81 / 124)	506 (194 / 312)	2,439 (687 / 1,752)	3,150
Yield (per 100,000)	2,765 (3,154 / 2,559)	549 (416 / 685)	1,135 (965 / 1,219)	1,001

Conclusions: Our intervention showed that three different ACF strategies for TB in the largest urban areas of Vietnam can yield a substantial number of people with active TB. There is an urgent need to expand comprehensive ACF packages to end TB in Vietnam.

PP19-973-14 Re-engineering the role of accredited social health activists: A community-based mixed-methods intervention study from Chandauli, Uttar Pradesh, India

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Background and challenges to implementation: Chandauli District of Uttar Pradesh, India has made significant progress in Tuberculosis (TB) elimination with a 20% decline in TB incidence compared to the year 2015. Despite significant improvements in diagnostic and treatment facilities, patients often seek care from public sector or private practitioners in neighbouring districts, leading to missed cases and underreporting. District authorities initiated a village-level intervention to combat this challenge, the impact of which was accessed using a mixed-methods intervention study.
Intervention or response: This intervention redirects the focus of Accredited Social Health Activists (ASHA) from routine household visits to engage healthcare practitioners for testing of persons with presumptive TB. Symptomatic individuals were prioritized for presumptive testing at healthcare practitioners‘ clinics. Incentives under India's TB program for qualified private practitioners and informal practitioners were facilitated. Additionally, upfront Nucleic Acid Amplification Test (NAAT) was introduced in decentralized manner for timely testing. A mixed-methods intervention study was designed to assess the impact of this intervention. Z-test in R 4.2.3 compared pre and post-intervention TB detection rates. In-depth interviews collected qualitative data on the impact of notification incentives for qualified private practitioners and informal practitioners, which was analyzed thematically using RQDA package in R.
Results/Impact: Post-intervention, significant increase in Presumptive TB Examination Rate (PTER) and Number Needed to Test (NNT) was observed. PTER rose by 35% ($p < 0.001$), NNT by 300% ($p < 0.001$), meeting the district‘s annual target of 2000 tests per 100,000 population. Prominent themes from qualitative analysis included practitioners' perspective: fear of income loss and patient footfall decrease; informal practitioners' perspective: legal concerns and fear of reprisal, ASHA's perspective: Engaging practitioners following incentivization.
Conclusions: Re-engineering the role of ASHAs for improving presumptive TB testing and engaging private practitioners, notably improved TB detection rates in Chandauli District, Uttar Pradesh. This emphasizes the value of multifaceted approach in rural TB elimination initiatives.

PP19-974-14 Improving TB detection through targeted facility-based screening of hospital attendees in twenty-five health facilities in Kaduna state, North-West Nigeria

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Background: Improving tuberculosis (TB) case detection remains crucial, especially in high-burden countries like Nigeria. Despite treatment coverage rising from 27% in 2018 to 59% in 2022, a significant 41% notification gap persists, leaving many TB cases undiagnosed and untreated, fueling ongoing transmission. Targeted facility-based screening of all hospital attendees emerges as a key strategy to bridge this gap.
Design/Methods: The National TB Programme (NTP) partnered with the Global Fund to implement this intervention in twenty-five health facilities in Kaduna state following the development of standard operating procedures (SOP). The intervention took place from May 2022 to December 2023. The health facilities were carefully chosen based on high client load. A dedicated team, including state and LGA mentors, and linkage coordinators, were engaged. Ad-hoc healthcare workers were trained to support the intervention, focusing on symptom-based screening, rapid diagnostic tests for symptomatic individuals, provision of chest X-rays (CXRs) as needed, TB preventive treatment for eligible contacts of positive cases, and linkage to diagnosis and treatment.
All clients visiting the facilities were screened for TB at the point of waiting to see the clinician. Relevant NTP tools were used for documentation from which data were collated and analyzed.
Results: Average presumptive TB notifications per facility surged from 65 to 3,236, while case detections increased from an average of 4 to 209. This translated to a 387% increase in presumptive cases and a 286% rise in confirmed cases cumulatively from the 25 selected facilities. Integration of molecular tests like GeneXpert and CXRs further bolstered diagnostic accuracy, facilitating timely treatment initiation for confirmed cases.
Background and challenges to implementation: Improving tuberculosis (TB) case detection remains crucial, especially in high-burden countries like Nigeria. Despite treatment coverage rising from 27% in 2018 to 59% in 2022, a significant 41% notification gap persists, leaving

many TB cases undiagnosed and untreated, fueling ongoing transmission. Targeted facility-based screening of all hospital attendees emerges as a key strategy to bridge this gap.

Intervention or response: The National TB Programme (NTP) partnered with the Global Fund to implement this intervention in twenty-five health facilities in Kaduna state following the development of standard operating procedures (SOP). The intervention took place from May 2022 to December 2023. The health facilities were carefully chosen based on high client load. A dedicated team, including state and LGA mentors, and linkage coordinators, were engaged. Ad-hoc healthcare workers were trained to support the intervention, focusing on symptom-based screening, rapid diagnostic tests for symptomatic individuals, provision of chest X-rays (CXRs) as needed, TB preventive treatment for eligible contacts of positive cases, and linkage to diagnosis and treatment. All clients visiting the facilities were screened for TB at the point of waiting to see the clinician. Relevant NTP tools were used for documentation from which data were collated and analyzed.

Results/Impact: Average presumptive TB notifications per facility surged from 65 to 3,236, while case detections increased from an average of 4 to 209. This translated to a 387% increase in presumptive cases and a 286% rise in confirmed cases cumulatively from the 25 selected facilities. Integration of molecular tests like GeneXpert and CXRs further bolstered diagnostic accuracy, facilitating timely treatment initiation for confirmed cases.

Conclusions: In conclusion, targeted facility-based screening of all hospital attendees shows great potential in enhancing TB case detection rates. Continued investment in resources and research is paramount to sustain and scale up these efforts, aligning with the global objective of eradicating TB.

PP15 Moving forward: From industry monitoring to tobacco endgame

PP15-937-14 Smoke-free Kendari City: Evaluating enforcement strategies and compliance in tobacco control

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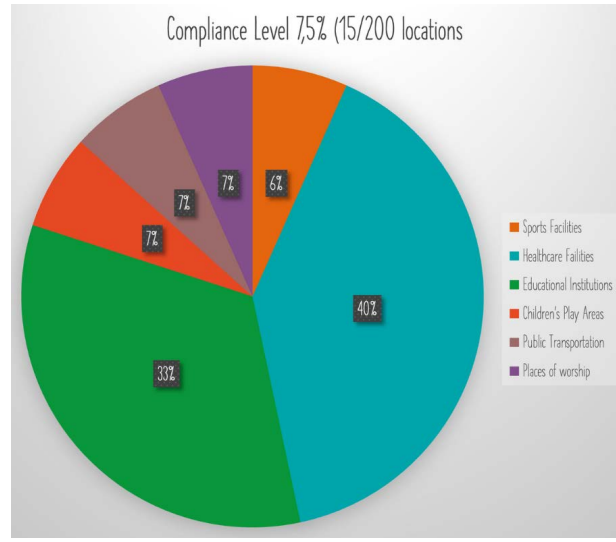
Background: Globally, tobacco use is a leading cause of preventable disease and death. In Indonesia, the tobacco epidemic is particularly acute, with the nation standing as one of the top countries for smoking prevalence. Within this national health crisis context, Kendari in Southeast Sulawesi, where 78% of individuals aged ≥5 years are heavy smokers, the need for effective tobacco control is crucial. The city's struggle with implementing the No-Smoking Area Regulation (Perda KTR) reflects the broader challenges in tobacco control within high-prevalence communities.

Design/Methods: Utilizing a qualitative approach, the study observed compliance across 200 locations and conducted interviews and discussions with various stakeholders, including government officials, healthcare workers, educators, and religious leaders. The research aimed to gauge Perda KTR's effectiveness and gather insights into public perception regarding smoke-free environments.

Results: Compliance with Perda KTR was significantly low at 7.5% overall. Sector-wise, health facilities reported a 40% compliance rate, while educational institutions reported a 33% rate. In contrast, public recreational spaces, childcare areas, public transport, and places of worship each reported a mere 7% compliance rate. The data highlighted systemic gaps in Perda KTR enforcement, with the lowest compliance in areas fundamental to public life. Advocacy initiatives have since prompted several key recommendations: enhancing regulatory visibility, deploying culturally resonant health education campaigns, and fostering public-private partnerships for community-driven enforcement.



Conclusions: This research highlights the need for a robust strategy in Kendari that combines strict enforcement, community-specific education, and public involvement. Developing compliance strategies for low-adherence areas, in line with Kendari's cultural and social context, is vital. Enhancing the Perda KTR is critical for effective TAPS policy adoption, moving Kendari towards improved urban health and global tobacco control standards.

PP15-938-14 Analysis of "Tobacco Endgame Strategies" in the state of Himachal Pradesh in India

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Background and challenges to implementation: Tobacco endgame goals recommended by experts include reducing the prevalence of tobacco use below 5% between 2025 and 2040. It is a huge challenge in low resource settings due to high burden of tobacco use, low priority on tobacco control program and high tobacco industry interference. Himachal Pradesh (a north Indian state with a population of about 7 million) has shown a substantial reduction in tobacco use since 2010. The adult tobacco use has reduced from 22 % to 11.6% and second Hand Smoke exposure at homes from 82.5% to 19.5% till 2022 (GATS-2 & State NCD surveillance).
The Global Youth Tobacco Survey-4 has reported 1.1% prevalence of tobacco use among youth which is lowest in all Indian states. The State has received WHO awards for tobacco control in 2012 and 2023.
Intervention or response: Keeping in view the success of tobacco control measures, the State level coordination committee for tobacco control comprising of key stakeholders from various organizations developed a road map on 18.8.2022 to reduce the prevalence of adult tobacco use below 10% by 2025 and below 5% by 2030. The key strategies includes, to strengthen the implementation of MPOWER policies, capacity building, enforcement of laws, banning hookah bars, licensing tobacco vendors, e cigarette ban, awareness through social media with main focus on tobacco free schools and village councils /Panchayats.
Results/Impact: The analysis of the annual progress reports of the year 2022 to 2024 shows that the awareness, enforcement and tobacco cession activities have been strengthened at all levels. 6072 schools (55%) have been declared as tobacco free .1374 (53%) Panchayats has achieved satisfactory compliance and 441 have qualified to be certified as Tobacco free.
Conclusions: The state is showing a decent progress in implementing all the tobacco control strategies as per the plan and is on track to achieve tobacco endgame.

PP15-935-14 Smoking Cessation Intervention using The Union's "ABC approach" for people with TB in Benin and Burkina Faso: Results from "CesTA_TB" pilot study

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Background and challenges to implementation: Smoking cessation intervention (SCI) is not a meaningful component of National TB Program (NTP) in African countries. We have therefore implemented a project of integration of SCI into routine TB service.
Intervention or response: Pulmonary TB patients were recruited from 20 TB clinics in Benin and Burkina Faso, with 10TB clinics giving routine TB care (control site: CS); and 10 others, offering SCI according to "ABC strategy" (intervention site: IS) after HCWs 's training. Patients were informed of harmful effect of smoking at every visit during treatment and their smoking status were updated till the end of TB treatment which was the endpoint of SCI evaluation.
Results/Impact: From December 2021 to September 2022, 1391 patients were included. Of them, 392 (28.0%) were smokers (225 in IS) at baseline. There was no difference between smokers from IS and CS in term of sociodemographic, TB characteristics and smoking prevalence (28.0%.vs 28.3; p =0.08).
Globally, 97.0% of current smokers, were willing to quit smoking with strong motivation in 74.0 %. There was no difference between the two sites (IS: 75.1% vs CS 72.5% p=0.6). At the end of TB treatment, and regardless of study site, 235 patients (60.0%) quitted successfully

smoking. Regarding study site, 66.0% of smokers quitted successfully smoking in IS vs 52.1% in CS; p<0.001. Regardless of study site; treatment outcomes is better for non-smokers (88.0% vs 83.0%; p= 0.040); and better in smokers from IS than those from CS (87.1% vs 76.6%; p= 0.025). From HCWs perspectives, SCI was feasible, useful and no special challenge encountered.
Conclusions: This study shows that SCI can be integrated in routine TB care in west African countries; with 66.0% of smoking cessation over 6 months of TB treatment. Africans NTP should set up SCI and scale up in the TB clinics for improving TB treatment outcomes.

PP15-936-14 Effective role of YouTube priority flagger program on online tobacco advertising and promotion monitoring and reporting in Indonesia

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Background: Online tobacco advertising has become a subject of concern due to its potential impact on public health. Despite restrictions on direct advertising, tobacco companies have employed various strategies to promote their products online, including through social media influencers and subtle placements on various platforms, including YouTube.
Design/Methods: From August to December 2023, Vital Strategies and the Southeast Asia Freedom of Expression Network (SAFEnet) conducted the monitoring and reporting on YouTube on online tobacco advertising and promotion through YouTube Priority Flagger. The program helps provide robust tools to government agencies and civil society organizations (CSOs).
These agencies and CSOs are particularly effective at reporting to Google/YouTube about videos that violate their Community Guidelines. The online tobacco monitoring program used keywords related to the tobacco advertising and promotion to identify which videos violated their guidelines.
Results: The monitoring found 1,002 videos on YouTube related to tobacco, vape, and electronic cigarettes advertisings and promotions that violated YouTube's Community Guidelines. The videos are classified to eight types: product review, smoking activity, product talk show, product recommendation, tutorial related to product use, showcase of brand, straight advertising, and price promotion. Most of the violated videos were product reviews (81%) and the products most seen were [conventional] cigarettes (74%), electronic cigarettes (14%), and other products, such as cigars, and dried tobacco leaves.
From 1,002 videos monitored and reported through YouTube Priority Flagger, the status of most of the videos were age-restricted (87%) and while a few videos were deleted by YouTube and the uploaders (9%).
Conclusions: The monitoring found 1,002 videos on YouTube related to the tobacco, vape, and electronic cigarettes promotion that violated YouTube's Community Guidelines and reported to YouTube through YouTube Priority Flagger Program.

PP15-940-14 India's progress in adopting WHO FCTC Articles 9 and 10: A detailed evaluation

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Background: The WHO Framework Convention on Tobacco Control (FCTC), the first global public health treaty negotiated under auspices of WHO, emphasizes upon testing and disclosure of tobacco product contents (Articles 9 and 10). Despite challenges, India is among the pioneers in region for implementing these provisions, crucial for curbing the tobacco epidemic.
Utilizing an Inductive approach, this study explores India's progress in implementing WHO FCTC Articles 9 and 10.
Design/Methods: This study explored the literature and conducted in-depth document analysis concerning global tobacco product testing practices. Employing an inductive approach, data extraction and analysis were conducted based on the principles outlined in WHO FCTC Article 9 and 10. The study compared guidelines regarding tobacco product testing and disclosures across diverse countries with a particular focus on India's advancements in implementing WHO FCTC Articles 9 and 10.
Results: The current analysis showcased diverse policies among countries implementing WHO Article 9 and 10, including Canada, Brazil, USA, Singapore, Australia, Japan, China, Lao DPR, Cambodia, Brunei Darussalam, India, and Ethiopia. India's progress in adopting WHO FCTC Articles 9 and 10 disclosed significant advancements. On September 5, 2019, through Government Notification GSR 633 (E), India notified establishment of three National Tobacco Testing Laboratories (NICPR, Noida; CDTL, Mumbai and RDTL, Guwahati).
India's participation in WHO method validation procedures through four WHOTOBLABNET member laboratories highlights the nation's well-equipped facilities and highly skilled workforce.
Further, the existing laboratories have been empowered to test tar, nicotine and carbon monoxide through an Indian tobacco control Act.

Conclusions: India emerges as a regional leader in implementing WHO FCTC Articles 9 and 10, evidenced by the establishment of National Tobacco Testing Laboratories and active participation in WHO validation procedures, which highlights its commitment to effective tobacco control.

PP15-941-14 Establishing priorities for the effective implementation of Tobacco Control Program at national and sub-national level in India

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Background: With 266.8 million adults using tobacco in various forms, India confronts unique challenges in enacting effective tobacco control policies. Despite this, the country has made significant advancements in developing and implementing the National Tobacco Control Program (NTCP). However, ensuring efficient implementation of these policies is crucial to combatting the growing tobacco epidemic.
This study provides insights into prioritizing the effective implementation of the NTCP at both national and subnational levels across India.
Design/Methods: A modified Delphi technique was employed across three rounds involving 21 experts from government, NGOs, and academia. Initially, experts identified priorities, round-1 which was followed by rating them on a Likert scale (0-4) round-2 leading to top 10 priorities using a weighted mean method.
Finally, in the third round, these priorities undergone a detailed discussion and were ranked in an orderly manner by the expert panel.
Results: During Initial rounds, experts suggested 20 national and 17 subnational priorities, followed by rating and ranking them to reach consensus on the top ten for each level. The top three national priorities were: amending the national tobacco control legislation COTPA; monitoring NTCP implementation; and protecting health policy from tobacco industry interference. The top three subnational priorities were: enforcing COTPA and the e-cigarette ban (PECA); engaging civil society in tobacco control efforts; and promoting tobacco-free schools/villages.
Conclusions: In conclusion, while national policies and legislation are important to strengthen the overarching tobacco control framework, subnational implementation and enforcement of these measures is critical to translating policy into impact on India's tobacco epidemic.
A holistic yet balanced approach should be integrated into NTCP framework and while developing tobacco control policy at national and state level.

PP15-934-14 Factors associated with shisha smoking: A cross-sectional telephone-based survey among general population adults in Nigeria

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Background: Shisha smoking has increased significantly worldwide over the past decade, including in Africa, but there is currently a lack of context-specific evidence to inform tobacco control responses to this growing public health threat. This is the first national-level study to identify factors associated with shisha smoking among general population adults in Nigeria where high prevalence rates have been reported.
Design/Methods: We conducted a telephone-based, cross-sectional survey among a random sample of 1278 individuals (611 who currently smoked shisha and 667 who did not) in 12 states across the six geopolitical zones in Nigeria. Data collection took place between 28th July and 11th September 2022.
We performed logistic regression analysis, with adjusted odds ratios (aORs) and 95% confidence intervals (CI) as the measures of association.
Results: The following increased the likelihood of being a person who currently smokes shisha: being a person who currently smokes cigarettes (aOR=5.54, 95%CI: 2.57 to 11.90) or consumes alcohol (aOR=3.46, 95%CI: 1.91 to 6.28); and having a family member (aOR=2.32, 95%CI: 1.23 to 4.40), or one (aOR=22.81, 95%CI: 9.99 to 52.06) or more (aOR=78.85, 95%CI: 22.50 to 276.33) close friends who smoke shisha.
The following reduced the likelihood of being a person who currently smokes shisha: being older (aOR=0.92, 95%CI: 0.89 to 0.95) and screening positive for possible generalised anxiety disorder (aOR=0.60 95%CI: 0.41 to 0.88).
The following did not have an effect on current shisha smoking status: sex, level of education, employment status, household wealth, religion, rural/urban residence,

perceived stress score, and screening positive/negative for possible major depressive disorder. We also identified potential sex differences in the factors associated with shisha smoking.
Conclusions: Strategies to curb shisha smoking need to account for the associated social and behavioural factors, including age, cigarette smoking, alcohol consumption, and having family members or close friends who smoke shisha.

PP12 TB in pregnancy and young children

PP12-911-14 Mass school testing for M. tuberculosis infection and disease in an adolescent population: A prospective cohort from eastern China

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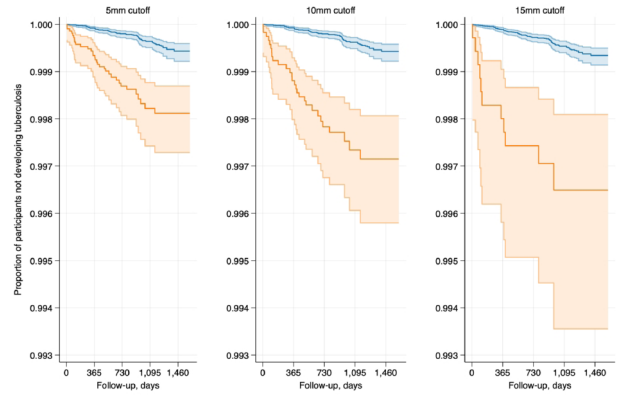
Background: To evaluate a mass school testing for Mycobacterium tuberculosis (Mtb) infection and disease among students in eastern China and measure tuberculosis progression over 5 years of follow-up.
Design/Methods: Full physical examinations, including tuberculin skin testing, of newly enrolled students were done from 2018–2021.
In addition to tuberculin testing, the full cohort of students were assessed for tuberculosis at the testing visit and followed up through record linkage. We evaluated whether implementing higher induration thresholds of the tuberculin skin test might improve prediction of incident tuberculosis. Binary logit and Cox regression models were used to understand risk factors for Mtb infection and disease. Outcomes were assessed during pre-Covid-19 years (2017-2019) and during Covid-19 years (2020 –2021).
Results: Of included students, tuberculin positivity at 5mm, 10mm, and 15mm indurations was 11% ($N_{positive}$= 21,225), 6% ($N_{positive}$= 11,721), and 2% ($N_{positive}$= 3,502), respectively. The adjusted hazard ratio (compared to indurations <5 millimeters) was 1.27 (95% CI, 0.46 –3.50), 6.65 (95% CI, 3.85 –11.49), and 10.02 (95% CI, 5.23-19.20) for indurations <5, 5 –9, 10 –14, and 15 and above. Despite this, sensitivity to detect incident tuberculosis at each cutoff was low .Despite this, sensitivity to detect incident tuberculosis at each cutoff was low (37% [95% CI, 27–48] at 5mm; 33% [95% CI, 23–44] at 10mm; 13% [95% CI, 7–22] at 15mm). After pre-Covid years (2018 –2019), a decrease was seen in tuberculin positivity (in 2020, aOR, 0.68; 95% CI, 0.65-0.71; in 2021, 0.62; 95% CI, 0.59-0.64) and tuberculosis progression (in 2021, aHR, 0.37; 95% CI, 0.14-0.96).



Conclusions: Current tools to identify and prevent progression from Mtb infection to disease in adolescents are insufficient to effectively target control efforts in this age group.
Importantly, we found lower levels of Mtb infection and tuberculosis progression during Covid-19 pandemic, suggesting decreases in transmission.

PP12-915-14 "I would cry all the time": The indirect yet complex burden of living in a household affected by TB on children in Cape Town

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Background: TB is a well-known 'social disease' and affects not only the person sick with TB but also their households, including children. Few studies have investigated this indirect impact of TB on children and even fewer have done so by listening to the children themselves.
Our study aimed to investigate the multiplicative burden on children living in a household affected by TB, through the perspectives and experiences of children themselves.
Design/Methods: We conducted an exploratory study using validated child-appropriate techniques and qualitative interviews with 17 children aged 8 – 18 years old living in a household affected by TB in Cape Town, South Africa.
Results: TB in the household was a significant traumatic event for most children. Many children were already facing trauma within their household, such as absence or neglect by a caregiver, substance abuse and/or conflict in the home, poverty and food insecurity.
Additional threats with a household member diagnosed with TB included separation from their primary caregiver, relocation and displacement, increased responsibilities and parentification, disruptions to household stability, isolation and increased food insecurity.

Some children were absent from and failed school. Most children showed significant signs of severe psychological impact including anxiety, depression and trauma responses.
Some risk/protective factors identified included: a conflict or stable home situation, whether the person with TB was a core caregiver, severity of the illness, prior or simultaneous non-TB related trauma, level of food insecurity, and levels of support.
The presence of a (surrogate) caregiver such as a grandparent or older sibling provided a strong protective or 'shielding' effect.
Conclusions: The presence of TB in the household generally has a significant psychosocial impact on children living in this household, resulting from heightened financial and social stress and impact on family dynamics. Maintaining household systems, inserting additional support at all levels, and providing emotional care can reduce stress.

PP12-906-14 Impact on paediatric TB diagnosis of implementing the new WHO Treatment Decision Algorithms in an MSF nutritional centre, Maiduguri, Nigeria

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Background: Paediatric tuberculosis (TB) diagnosis is challenging due to the paucibacillary nature of the infection and the difficulty collecting sputum in children. This has led to hundreds of thousands with the disease left undiagnosed and untreated.
We show the impact on TB diagnosis of using new WHO treatment decision algorithms (TDAs) for pulmonary TB in children under 10 years with severe malnutrition.
Design/Methods: We analyzed retrospective programmatic data of children under 10 years attending the Maiduguri Therapeutic Feeding Centre in Nigeria. We describe and compare the number of children diagnosed and started on treatment from June 2022 to March 2023 and from June 2023 to March 2024, prior to and after the implementation of the WHO TDA respectively.
Results: From June 2022 to March 2023, 7647 children were admitted as inpatients and 9642 between June 2023 and March 2024, an increase of 26.1%. The number of children diagnosed with TB were 203 and 362 respectively, representing an increase of 78.3% following the algorithm's implementation. The age ranges of <6, 6-59 and >59 months represented 2.5%, 81.2% and 16.3% respectively in June 2022 to March 2023 and 3.3%, 78.5% and 18.2% in June 2023 to March 2024.
Of the 338 patients diagnosed with pulmonary TB using the new WHO TDAs between July 2023 and March 2024, 8.9% decision to initiate a TB treatment was based on a TB contact history (30/338), 18.9% (64/338) on a positive GeneXpert, 21.6% (73/338) using the TDAs scoring system based on clinical and X-ray signs and 50.6% (171/338) using the TDAs scoring system based on clinical signs (without X-ray).
Conclusions: These results show a substantial increase in children diagnosed with TB and started on treatment after implementation of WHO TB algorithms. When systematically used, the algorithms help in reducing the gap between undiagnosed and untreated children with TB.

PP12-914-14 Boosting TB screening and treatment among children attending community care sites in Kinshasa province, DR Congo

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Background and challenges to implementation: Detection of tuberculosis (TB) cases is an ongoing challenge for Democratic Republic of Congo (DRC), particularly among children aged 0-14 years. WHO estimates that the proportion of pediatric TB is between 15-20% for high-incidence countries. However, in 2022, the National TB Control Program (NTP) notified 31,995 pediatric TB cases, representing just 13% of TB cases, a trend that has persisted since 2019. In 2021, the NTP used funding from the U.S. Agency for International Development under the Tuberculosis Implementation Framework Agreement to roll out the "Integrated management of newborn and childhood illnesses" approach at community care sites (CCS) in Kinshasa province.
The objective was to improve identification and referral of children with presumed TB to Centres for Diagnosis and Treatment (CDTs).
Intervention or response: The NTP updated guidelines, algorithms, job aids for cough management and reporting tools, including monthly reporting on community site activities. The NTP then trained CCS community health workers and service providers on TB screening and signs

suggestive of TB in children. With NTP support, a total of 96 CCS implemented the new pediatric TB management approach.

Results/Impact: Among the 96 CCS, in 2021, 1,394 children with presumed TB were referred to CDTs and 29 (2.1%) were diagnosed with TB. In 2022, 1,425 children were referred and 39 (2.7%) children were diagnosed with TB, and in 2023, the CCS referred 3,101 children, among whom 78 (2.5%) were diagnosed with TB.

Conclusions: The new approach resulted in an increased number of children referred for testing, and an increased number diagnosed with TB , with a cumulative effect over time. The integration of community care sites in the fight against pediatric tuberculosis contributes to increased case detection. Intensification of TB screening and treatment among children visiting community care sites is recommended as an innovative approach that can facilitate recovering missing pediatric TB cases.

PP12-913-14 Maternal and fetal outcomes in pregnancy-associated TB in Uganda: A pilot multi-centre case-controlled study

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Background: Pregnant women are at an increased risk of tuberculosis (TB) and this poses a transmission threat to the newborn infant. We sought to assess baseline maternal and neonatal clinical outcomes for ante and post natal women diagnosed with definite TB disease as cases compared to women with no TB disease as controls.

Design/Methods: We screened a total of 7856 women across three distinct health facilities in Uganda between October 2021 to April 2022 for definite TB disease using TB symptomatology and GeneXpert testing. We recruited 61 participants comprising 31 cases (50.8%) and 30 controls (49.2%) matched for age and maternal status.

Results: The median (IQR) maternal age was 25 years (21–28 years). A third of the participants (31.7%) were HIV positive (29.0% vs 34.5%, p=0.650), and 11.5% of the cases (n=7) were TB contact (29.2% vs 0%, p=0.01). Maternal body mass index (BMI) was lower among cases vs controls: median (IQR) ((24.6 kg/m2, 20.5–26.7) vs (27.2 kg/m2, 22.9–32.0), p=0.02). Cases exhibited lower hemoglobin concentrations (Hb) (11.2g/dL vs 12.4 g/dL, p=0.02). Maternal data were matched with 33 infant records: cases (n=16, 51.6%) and control (n=17, 48.5%). Of these infants, 60.6% (n=20) were female, and the median (IQR) age at enrolment was six weeks (1–14). Infants born to cases had lower birthweights compared to those born to controls: (median (IQR) 2.8 kg (2.1–3.2) vs 3.1 kg (2.7–4.0), p= 0.038) with an adjusted β coefficient (β= - 1.02, 95% CI: -1.83 to -0.22, p=0.015).

Surprisingly, a unit increase in maternal Hb by 1.0g/dL was associated with a 0.37-fold increase in fetal birthweight (95% CI: 0.12–0.62, p=0.007).

Conclusions: Our results demonstrate that women with TB disease, and their babies have poor clinical outcomes, posing threats to maternal neonatal health. Assessing future TB risk among exposed infants is recommended.

PP12-908-14 Smaller people, bigger gaps: Is your TB programme ‚paeds-proof'?

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Background and challenges to implementation: Children remain an under-served group within TB programmes. Across the cascade of care, challenges and practicalities unique to children need to be identified and addressed in order to close the gap. Different actors are involved in childrens' paths to care, many of whom are not included when developing TB policies primarily designed for adults.

Excellent programmes are not equally implementable for all age groups - leaving ambiguity for health care workers to navigate. Both TB **AND** child health services within a district should be included to address childhood TB needs.

Intervention or response: A "toolkit" was developed to assess real-world implementation of TB guidelines for DS-TB and DR-TB in children. 5 components are assessed per district: reported child TB data, district TB programme, paediatric hospital units, specialist TB facilities and primary health care facilities.

The aim: identify best-practice, barriers, opportunities for streamlining across services.

At each level, facilities are visited (assessing available infrastructure, practice and linkage pathways) and staff are interviewed (to gauge skills, interpretation of existing policies, identify gaps and underutilised cadres). This information is used to generate a report and recommendation specific to each district, with realistic targets and timelines.

Results/Impact: Findings included: referral of children despite local expertise, no relationship between TB-paediatric-HIV services, no childhood DR-TB services at

"adult" facilities, unnecessary prolonged hospital admissions, inexpensive consumables unavailable at primary care, contradicting guidelines, TB drugs inaccessible at HIV clinics, lack of support in interpreting paediatric X-rays.

Once identified, many gaps are easily and cost-effectively rectifiable. Skills/equipment transfer and creating shared-care mechanisms between TB and paediatric services, allow childhood TB to be sustainably managed at appropriate levels of care.

Conclusions: Including both child health AND TB services and dovetailing the strengths of each allows for sustainable solutions to close the gap in childhood TB. This tool could be adapted for any country.

PP12-905-14 Clinical features and outcomes in pregnant women with active TB: A single centre retrospective study in China

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Background: Tuberculosis (TB) can affect female reproduction in fertility and birth outcomes. TB infection or progression during pregnancy poses a significant risk of morbidity to both the mother and the fetus if not promptly diagnosed and treated. In recent years, there has been a concerning rise in reports of tuberculosis infection following fertility treatments like IVF.

This includes severe cases of disseminated miliary TB, as well as pregnancy loss and congenital TB. The diagnosis and treatment of tuberculosis in pregnant women can be challenging.

Design/Methods: This study was retrospectively conducted in the Tuberculosis Department of Shanghai Public Health Clinical Center. Inpatients diagnosed with active TB (ATB) during pregnancy from October 2012 to October 2022 were enrolled by systematically searching medical history database.

Their clinical history, symptoms, diagnosing procedures, and pregnancy outcomes were analyzed, and the differences between the assisted reproductive technology (ART) group and the natural pregnancy group were discussed.

Results: A total of 32 pregnant women diagnosed with active TB infection were enrolled, 56.25% (18/32) of them having microbiological evidence, and 62.50% (20/32) having pathological placental tuberculosis (Table 1).

More severe cases of ATB occurred in ART (Table 2).

The pregnancy outcomes (Table 3) were composed of 9 full-term deliveries, 17 miscarriages, 5 premature deliveries and 1 stillbirth. The median birth weight of the 15 surviving newborns was 2820 g (1180-3860 g). The difference of central nervous system TB between the two groups is statistically significant (P=0.006). The proportion of adverse pregnancy outcomes (premature delivery + miscarriage+ stillbirth) was higher in ART group compared with that in natural pregnancy group.

Tuberculosis Infection	ART(n=13)	Natural Pregnancy(n=19)	P value
Pulmonary Tuberculosis	13(100.0%)	18(94.74%)	1.000
Disseminated Pulmonary Tuberculosis	2(15.38%)	3(15.79%)	1.000
Central Nervous System Tuberculosis	5(38.46%)	0(/)	0.006
Intestinal Tuberculosis	1(7.692%)	0(/)	0.406
Pleural Tuberculosis	0(/)	3(15.79%)	0.253
Genital Tuberculosis	0(/)	2(10.53%)	0.502
Placental Tuberculosis	8(61.54%)	12(63.16%)	1.000
Pelvic Tuberculosis	0(/)	2(10.53%)	0.502

Table 2. Differences in severe ATB cases of ART and natural pregnancies

	ART(n=13)	Natural Pregnancy(n=19)
Surgical Intervention	3(23.08%)	2(10.53%)
Emergency Cesarean Section	6(46.15%)	1(5.263%)
Critical Condition or Resuscitation	9(69.23%)	3(15.79%)
Assisted Ventilation	2(15.38%)	1(5.263%)

Table 3. Differences in pregnancy outcomes of ART and natural pregnancies

Outcomes		Total(n=32)	ART(n=13)	Natural Pregnancy(n=19)
Full-term Delivery		9(28.13%)	1(7.692%)	8(42.11%)
Premature Birth		5(15.63%)	2(15.38%)	3(15.79%)
	Induced Abortion	5(15.63%)	2(15.38%)	3(15.79%)
Miscarriage	Inevitable Miscarriage	9(28.13%)	6(46.15%)	3(15.79%)
	Medical Termination	3(9.375%)	1(7.692%)	2(10.53%)
Stillbirth		1(3.125%)	1(7.692%)	0(/)
Adverse Pregnancy Outcome		18(56.25%)	10(76.92%)	8(42.11%)

Table. Differences in types of ATB of ART and natural pregnancies.

Conclusions: TB infection during pregnancy is difficult to diagnose as only 56.25% of the patients having microbiological evidence, which resulting in delayed treatment and poor pregnancy outcomes. Guidelines of more sensitive screening and systematic diagnostic methods for pregnancy with TB are needed.

PP12-907-14 Stool specimen testing for diagnosing pulmonary TB among pregnant women and children under five years in rural India: Preliminary results

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Background: The diagnosis of Tuberculosis (TB) is challenging for individuals having difficulty producing sputum such as children and pregnant women (PW). They face additional diagnostic hurdles due to the nonspecific nature of their symptoms. Stool collection is a non-invasive method that detects MTB from the swallowed sputum. We aim to assess the diagnostic value of stool testing in Xpert MTB/Rif Ultra in pregnant women and children under five years (U5C) in Bihar.

Design/Methods: Study started in October 2023 in TB REACH Wave 10 areas which included five blocks each of Samastipur and Begusarai districts of Bihar. Using a WHO-based symptom-based checklist, we screened PW on Antenatal checkup (ANC) days, and U5C in creches. The stool was collected among those who weren't able to

expectorate sputum. After process validation, we used Petroff's method for stool processing and subsequent Xpert Rif Ultra testing.

Results: Among 10967 Pregnant Women and 19144 children under 5 years screened for TB, we found 307 (3%) and 1021 (5%) with symptoms respectively. Testing was done on samples from 14 PW and 136 U5C who couldn't expectorate sputum. We found four samples positive for TB, 2 each in PW (14%) and U5C(2%). In the same period, Xpert testing on sputum samples was conducted in 87 PW and 8 U5C, where 17% (15) in PW and 12.5% (1) in U5C was found to be TB positive. The error rate in stool was 5% whereas for sputum in the same key population was 4%. Stool testing added 11% (2/18) TB in Pregnant Women and 6% (2/36) in children under 5 years.

Conclusions: Diagnosing TB remains challenging in Pregnant Women and children under 5 years. Stool testing may provide an alternative if sputum is not available for rapid diagnosis although additional yield is limited. Sample collection had its own challenges.

PP12-910-14 Parallel use of low-complexity automated nucleic-acid-amplification tests on respiratory samples and stool with/ without urine lipoarabinomannan assays to detect childhood pulmonary TB: A systematic review

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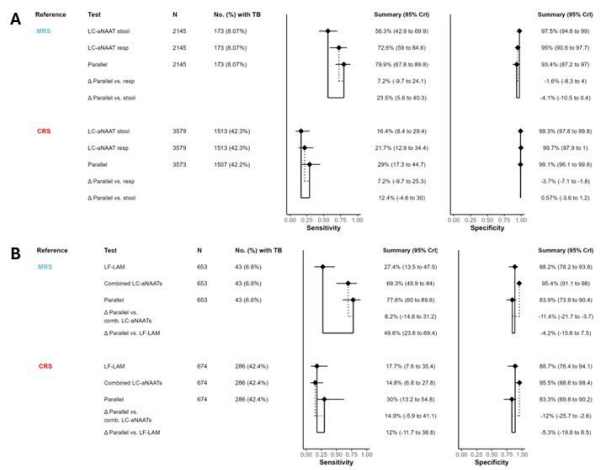
Background: Childhood tuberculosis(TB) diagnosis requires combinations of tests, but accuracy of diagnostics is usually assessed individually.Here, we compared the accuracy of the parallel use of low-complexity automated nucleic-acid amplification tests on respiratory samples(LC-aNAAT-resp) and stool(LC-aNAAT-stool) with or without lateral-flow lipoarabinomannan assays(LF-LAM) to either test alone to detect childhood pulmonary TB.

Design/Methods: We searched multiple databases up to 3rd November, 2023, and reached out to primary study authors for paired diagnostic accuracy studies of LC-aNAATs-resp and LC-aNAAT-stool (all children <10 years) and LF-LAM (children with HIV,CHIV).

We assessed study quality (QUADAS-2) and performed meta-analyses using a bivariate random-effects model. For each test individually and in parallel, we used a Bayesian approach to determine pooled sensitivity and specificity using a culture-based microbiological reference standard(MRS) and composite reference standard(CRS) that included clinical diagnosis.

Results: We included eight studies that enrolled 2,145 children without HIV (culture-positive TB-prevalence 8.1%,173/2,145), and six studies that enrolled 653 CHIV (TB-prevalence 6.6%,43/653). Among children without HIV, parallel use of LC-aNAAT-resp and LC-aNAAT-stool had a pooled sensitivity and specificity (95%credible interval) of 79.9%(67.9-89.8) and 93.4% (87.2-97.0) against the MRS. Compared to LC-aNAAT-resp alone, parallel testing increased sensitivity by 7.2%(0-24.1) and decreased specificity by 1.6% (-8.3-0). Compared to LC-aNAAT-stool alone, parallel testing increased sensitivity by 23.5% (5.6-40.3) and decreased specificity by 4.1% (-10.5-0).

Among CHIV, parallel use of LC-aNAAT-resp, LC-aNAAT-stool, and LF-LAM had a pooled sensitivity and specificity of 77.8% (59.9-89.8) and 83.9% (73.9-90.4) against the MRS.The addition of LF-LAM to LC-aNAAT testing increased sensitivity by 8.2% (0-31.2) and decreased specificity by 11.4% (-21.7-0). While overall sensitivity was decreased,trends were mostly similar against CRS, however, the addition of LF-LAM was more benefitial, suggesting a particular benefit in unconfirmed TB cases *(Fig. 1)*.



Conclusions: A combined test strategy versus a single-test strategy increased sensitivity to detect TB for both children with and without HIV.The benefit of a combined-test strategy is expected to be largest in TB high-prevalence settings, likely outweighing the disadvantage of the reduced specificity.

PP12-912-14 An analysis of childhood TB notifications incident rates ratios in Zambia, 2016-2021

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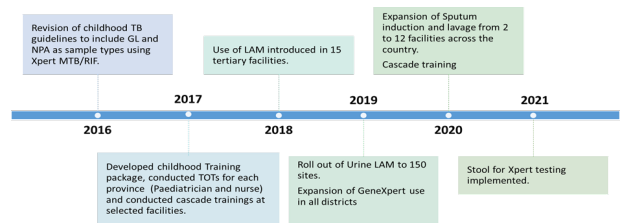
Background: Childhood TB is of public health concern in Zambia because its often difficult to diagnose. The last comprehensive trend analysis in childhood TB was conducted in 2013.Analysis showed a decline in trends from 135 per 100 000 population in 2004, to 69 per 100 000 population in 2011.The objectives of the trend analysis were to describe trends in childhood TB notifications and explore the effect of previous interventions and strategies implemented to combat childhood TB.

Design/Methods: We analyzed 2016-2021 childhood TB data from the Zambia National TB and Leprosy Program Surveillance System. We reviewed policy documents and guidelines on tuberculosis at MOH to understand previous interventions. We checked for excess zeroes in TB case counts and tested for overdispersion. We then fitted negative Binomial count models to investigate incidence rate of childhood TB notifications adjusting for sex, age, type of TB, site of TB and year. The incident rate ratio (IRR) statistically significant at $p<0.05$.

Results: There were various interventions in the childhood TB program from 2016 to 2021, including improved diagnostics, professional training, expanded sample type and testing options for children. From 2016 to 2021, 15,507 notifications of childhood TB were recorded. There was nearly a twofold increase in IRR of childhood TB notifications each year from 2018-2020 and a threefold increase in 2021 (IRR: 1.79; 95% confidence interval [CI]: 1.70-1.89).



Conclusions: The incident rate of childhood TB notifications in Zambia increased between 2016 and 2021, underscoring the necessity for ongoing evaluation and adaptation of strategies to effectively address childhood TB. Key to this effort is the need to sustain and enhance diagnostic interventions, such as Gastric Lavage (GL), Nasopharyngeal Aspirate (NPA), and GeneXpert use, ensuring early detection and treatment of childhood TB cases.

PP12-909-14 Diagnostic accuracy estimates of TB tests in children using latent class analysis with Bayesian inference

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Background: Evaluation of the diagnostic accuracy of tuberculosis tests in children suffers from the absence of gold standards and the use of composite reference standards is associated with bias. Latent class analysis is a statistical method that can overcome potential biases from imperfect reference standards and conditional dependence between tests.

Design/Methods: We performed a secondary analysis of data from a diagnostic accuracy cohort study of 219 Ugandan children aged 2 weeks to 10 years who were hospitalized with presumptive TB. We used Latent Class Analysis with Bayesian inference to estimate the sensitivities and specificities of five commonly used tests for TB: XpertMTB/RIF and culture from respiratory samples (gastric aspirate or nasopharyngeal aspirate), XpertMTB/RIF from stool, Alere urine-lipoarabinomannan assay and chest X-ray. We used fixed effects to model conditional dependence between tests.

In Model 1, we assumed a correlation between XpertMTB/RIF and mycobacterial culture as both depend on the bacillary load in the sample.

In Model 2, we added a fixed covariance representing the correlation between chest X-ray and urine-LAM results among children with disseminated TB (bloodstream spread from lungs to kidneys).

We elicited prior distributions of TB prevalence, test sensitivities and specificities from existing literature.

Results:

	Posterior median estimate			
	Model 1		Model 2	
TB prevalence, % (95%CrI)	5.0 (2.0, 8.0)		5.0 (2.0, 9.0)	
	Sensitivity (95%CrI)	Specificity (95%CrI)	Sensitivity (95%CrI)	Specificity (95%CrI)
Xpert respiratory sample	89.0 (66.0, 99.0)	99.0 (98.0, 100.0)	87.0 (64.0, 98.0)	100.0 (98.0, 100.0)
Xpert/MTB/RIF (stool)	78.0 (53.0, 93.0)	99.0 (96.0, 100.0)	78.0 (54.0, 94.0)	99.0 (97.0, 100.0)
Culture (respiratory)	83.0 (55.0, 98.0)	98.0 (96.0, 100.0)	81.0 (55.0, 97.0)	98.0 (96.0, 100.0)
Chest radiography	85.0 (62.0, 97.0)	79.0 (73.0, 85.0)	87.0 (65.0, 97.0)	80.0 (74.0, 85.0)
Urine lipoarabinomannan	70.0 (42.0, 92.0)	83.0 (76.0, 88.0)	68.0 (40.0, 89.0)	83.0 (77.0, 88.0)
Posterior median Deviance	60.64		59.0	

With Model 2, the prevalence of TB was 5% (95% Credible Interval [95% CrI]: 2-9%). The sensitivity (95% CrIs) of XpertMTB/RIF on respiratory samples, XpertMTB/RIF on stool, culture of respiratory samples, chest X-ray and urine-LAM were 87% (64-98), 78% (54-94), 81% (55-97), 87% (65-97) and 68% (40-89) respectively (Table 1). Specificities (95% CrIs) were 100% (99-100), 99% (97-100), 98% (96-100), 80% (74-85), and 83% (77-88), respectively.

Conclusions: When the correlation between tests is accounted for, the sensitivities and specificities for XpertMTB/RIF from stool and urine-LAM were higher than those estimated using microbiological and composite reference standards in Orikiriza P et al, ERJ 2021.

PP20 TB pharmacology

PP20-983-14 Pyrazinamide in initial regimen for elderly TB

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Background: The utilization of pyrazinamide (PZA) has been associated with an increased risk of adverse drug reactions, thus prompting its avoidance in elderly tuberculosis (TB) patients. This study aims to examine whether the administration of PZA is associated with worsened outcomes during TB treatment among elderly individuals.

Design/Methods: A prospective cohort study was conducted from July 2019 to June 2023, involving TB patients from 18 institutions in South Korea. The study aimed to assess the impact of PZA on the risk of SAEs, medication interruption, and lost to follow-up (LTFU) during the standard short course of TB treatment in elderly (≥65) patients.

Results: Of 390 elderly TB patients, PZA was used in 356 patients (91.3%), and 98 (25.1%) experienced SAEs during TB treatment. The treatment success rate was significantly lower in patients without PZA compared to those in patients with PZA (64.7% vs 89.9%, p<0.001). The occurrence of serious adverse events (SAEs), medication interruption, or LTFU was higher in patients without PZA compared to those in patients with PZA (52.9% vs. 27.2%, p=0.002).

A multivariate logistic regression analysis, factoring in covariates such as age, comorbidities, and baseline laboratory tests, revealed that PZA was not a risk factor for SAEs, medication interruption, or LTFU in TB treatment (odds ratio [OR] 0.457, 95% confidence interval [CI] 0.201-1.041).

Conclusions: The utilization of PZA in elderly TB patients did not affect the incidence of SAEs, medication interruptions, or LTFU during the standard short course of TB treatment. Thus, considering its potential advantages, incorporating PZA into the treatment regimen for elderly TB patients may be advisable.

PP20-990-14 Pharmacokinetics of isoniazid and rifampicin and predictors in Ethiopian TB patients

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Background: Isoniazid and rifampicin remained key drugs in tuberculosis treatment. Previous studies suggest optimal maximum plasma concentration (C_{max}) of 8-24µg/mL and 3-6 µg/mL for rifampicin and isoniazid respectively. Yet, data on Ethiopian tuberculosis patients, where tuberculosis is a key public health problem remain scarce.
We aimed to characterize rifampicin and isoniazid pharmacokinetics and evaluate the effect of genetic polymorphism on rifampicin and isoniazid pharmacokinetics.
Design/Methods: One hundred forty-six adult TB patients were enrolled. Blood samples were collected at three-time points (1-7 hours post-dose). Genotyping of *NAT2*, *SLCO1B1* , *ABCB1*, *AADACc.841G>A* and *CES-2 (c.269-965A>G)* was done using TaqMan. Rifampicin and isoniazid concentrations were determined using liquid chromatography-tandem mass spectrometry (LC-MS/MS). Population pharmacokinetic (POPK) modeling of rifampicin was done using NONMEM.
Results: Median isoniazid C_{max} was 4.73µg/mL and the area under the curve ($AUC_{0\text{-}7h}$) was 11.21µg.h/mL. The majority (64.4%) of patients achieved the recommended therapeutic target of isoniazid. Rifampicin median C_{max} was 6.79µg/mL with only 29% of patients achieving the therapeutic target. The median rifampicin $AUC_{0\text{-}7h}$ was 17.055µg.h/mL. *NAT2* genotypes accounted for 26.1% and 40.6% of the variability in isoniazid C_{max} and $AUC_{0\text{-}7h}$, respectively. *ABCB1 c.4036A>G* genotypes accounted for 7.4%, and 6.1 % of the variability in rifampicin C_{max} and $AUC_{0\text{-}7h}$, respectively and the *GG* genotype has 41% lower intrinsic clearance compared to *GA* and *AA* genotypes. Subjects with the *ABCB13435C TT* genotype were estimated to have a 100% higher absorption rate constant. Higher doses and female sex were associated with both rifampicin and isoniazid exposure.
Conclusions: Isoniazid and rifampicin plasma exposure display wide variation among Ethiopian tuberculosi patients, partly due to genetic diversity. *NAT2* and *ABCB1 c.4036A>G* genotypes are significant predictors for isoniazid and rifampicin plasma exposure, respectively.
Moreover, exposure levels to both drugs differ based on sex and dosage of the drugs. Further investigation is warranted regarding the clinical significance of these findings

PP20-981-14 Paediatric pharmacokinetics of first-line TB drugs in Haitian children under 5 years and accuracy of a finger stick capillary sampling technique

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Background: Current dosing of TB drugs in children is based upon adult data without accounting for physiologic differences. Generating pharmacokinetic data in children, especially with malnutrition, is hampered by frequent blood draws for intensive pharmacokinetic sampling, and less invasive blood sampling techniques for children are needed.
We investigated the impact of malnutrition and HIV on TB drug concentrations in Haitian children while evaluating a new low-blood volume sampling technology.
Design/Methods: We enrolled children <5 years, living with and without HIV, receiving TB treatment as per WHO guidelines at GHESKIO's pediatric clinic in Port-au-Prince, Haiti. Between 2 and 8 weeks of treatment, we collected blood at 0, 1, 2, 6, and 24 hours post dosing for pharmacokinetics testing.
We compared drug levels of isoniazid, rifampin, pyrazinamide, and ethambutol using intravenous and a finger stick capillary method. Pharmacokinetics parameters and relevant covariates, including HIV status and malnutrition, were analyzed using nonlinear mixed-effects modelling in NONMEM.
Results: Data for 39 children were analyzed, 22 without and 17 with malnutrition (weight-for-age z-score < −2), with 4 children with HIV in each group (5 on LPV/r and 3 on dolutegravir-based regimens). Median weight was 8.22 kg and median age was 1.46 years. Population PK models accounting for body size with allometric scaling, and characterizing the maturation of clearance using a sigmo-

dal function fit the data well and revealed no significant impact of malnutrition or HIV status on pharmacokinetics. The correlation between the drug concentrations in plasma and both capillary and venous blood was high with r2 values ranging between 0.94 and 0.98.
Conclusions: The pharmacokinetics of 1st-line TB drugs in this cohort of Haitian children was in line with previous reports, and we did not find any significant impact of malnutrition or HIV. TB drug concentrations were comparable between samples collected via capillary sampling versus venous sampling.

PP20-988-14 Pharmacovigilance for HP fixed dose combination (FDC) and 3HP-safety monitoring of generic drugs

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Background and challenges to implementation: Fixed dose combination of Isoniazid and Rifapentine (HP FDC) for latent tuberculosis infection (LTBI) was imported by the National TB Program (NTP) to reduce pill burden in late 2021 in Taiwan while 3HP regimen has been endorsed since 2016. This operational research project aims to assess the safety of HP FDC compared to 3HP.
Intervention or response: The pre-licensed, postmarketing HP FDC joint pharmacovigilance project was planned utilizing the permanently discontinuation of prescriptions in the electronic TB case management system at the Taiwan Centers for Disease Control, the spontaneous reporting databases at the Taiwan National Adverse Drug Reaction Reporting System, and the drug injury relief database at the Taiwan Drug Relief Foundation.
Adverse events (AEs) and severe adverse events (SAEs) leading to the permanently discontinuation of HP FDC during Oct, 2021 to March, 2023 were compared to those in a 9,822 3HP historical cohort collected during 2016-2018.
Results/Impact: A total of 2,071 LTBI patients received HP FDC since 2021 and among them, 9.2% (248/2,701) experienced AEs leading to the permanent discontinuation while 3.2% experiencing dizziness, 3.2% experiencing nausea/vomiting, 3.1% experiencing fever, 2.6% experiencing fatigue, 2.2% experiencing headache, and 2.0% experiencing skin rash.
When compared to patients receiving 3HP, there was no significant difference observed in the rate of AEs (9.2% vs. 11.0%, p=0.054) SAEs (0.6% vs. 0.9%, *p*=0.059) and hepatotoxicity (higher than 5X GPT) (0.4% vs.0.7% p=0.253). After linking the data to the dataset of the National Health Insurance Agency, there was still no statistically significant difference regarding AEs leading to the permanent discontinuation between HP FDC and 3HP (adjusted relative risk and its 95% confidence interval: 1.01 [0.86-1.13]) (Table).
Conclusions: Comprehensive pharmacovigilance projects revealed equal safety of HP-FDC and 3HP. Such analysis allows clinicians to provide treatment with confidence.

PP20-985-14 Is the short regimen safe? Evaluation of the safety and tolerability of linezolid in the treatment of drug-resistant TB

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Background: WHO has recommended short treatment regimens to reduce the treatment duration of multidrug-resistant (MDR) tuberculosis. Linezolid is a core molecule in the recommended short-term regimen. However, real-world data on the safety and tolerability of linezolid is still varied among patients. We share the occurrence of adverse events associated with linezolid that occurred during MDR-TB treatment in Uganda.
Design/Methods: Adverse event reports submitted to the Pharmacovigilance Management Information System (PViMS) from June 2022 to March 2024 were analyzed. We report the incidence of adverse drug event (ADE) experienced by patients who received 600 mg/day of linezolid for MDR-TB treatment. The causal relationship between the ADEs and Linezolid was evaluated using *The World Health Organization-Uppsala Monitoring Center* (WHO-UMC) at the time of collection and Naranjo causality assessment scale in the PViMS database. We evaluated the occurrence of adverse events such as anemia, visual disturbances, and neuropathy and the time to the onset of the events.
Results: A total of 526 patients reported ADEs, of which 268 (50.95%) adverse drug events (ADE) were associated with Linezolid. Predominant ADEs included peripheral neuropathy 115 (42%), visual disturbance 95 (35%) and anemia 63(23.5%). Among the 268 patients, thirty-two (12%) of reported ADEs were classified as serious adverse drug events (resulting in death, permanent disability, or prolonged hospitalization). Most ADEs (*n* = 180) occurred within the first month of linezolid use. Almost half of the linezolid related ADEs 120 (45%) ADEs resulted in the withdrawal of the drug. These patients were started on an alternative treatment regimen consisting Pyrazinamide and Delamanid.

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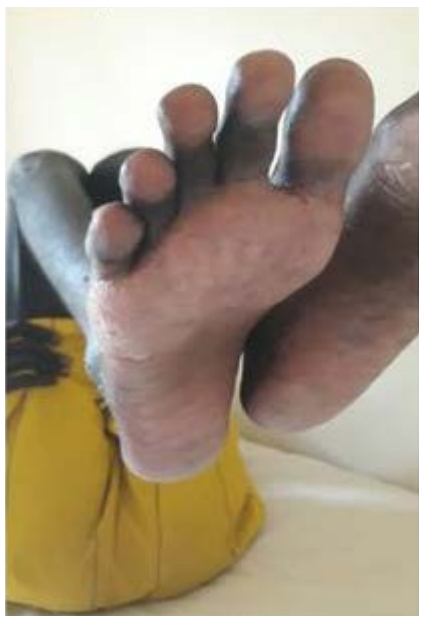
We evaluated the occurrence of adverse events such as anemia, visual disturbances, and neuropathy and the time to the onset of the events.
Results/Impact: A total of 526 patients reported ADEs, of which 268 (50.95%) adverse drug events (ADE) were associated with Linezolid. Predominant ADEs included peripheral neuropathy (115, 42%), loss of visual acuity (95, 35%) and anemia (63, 23.5%).
Among the 268 patients, thirty-two (12%) of reported ADEs were classified as serious adverse drug events (resulting in death, permanent disability, or prolonged hospitalization). Most ADEs (n = 180) occurred within the first month of linezolid use.
Almost half of the linezolid related ADEs 120 (45%) ADEs resulted in the withdrawal of the drug. These patients were started on an alternative treatment regimen consisting Pyrazinamide and Delamanid.



Peripheral Neuropathy.

Conclusions: Linezolid is commonly associated with adverse events. These findings suggest the need to closely monitor patients for the incidence of major adverse events such as anemia, loss of visual acuity and neuropathy.

PP20-986-14 Enhancing active drug safety monitoring and management (aDSM) for multi-drug-resistant TB: Lessons from the implementation of the Pharmacovigilance Information Management System (PVIMS)

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Background and challenges to implementation: During the treatment of MDR-TB, adverse drug events (ADEs) may emerge, some of which may be unexpected and serious. It is imperative that health providers and programs are vigilant in active monitoring and managing ADEs with strong surveillance and reporting systems. In Uganda, there was no systematic approach to actively monitor patients for ADEs.
The processes of data collection on ADEs were paper-based, with low reporting rates to the regulatory body, and critical signals would be missed. We share lessons from the utilization of an electronic pharmacovigilance system.
Intervention or response: To improve detection, and management of ADEs, the national TB program and national drug authority (NDA) adopted aDSM across MDR-TB treatment hospitals. The tools for monitoring and reporting ADEs were standardized. To build capacity in aDSM, training was held for the central- level team and later cascaded to treatment sites. PVIMS was piloted at six tertialy hospitals offering MDR-TB treatment. Hospital teams received causality assessment training followed by bimonthly coaching visits.
Data was captured daily into PViMS and dashboards were generated and reviewed in monthly learning meetings to discuss ADE occurrence and management.
Results/Impact: We analyzed data for ADEs reported through the PViMS from June 2022 to March 2024. During that period, 526 patients reported ADEs. The common adverse events included Arthralgia (64%), Peripheral Neuropathy (28%). Of the ADEs reported, 14.8% (78) were serious ADEs.
Linezolid and Cycloserine were the most common drugs associated with serious ADEs such as suicide. Almost a third of patients (164, 31%) had their treatment regimen switched due to adverse events.

Overall, the number of ADEs detected and reported to NDA improved from <50 to 319 and the timeliness of reporting serious ADEs improved from > 48 to < 24 hours.
Conclusions: PViMS enhanced the efficiency of aDSM and improved patient safety by facilitating evidence-based decision-making for patient management.

PP20-989-14 Frequency of hepatobiliary disorders in people with TB receiving high-dose rifapentine: Insights from the ORIENT trial safety data

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Background: The 2HPMZ/2PMZ regimen containing rifapentine at 1200 mg daily, has successfully shortened treatment duration of drug-sensitive tuberculosis (DS-TB) to 4 months, while the efficacy and safety of high-dose rifapentine need to be further validated. We launched a randomized controlled trial entitled Optimizing RIfapentine-based regimen and shortENing the Treatment of DS-TB (ORIENT, NCT05401071) to evaluate the safety of the high-dose rifapentine regimens.
Design/Methods: Participants are recruited and randomly assigned into the control arm using standardized six-month regimen and three investigational arms of 2HPMZ/2PMZ with rifapentine at different dose levels (10 mg/kg, 15 mg/kg, and 20 mg/kg).
In this study, we analyzed the safety data of patients enrolled in the ORIENT study as of January 31, 2024. Pearson's Chi-square ($\chi 2$) test, Fisher's exact test, or the Kruskal-Wallis test for comparisons was properly applied in statistics analysis, with Bonferroni correction used for pairwise comparison.

Characteristic[a]	Control arm (n=50)	RPT 10mg/kg arm (n=52)	RPT 15mg/kg arm (n=52)	RPT 20mg/kg arm (n=47)	P value[#]
ALT elevation, n (%)	18 (36.0)	16 (30.8)	13 (25.0)	16 (34.0)	0.650
ALP elevation, n (%)	10 (20.0)	15 (28.8)	10 (19.2)	17 (36.2)	0.081
TBIL elevation, n (%)	12 (24.0)	23 (44.2)	35 (67.3)	37 (78.7)	< 0.001[b,c]
≥ Grade 2, n (%)	1 (2.0)	8 (15.4)	20 (38.5)	22 (46.8)	< 0.001[b,c,d]
DBIL value (ULN) when TBIL peaking, median (IQR)	1.72 (1.38,2.12)	3.09 (1.90,5.41)	4.15 (2.96,6.72)	5.21 (3.93,7.18)	< 0.001[a,b,c,d,e]
IBIL value (ULN) when TBIL peaking, median (IQR)	0.92 (0.71,1.08)	0.68 (0.46,0.75)	0.71 (0.59,0.82)	0.83 (0.64,1.03)	0.008[b,c,e]
DILI, n (%)	3 (6.0)	5 (9.6)	2 (3.8)	6 (12.8)	0.371
Hepatic failure, n (%)	0	0	0	0	-
Liver-related withdraw, n (%)	1 (2.0)	1 (1.9)	1 (1.9)	2 (4.3)	0.904

Abbreviations: ALT, alanine aminotransferase; ALP, alkaline phosphatase; DBIL, direct Bilirubin; DILI, drug-induced liver injury; GGT, gamma-glutamyl transferase; IBIL, indirect Bilirubin; IQR, interquartile range; RPT, rifapentine; TBIL, total bilirubin; ULN, upper limit of normal.
[a] Abnormal liver function is defined and graded according to the Common Terminology Criteria for Adverse Events (CTCAE). DILI was defined as liver clinical chemistries meeting any one of the following criteria: (1) ALT ≥ 5×ULN; (2) ALP ≥ 2×ULN (particularly with GGT elevation); (3) ALT ≥ 3×ULN and TBIL ≥ 2×ULN. Liver-related withdraw was defined as participants withdrew from the study due to liver injury based on the judgement of investigatoes,
[#] It is considered statistically significant only when the P value < 0.05.
[a] Statistical difference between control arm and RPT 20mg/kg arm.
[b] Statistical difference between control arm and RPT 15mg/kg arm.
[c] Statistical difference between RPT 10mg/kg arm and RPT 20mg/kg arm.
[d] Statistical difference between RPT 10mg/kg arm and RPT 15mg/kg arm.
[e] Statistical difference between control arm and RPT 10mg/kg arm.

Table 1. Hepatobiliary disorders during antituberculosis treatment with rifampicin or rifapentine at different dose levels.

Results: A total of 201 patients were enrolled, with 50 in the control arm and 52, 52, 47 in the rifapentine 10, 15, 20 mg/kg arm, respectively. Hepatobiliary disorders occurred in 80.7%, 84.6%, 93.6% in the rifapentine 10, 15, 20 mg/kg arm, at a higher frequency than that in the control arm (60.0%). There were no significant differences in alanine aminotransferase elevation (P=0.650) and alkaline phosphatase elevation (P=0.081) among four arms. The frequency of hyperbilirubinemia in the rifapentine 20mg/kg arm was significantly higher than 10mg/kg arm (78.7% vs 44.2%, P<0.001) and control arm (78.7% vs 24.0%, P=0.003), while with no difference to 15mg/kg arm (78.7% vs 67.3%, P=1.000).
Significant direct bilirubin elevation was observed in patients with hyperbilirubinemia, especially in three investigational arms. Five participants withdrew from the study due to liver injury.
Conclusions: The 2HPMZ/2HPM regimen (daily high-dose rifapentine) leaded to significant isolated hyperbilirubinemia, primarily characterized by direct bilirubin elevation and a dose-related elevation with rifapentine.

PP20-984-14 Adverse drug reactions and treatment outcomes in people with drug-resistant TB on short-term treatment regimens in Matabeleland North and Bulawayo Provinces, Zimbabwe (2019-2022)

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Background: Drug resistant tuberculosis (DR-TB) remains a public health threat due to poor treatment outcomes. Previous DR-TB therapy was long and associated with numerous side effects. In 2018 the World Health Organisation introduced shorter treatment regimens to improve outcomes. Zimbabwe implemented the updated DR-TB treatment recommendations in 2019.
In 2022, through funding from the U.S. Agency for International Development under the Tuberculosis Implementation Framework Agreement, the Ministry of Health and Child Care conducted a study to assess treatment outcomes and adverse drug reactions (ADR) associated with new treatment regimens.
Design/Methods: The study reviewed secondary data routinely collected in facility DR-TB registers and patient booklets from 2019-2022. In total we reviewed 113 records of DRTB patients diagnosed and commenced on short-term therapy in five district hospitals in Matebeleland North province and 11 clinics in Bulawayo province.

Results: Treatment success rate increased to 68%, up from 61% previously reported for longer regimens. Death accounted for majority (68%) of all unfavorable treatment outcomes. 26 (23%) patients died while still on treatment; 4 (4%) were lost to follow-up; and 5 (4%) reported treatment failure. Linezolid-induced anemia was the most common ADR (46%).
Unlike the most common ADR, hearing impairment from previous regimens, which can result in permanent disability, this can be completely resolved. There were gaps in active drug safety monitoring (aDSM). Data on ADRs were not routinely recorded: only 33 (29%) of records showed evidence of aDSM.
Conclusions: Despite shorter treatment regimens, treatment success rates remain suboptimal (<90%) and fatality rates in DR-TB patients on therapy are high. More research is needed to determine the causes of high mortality.
Implementing death audits can help identify the reasons of mortality. The incidence of linezolid-induced anemia is high. aDSM should be strengthened, especially as we migrate to regimens where linezolid is taken for longer periods.

PP20-987-14 Hepatobiliary disorders, the adverse drug reactions driving missed doses of anti-TB treatment: A retrospective cohort study

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Background: Our recent scoping review identified adverse drug reactions (ADRs) as a primary driver of missed doses of anti-tuberculosis (TB) therapy. It highlighted critical knowledge gaps including what patterns of missed doses occur due to ADRs and the relative importance of different ADRs. This study aimed to examine how ADRs shape missed dose patterns and which ADRs are the key drivers of missed doses.
Design/Methods: A retrospective cohort study was conducted at an outpatient facility in Riga, Latvia with patients treated May 2015- September 2022. Adults (≥18 years) starting the six-month drug-sensitive TB regimen who missed ≥1 dose were included. Directly Observed Therapy records were used to collect missed dose data. Data on the type and severity of ADR were collected from medical records. RStudio (R-4.2.2) was used to analyse the data, including longitudinal k-means clustering.
Results: Among 184 patients, 32.1% missed doses due to ADRs. Out of 32,467 doses prescribed, 11.8% were missed, of which 22.8% were due to ADRs. Doses were missed for a median gap length of one dose (IQR 1-3), but where ADRs were the cause of missed doses, the median gap length was six doses (IQR 2-10).
Longitudinal clustering analyses revealed a cluster of patients where ~90% doses were consistently taken during treatment and another with escalating missed doses (~70% doses taken at month one versus ~40% at month six). Patients who missed doses due to ADRs were distributed as expected between clusters.
Hepatobiliary disorders caused longer periods of missed doses (median, 18 doses) than blood (5), cardiac (2) or immune (4) disorders. Hepatobiliary and gastrointestinal disorders were the most frequent cause of missed doses (29.7% and 13.9% gaps, respectively). Fourteen ADRs were severe; nine of these (64.3%) were hepatobiliary disorders.

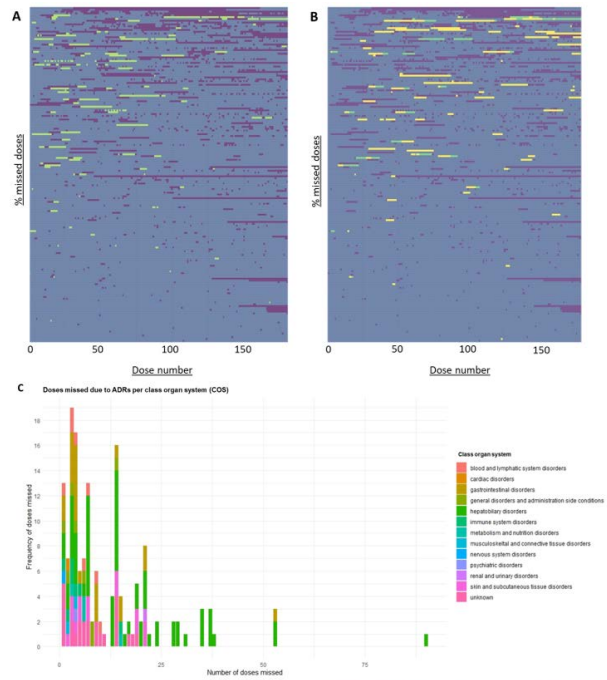

Figure 1: Lasagne plots of missed dose patterns (A) taking into account ADRs (B), and the gap length of missed doses due to ADRs by type (C) | In lasagne plots A) and B) each row is a patient and patients are ordered from least to most missed doses. A: Blue- dose not missed. Purple- full dose missed i.e. missed all drugs in regimen. Green- partial dose missed (i.e. missed some drugs). B: Blue- dose not missed. Purple- full dose missed, but no drugs missed due to ADRs. Yellow- full dose missed, all drugs missed due to ADRs. Green- partial or full dose missed, at least one but not all drugs were missed due to ADRs. C: Where missed doses occurred due to ADRs, gap length (i.e. the number of sporadic missed doses missed in sequence) is plotted and columns are colour-coded by the ADR type, categorised by class organ system (COS) using MedDRA terminology.

Conclusions: Hepatobiliary-sparing regimens need to be developed in order to reduce missed doses and improve treatment outcomes.

PP20-982-14 Evaluation of cycloserine dose regimens in multi-drug-resistant TB participants from India

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Background: Cycloserine is endorsed by WHO for use in longer multidrug-resistant tuberculosis (MDR-TB) regimens and is associated with reduced mortality. Efficacy of cycloserine relies on the time during dosing interval that exposure exceeds minimum inhibitory concentration (T>MIC), ideally ≥64%, but scarce pharmacokinetic studies of cycloserine exist.
We aimed to describe cycloserine pharmacokinetics in an Indian population over a range of doses and MIC levels.
Design/Methods: Adults and adolescents with MDR-TB were enrolled in a prospective observational study at a tertiary care referral hospital in Mumbai, India.
Participants received MDR-TB treatment as per national guidelines, including weight-adjusted cycloserine dose of 250 mg twice or three-times daily or split doses of 250 mg in the morning and 500 mg at night.
Intensive and sparse samples were drawn after the first month of treatment. Samples were assayed with a validated chromatography tandem mass assay and the pharmacokinetic analysis was performed using nonlinear mixed-effects modelling.

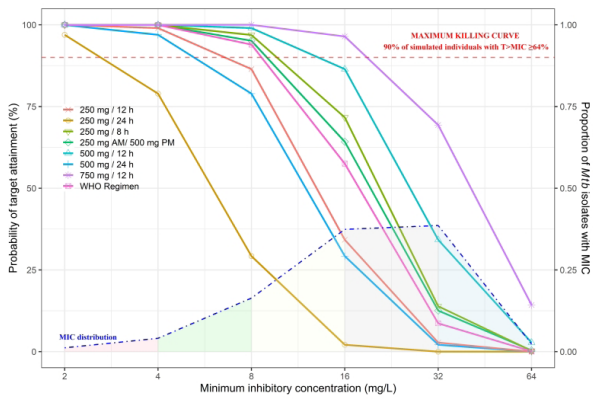

Figure 1. Probability of target attainment by dose and minimum inhibitory concentration. Solid lines indicate the probability of targe attainment (PTA) on the primary y-axis (on left) based on the percentage of time during dose interval which the concentration exceeds the minimum inhibitory concentration (%$T_{>MIC}$) for cycloserine MIC levels on the x-axis. Regimen by WHO consisting of 500 mg for body weights ≤45 kg and 750 mg for body weights ≥46 kg.

Results: Data included 180 participants (117 female) with median age, weight, and fat-free mass of 27 (interquartile range, 21-35) years, 56.0 (46.0-65.9) kg, and 38.6 (32.3-47.1) kg, respectively. A total of 1,281 observations were fitted to a one-compartment model with first-order elimination and delayed absorption by transit compartments. Fat-free mass best described the effect of body size on disposition parameters. Typical non-renal clearance was 0.901 L/h and renal elimination was 0.589 L/h based on standard creatinine clearance.
Our simulations suggest for a median MIC of 16 mg/L, 86% and 64% of people achieving the target T>MIC at a dose of 500 mg/12 h and 250/500 mg, respectively.
Conclusions: In our study, cycloserine exposure was significantly lower than previously reported. Hence, our model suggests sizeable to reach predicted efficacy targets.
Due to differences in overall exposures found in our population the reported doses should be confirmed and evaluated prospectively.

PP16 HIV co-morbidities: Services and integrated approaches

PP16-945-14 Implementation of TB services for children living with HIV in PEPFAR-supported programs from 16 high TB/HIV-burden countries in sub-Saharan Africa, 2019–2022

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Background: PEPFAR is the largest platform providing TB/HIV services globally, serving 18 million people, including nearly 600,000 children (<15) living with HIV (CLHIV).
Design/Methods: We reviewed semi-annual PEFPAR indicators describing TB symptom screening and treatment initiation among CLHIV in 16 WHO TB/HIV high-burden countries supported by PEPFAR between October 2018–September 2022 (FY2019–2022), stratified by geographic region and ART status in FY2022. Data by age are unavailable for TB diagnostic testing; TB treatment is a proxy for diagnosis.

Results: During FY2019-2022, TB screening coverage among CLHIV fluctuated (80%-87%) across reporting periods. Between 2.5 % and 4.6% CLHIV screened positive for TB symptoms and between 18% and 47% of those screening positive initiated TB treatment during this time. In FY2022, 83% of CLHIV were screened for TB; 3.1% of CLHIV already on ART screened positive as did 11.3% of those newly initiating ART. Of CLHIV with a positive symptom screen, 14% already on ART and 40% newly initiating ART started TB treatment.
By region, screening coverage ranged from 75% in Southern Africa to 98% in Central/West Africa, while proportion screening positive ranged from 3.3% in Southern Africa to 4.2% in East Africa. TB treatment initiation among all CLHIV with a positive screen ranged from 13% in Central/West Africa to 25% in East Africa.
Conclusions: PEPFAR expectations are as follows: 100% TB screening coverage with at least 5% and 15% screening positive among those already on ART and newly initiating ART, respectively. Furthermore, among those screening positive, <5% are expected to need TB treatment. These data show that TB screening coverage in CLHIV was suboptimal. The proportion screening positive was lower than expected across time and regions, while higher proportions than expected started TB treatment following positive TB symptom screen. Findings suggest missed opportunities to diagnose and treat TB in CLHIV.

PP16-950-14 Implementing integrated TB, mental health and substance use disorder services in Nigeria: Lessons learned so far

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Background and challenges to implementation: Nigeria grapples with a triple burden of tuberculosis (TB), TB/HIV, and drug-resistant TB (DR-TB), alongside a significant prevalence of mental health disorders (MHD) and substance use disorders (SD). Prevalence of depression is notably higher among individuals with TB and TB/HIV, at 46% and 66.7% respectively, compared to 4% in the general population.
This underscores a critical need for integrated services delivery (ISD) interventions. However, within the National TB Program (NTP), mental health (MH) support for TB patients remains scarce due to low awareness and systemic weaknesses in mental health care infrastructure that leave the country with mental health (MH) treatment gap of >80%.
Presented are lessons learned by RedAid Nigeria in piloting the Stop TB Partnership TB REACH Wave 10 grant on integrating TB, MH, and SD services across three Nigerian states from July 2023 to September 2024.
Intervention or response: A package of interventions directed at strengthening the health system was adopted, viz: advocacy for strengthened leadership and accountability; capacity building using WHO mhGAP, for general healthcare workers and community volunteers on identification, referral, and management of TB/MH/SD; task-shifting with regular supportive supervision for provision of comprehensive integrated person-centered services; adopting integrated health management information system for TB/MH/SD and increasing availability of quality psychotropic agents.
Results/Impact: The implementation yielded valuable insights. Despite high MHD and SD prevalence, healthcare-seeking behavior remains low due to limited awareness. Use of shorter validated screening tools can improve the uptake of services by reducing patient waiting time. Non-mental health professionals can provide basic MH/SD services if trained. Proximity of MH/SD services to the point of identification facilitates linkage and service utilization. Sustained quality implementation necessitates ongoing training, monitoring, and supportive supervision, especially amid a diminishing healthcare workforce.
Conclusions: Implementing ISD of TB/MH/SD is feasible, and requires increased awareness, capacity building, increased workforce, and task-shifting.

PP16-944-14 Linking children with TB disease to HIV services in 16 high TB/HIV-burden countries supported by U.S. President's Emergency Plan for AIDS Relief, October 2018-September 2022

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Background: Promptly identifying children and adolescents with TB co-infected with HIV and ensuring they receive antiretroviral treatment (ART) can reduce TB/HIV-associated mortality. We reviewed linkage of children and younger adolescents with TB to HIV services at TB clinical sites in 16 high TB/HIV-burden sub-Saharan African countries supported by U.S. President's Emergency Plan for AIDS Relief (PEPFAR).

Design/Methods: PEPFAR monitoring, evaluation, and reporting data describing persons aged <15 years with TB on anti-TB treatment, during October 2018-September 2022 (Fiscal year [FY]19-FY22), were reviewed. Indicators include known HIV status (proportion with TB with reported HIV-status), HIV positivity (proportion with TB and reported HIV-status who are TB/HIV-coinfected, including those newly identified and those already diagnosed with HIV), and ART linkage (proportion of TB/HIV-coinfected receiving ART). Data were collected quarterly except for ART linkage (annually collected in FY22). Trend performance of indicators during FY19-FY22 and cumulative (including age-stratified) performance in FY22 are described.

Results: From FY19-FY22 among children and adolescents with TB, known HIV status coverage marginally increased from 90% to 91%; HIV positivity decreased from 22% to 14%, including newly identified positive from 7% to 4%; and ART coverage increased from 90% to 97% (Figure). In FY22, among 73,185 children and adolescents with TB, 93% had a known HIV status, of which 14% were coinfected (4% newly identified and 10% with known diagnosis). Of 9,295 coinfected, 97% were currently on or newly started ART. Known HIV status was lower among infants <1 (74%) and ART linkage was lower among children <1 and 1-4 years (93%).

Conclusions: These findings highlight PEPFAR's effective integration of HIV services into TB services despite persisting gaps in young children. While HIV positivity decreased among children and adolescents with TB, universal HIV testing of those with TB remains critical to close pediatric HIV treatment gaps and reduce mortality in high-burden countries.

PP16-942-14 TB services uptake and incidence among key populations receiving HIV services in Uganda during 2017-2021

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Background: The TB incidence in Uganda is 200 per 100,000 persons. Key populations (KPs) — female sex workers (FSW), men who have sex with men (MSM), people who inject drugs (PWID), transgender persons (TG), and people in prisons (PIP) - have increased risks of TB due to where they live/work and limited access to quality TB services. We analyzed routine health facility data for KPs in Uganda to assess the level of TB services uptake and incidence during 2017-2021.

Design/Methods: TB incidence rates were estimated by dividing the total number of new TB diagnoses by person-time-at-risk. Poisson regression and adjusted incidence rate ratios (aIRRs) were used to determine factors associated with incidence.

Results: During 2017-2021, 749,526 KPs aged 18+ received services at health facilities in Uganda - 418,016 FSW (55.7%), 255,116 (34.0%) PIP, 51,759 (6.9%) MSM, 20,466 (2.7%) PWID, and 4,169 (0.6%) TG. Of these, 678,541 (90.5%) were screened for TB, and 765 (0.11%) were diagnosed with TB: FSW (0.08%), PIP (0.18%), MSM (0.04%), PWID (0.08%), and TG (0.11%).

A total of 471 (61.6%) were treated for TB: FSW (64.5%), PIP (59.3%), MSM (68.8%), PWID (56.3%), and TG (100%).

Overall, incidence was 21.4 cases (95% CI: 19.60, 23.29) per 1000 person-years or 500 per 100,000 persons.

Incidence was highest among PIP (34.25 [95%CI: 30.92, 37.94]). Incidence among persons living with HIV was higher (aIRR =1.74, 95%CI: 1.33-2.28) compared to HIV-negative clients. Incidence in Eastern (aIRR=0.16, 95% CI: 0.09–0.30), Northern (aIRR=0.53, 95% CI: 0.40–0.69) and Western (aIRR=0.17, 95% CI: 0.17–0.26) regions was lower than in Central region.

Conclusions: TB screening among KPs in Uganda during 2017-2021 was high, and incidence was threefold that in the general population. Treatment uptake was suboptimal, suggesting the urgent need for programs to enhance TB prevention and treatment among KPs, especially PIP.

PP16-949-14 Barriers to access counselling for alcohol use among newly-diagnosed people with TB and HIV in India

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Background: Globally, alcohol use (AU) has been found to negatively impact treatment outcomes among people with Tuberculosis and HIV coinfection (PWTB-HIV). However, data on AU and PWTB-HIV is limited. Additionally, little is known about the perspectives of the PWTB-HIV on barriers to seeking counselling for AU (CAU).

Our study assesses the prevalence of AU among PWTB-HIV and the barriers to seeking CAU among them in India.

Design/Methods: We assessed the prevalence of AU among 163 purposively selected newly diagnosed PWTB-HIV (Age: ≥18 years) between March 2021 and October 2023 using the alcohol use disorder identification test-C [(AUDIT-C); cut-off score ≥ 4 for identifying AU] in Pune, India. Data was analyzed using R-Studio.

Barriers seeking CAU were assessed by in-depth interviews (IDIs) conducted with 10 purposively selected newly diagnosed PWTB-HIV with AUDIT scores≥8. The interview guide was based on the information-motivation-behavioral skills model. IDIs were analyzed using the rapid qualitative analysis method.

Results: Of 163 PWTB-HIV (Male 105, Female 57, Transgender 1) screened, 50 (31%) reported AU. The median age was 40 IQR: 31-47. Prevalence of AU among males was 47% (CI: 37-57). Median age of AU was 40 years (IQR: 31-49). AU was higher among the 26-35 age group (38%, CI: 25-53).

IDI participants (Male 9, Female 1) never sought CAU from the health system due to the absence of motivational communication to reduce AU. Other barriers reported were perceived and enacted stigma on AU, lack of family support, peer influence, and unawareness of the adverse effects of AU on their health.

Conclusions: Mandatory AU screening using AUDIT-C in TB and HIV care programs during treatment initiation is necessary for early identification of AU and appropriate referral. Counseling in the health system can be improved by educating patients on harmful effects of AU, promoting support from family and peers, and addressing stigma among PWTB-HIV.

PP16-946-14 Managing multimorbidity: The role of integrated health services in TB screening in Rural Sindh, Pakistan

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Background and challenges to implementation: Individuals afflicted with tuberculosis (TB) often face barriers to holistic healthcare in resource-constrained settings. Weak health systems with service delivery through vertical programs perpetuate access barriers and overlook needs of those with TB and other common comorbidities. We designed a decentralized, community-based, integrated service-delivery model in rural Sindh, Pakistan, integrating TB, Hepatitis-C (HCV), COVID-19, and mental health screening, diagnosis, and care linkage.

Intervention or response: From July 2023 to March 2024, in Mirpurkhas district, we conducted community camps using a mobile-van equipped with artificial intelligence (AI)-assisted digital chest radiography (CXR) for point-of-care TB and COVID-19 screening.

Concurrent screening and diagnosis for HCV and COVID-19 were also offered via rapid tests. Individuals presumed with TB and/or HCV received on-site Xpert MTB/RIF assay and HCV viral load testing. All individuals at risk of screened conditions also received mental health assessments with the PHQ-4[1].

Results/Impact: Of 8,700 individuals across 51 community camps, the majority received CXR screening for TB, COVID-19, and rapid HCV tests (Figure 1).

1,101 (13%) persons were identified with presumed TB and none with COVID-19. 93 individuals were diagnosed with TB through Xpert MTB/RIF assay, reflecting high TB yields of 1.1% in community settings, with 88 (95%) initiating treatment. 916 (11%) tested anti-HCV positive, exceeding the national estimate of 6%. Of these, 459 (50%) were PCR confirmed for active HCV via Xpert, with 92% linked to treatment, and 41% starting treatment.

Additionally, 1,671 underwent mental health screening; 20 (1%) experienced mental distress, with 80% receiving counseling. 12 individuals TB/HCV co-infection; 4 HCV cases presented concurrent mental health concerns.

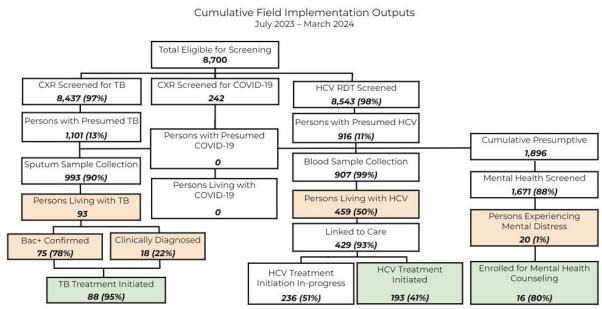

Figure 1. Flowchart illustrates integrated screening, diagnosis, and linkage to care outputs during community camps in rural Sindh from July 2023 to March 2024, covering tuberculosis (TB), hepatitis C (HCV), COVID-19, and mental health screenings.

Abbreviations: Chest X-ray (CXR), Tuberculosis (TB), Hepatitis C (HCV), and Rapid Diagnostic Test (RDT).

[1]The PHQ-4 is a brief screening tool designed to assess symptoms of depression and generalized anxiety disorder. Consisting of four questions, respondents provide answers on a four-point Likert-type scale. Its brevity makes it ideal for routine screenings in various settings, offering a quick assessment of these mental health conditions.

Conclusions: Our analysis underscores the importance of prioritizing people-centered strategies in TB screening. Early findings demonstrate the effectiveness of combining services to manage multimorbidity, ensuring holistic care and optimizing resource utilization. This approach effectively addresses healthcare gaps, promoting equitable access to quality care and improved health outcomes.

PP16-943-14 Integrated TB, cardiovascular disease, and chronic respiratory disease screening in Nasarawa State, Nigeria: Field experiences and lessons learned

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Background: Nigeria harbors the dual burden of both communicable and non-communicable diseases and suffers from the underdiagnosis of these disease conditions. To mitigate against this public health concern, there is a need for integrated screening efforts at the community level.
This study aims to present lessons learned from a pilot implementation of technology-assisted integrated screening for tuberculosis, cardiovascular disease, and chronic respiratory diseases in remote rural communities and slums in Nasarawa State.
Design/Methods: An AI-enabled mobile digital X-ray that detected TB/CVD/CRD-related abnormalities was used to screen community members in outreaches. Each outreach was preceded by advocacy visits and awareness creation involving community gatekeepers, and a total of 31 outreaches were conducted in selected communities. Each client was clinically screened after which a chest x-ray was taken. The X-ray result was automatically transmitted to the Ai-platform for interpretation. Sputum samples were collected from presumptives and those with abnormal chest X-ray findings and sent to the laboratory for diagnosis using GeneXpert. Data was collected using standard NTBLCP registers.
Results: The mobile digital X-ray screening initiative assessed 2874 individuals, revealing 200 TB presumptive cases and 841 abnormal X-ray readings of which 704 show chronic respiratory diseases and 137 signs of cardiovascular diseases and total of 217 bacteriological and clinically diagnosed TB cases.
Experience in the field shows low community TB risk perception before awareness programs. Integrating TB screening with other diseases enhances acceptability. Men are more likely to attend technology-assisted integrated TB screening and interventions involving community leaders and known outreach team members than conventional sputum collection outreaches. In remote villages, severe health cases are often associated with witchcraft, leading to underutilization of facilities.
Conclusions: Effective TB screening requires employing technology, community involvement, sensitivity to the culture of the people, and integration with other health initiatives to improve healthcare access.

PP16-947-14 Enhancing access to prevention and care services for TB and co-morbidities for vulnerable populations through an integrated community-based approach in India

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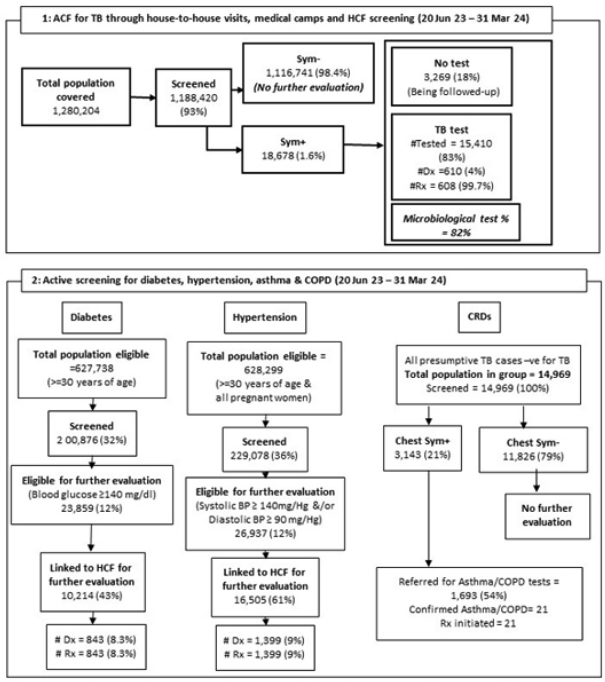
Background and challenges to implementation: To attain the ambitious goals of ‚Ending TB' in India by 2025, initiatives focusing on collaborative management of TB and comorbidities closer to the community are essential. Towards this, FIND, in collaboration with India's National TB programme, with funding support from Stop TB partnership through TB REACH Wave 10 grant, implemented an integrated service delivery (ISD) intervention.
This abstract documents the experience of the project implementation.
Intervention or response: This ISD intervention was rolled-out in June 2023 across two districts of Karnataka covering 1.68 million vulnerable population across 505 villages and slums. The project focuses on active case finding (ACF) of TB, diabetes (DM), hypertension (HT), and chronic respiratory diseases (CRD) and associated services by women self-help affinity group volunteers (SAGs). Individuals presumptive for TB are being linked to diagnosis and treatment while those symptomatic for DM, HT and CRDs are linked to health care facilities (HCF) for further investigation.

Household contacts (HHCs) of pulmonary TB patients (PTB) are linked to TB preventive therapy (TPT). Data reported till March 2024 were analysed.

Results/Impact: More than 1,300 SAGs and field staff were trained who enumerated 1,280,204 individuals (from 322,484 households) and screened 1,288,420 (93%) people (Figure 1).

Among these, ~2% were identified as presumptive TB cases. Among those tested (~83%), 610 were diagnosed with TB (82% microbiological confirmation) and 608 were initiated on treatment. Approximately 300 HHCs of PTB patients were initiated on TPT.

Among presumptive who were negative for TB (N=14,969) 1,693 individuals were linked to HCF for CRD evaluation of whom 21 were diagnosed with Asthma/COPD. About 200,000 individuals were screened for DM and HT of whom ~26,000 were linked to HCF for care.



3: Screening, evaluation and initiation of TPT among HHCs of PTB patients in project districts

	Belgaum district		Kalaburagi district		Total		
	N	%	N	%	N	%	
Total Pulmonary TB cases	157		409		566		*No of HHCs per index PTB patient
Total HHCs	437	3*	1,242	3*	1,679	3*	
HHCs screened	320	73%**	1,028	83%**	1,348	80%**	** Rest of the HHCs are being followed-up
HHCs evaluated	291	91%**	802	78%**	1,093	81%**	
TB ruled out	291	100%	802	100%	1,093	100%	
Offered TPT	291	100%	802	100%	1,093	100%	
Initiated on TPT	291	100%	11	1%	302	28%	

Figure 1. Key objectives and achievements of TB-NCD project, Karnataka, India

Conclusions: This women-led intervention demonstrated feasibility of addressing the intersecting health care needs of people with improved efficiency, access and uptake of services, and making services more people centred.

PP16-948-14 Investigating alcohol use disorder prevalence among people with presumptive TB, its association with clinical presentation, TB diagnosis and treatment outcomes in adults, in Lusaka, Zambia

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Background: Emerging evidence shows that alcohol use is an independent risk factor for tuberculosis. Alcohol use is not only linked to an increased risk of TB disease but also the severity of disease as well as poor TB treatment Outcomes. Individuals with alcohol use disorders exhibit delayed medical attention-seeking behaviour, leading to increased TB severity, higher rates of bacteriologically confirmed TB and poorer treatment outcomes.

Design/Methods: Secondary analysis of data collected in a primary cross-sectional diagnostic study of presumptive TB participants ≥ 18 years old, between November 2021 and December 2022 in Lusaka Zambia.

All participants were evaluated for TB using Mycobacteria culture and Xpert ultra. The prevalence of Alcohol Use Disorder (AUD) was determined using the Alcohol Use Disorders Identification Test (AUDIT-C).

Results: A total of 2421 presumptive tuberculosis patients were included in the analysis, Median age 35(IQR 27-45) years, 46.3%(119) Male, 37.1%(897) HIV positive, 12.0%(290) were diagnosed with bact. confirmed TB and 32.9% (795) had AUD. Of those diagnosed with TB, 47.2% and 52.8% were among those with AUD and those without AUD respectively (p=<0.001). AUD was associated with bacterial confirmation of TB (aOR 1.42, 95% CI 1.07-1.88) and neither severe clinical presentation at diagnosis (OR=1.97 95% CI: 0.55-6.98, p=0.296) nor TB treatment outcome (OR 0.89, 95% CI 0.44-1.78,p=0.737) were associated with AUD.

Conclusions: The association between AUD and bacterial diagnosis of tuberculosis provides a foundation for targeted interventions, offering a pivotal contribution to the global discourse on the intersectionality of infectious diseases and substance use disorders.

However, it is essential to consider a more objective measure for alcohol use to fully understand this relationship and identify opportunities for intervention.

PP18 Information system for TB

PP18-964-14 Transforming public health: End-to-end AI-driven TB screening in Tamil Nadu

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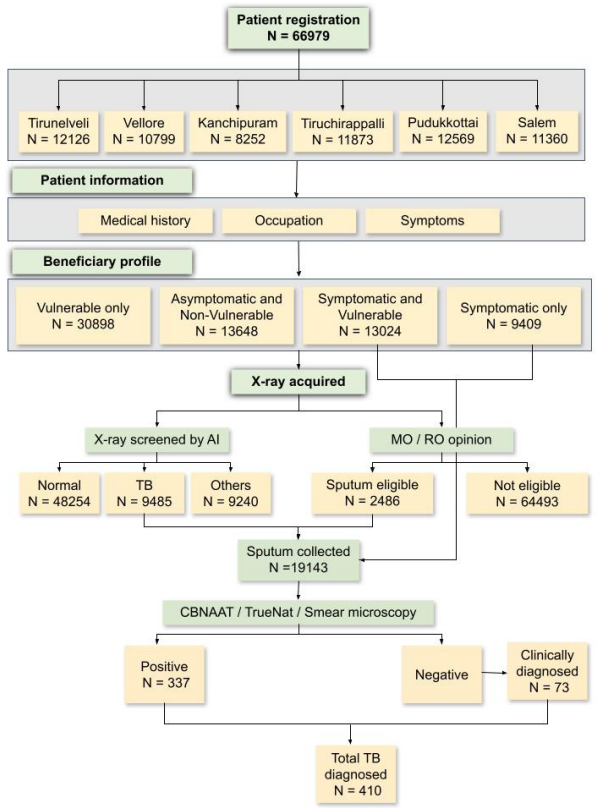
Background: The Tamil Nadu-National Tuberculosis Elimination Program (NTEP) incorporated AI-based chest X-ray screening to augment TB detection rates across 6 districts.
Design/Methods: 9 mobile diagnostic units equipped with digital X-ray machines and DeepTek's CADe software (Genki) were operationalized in 6 districts of Tamil Nadu, India. Participants' health, medical history, occupational status, and symptom data were recorded before X-ray screening.
The scans were analyzed by DeepTek's Genki and further reviewed by either a medical officer (MO) or a radiology officer (RO) as needed. Participants identified by symptoms, AI analysis, or assessment by MO/RO were subjected to TB confirmation tests.



Results: From March 2023 to February 2024, 66,979 individuals were screened (52 ± 16 years old, 28,332 males, 38,628 females, 19 others). 30,898 individuals were identified as vulnerable based on their medical history and occupational status and 9,409 were symptomatic. 13,024 participants were both vulnerable and symptomatic, while 13,648 were asymptomatic and non-vulnerable.
AI predicted 48,354 X-rays as normal, 9,485 as indicative of TB, and 9,240 with other abnormalities. Sputum samples were collected from individuals showing any symptoms (Cough, chills, fever, night sweat, weight loss, and blood in sputum) or identified through AI or MO/RO review, totaling 19,143 samples. 337 cases were confirmed as TB through CBNAAT/TrueNat/Smear microscopy tests.
An additional 73 sputum negative cases were clinically diagnosed as TB, resulting in a total of 410 cases as TB diagnosed. 379/410 (92.44%) individuals diagnosed with TB were also suggestive of TB by DeepTek's Genki. 70/73 (95.9%) individuals who were clinically diagnosed for TB were suggestive of TB by DeepTek's Genki.
Conclusions: Implementation of AI in NTEP significantly aided the Tamil Nadu NTEP in screening a vast number of individuals, highlighting the utility of integrating technology in public TB screening initiatives.

PP18-962-14 A comparative study of TB screening methods in Tamil Nadu: AI vs. conventional approach

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Background: TB presents a global public health challenge, often hindered by delays in detection using conventional screening methods. In Tamil Nadu, India, DeepTek's AI solution (Genki) was integrated into the public TB screening programmes to improve detection rates through chest radiograph analysis.
Design/Methods: The comparative analysis encompasses a comprehensive examination of population demographics, utilization of chest X-rays, number of sputum samples collected, and TB diagnosis outcomes in districts employing DeepTek's Genki (Kanchipuram, Salem, Tiruchirapalli, Tirunelveli, and Vellore) against those utilizing conventional methods (Viluppuram, Coimbatore, Madurai, Cuddalore, and Tirupur).
The selection criteria ensured the inclusion of the five most populous districts, with comparable population sizes, for both conventional and AI-based TB screening. Data was collected and analyzed to assess the effectiveness of AI in improving TB detection.
Results: The findings reveal noteworthy enhancements in TB detection rates through AI-based screening compared to conventional methods. While the total population screened and the number of chest X-rays acquired remained comparable between the two approaches, AI-based screening exhibited a marked improvement in identifying TB cases. Notably, despite an equivalent number of sputum samples collected, there was a substantial

increase in the percentage of positive sputum samples (2.86-fold) with DeepTek's Genki. Furthermore, both the percentage of sputum-positive cases and X-ray-positive cases demonstrated significant increments with AI-based screening (3.15-fold and 2.35-fold, respectively). The total number of diagnosed TB cases exhibited a remarkable increase (2.09-fold) with AI-based screening, indicating its substantial contribution to TB case identification.

Parameter	Districts with conventional TB screening (A) (N=5)	Districts with AI-based TB screening (B) (N=5)	Fold change (B/A)	Impact of AI in population TB screening	p-value
Total Population	1,63,45,626	1,78,43,712	1.09	-	0.148
Total no. of Chest X-ray acquired	44,775	54,410	1.22	-	0.148
Total no. of sputum samples collected	18,000	16,337	0.91	-	0.338
% Sputum samples collected	40.20	30.03	0.69	-	0.202
Total no. of positive sputum samples (a)	100	286	**2.86**	286% increase in identification of sputum positive samples	**0.011**
% Sputum positive	0.56	1.75	**3.15**	3.15 fold increase in the percentage of sputum positive cases from the total no. of sputum samples collected	**0.006**
% X-ray positive	0.22	0.53	**2.35**	2.35 fold increase in diagnosis of sputum positive cases from the total no. of X-rays screened	**0.030**
Total no. of Clinician positive cases (b)	63	55	0.87	-	0.330
Total number of TB diagnosed cases (a+b)	163	341	**2.09**	209% increase in total number of TB cases diagnosed	**0.018**
Total % TB positive	0.36	0.63	**1.72**	1.72 fold increase in diagnosis of TB cases from the total no. of X-rays screened	**0.047**

Conclusions: The Implementation of AI-based screening emerges to be promising in identification of subclinical and missing asymptomatic case, which has led to substantial improvements in TB case detection rates across the evaluated districts in Tamil Nadu. These findings underscore the transformative potential of AI-driven solutions like DeepTek's Genki in revolutionizing TB screening practices, thereby facilitating effective disease management and control strategies.

PP18-961-14 Improving access to TB services through specimen transportation in hard-to-reach communities in Plateau State through the "PICK-ME-UP-TO-JOS" (PUJ) intervention

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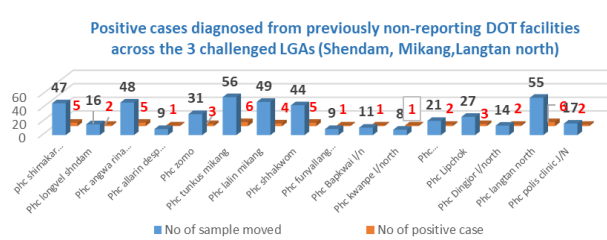
Background and challenges to implementation: Plateau State, located in North Central Nigeria, faces challenges due to its difficult terrain and recurrent humanitarian crises. Despite this, TB treatment coverage remains low, and the state reports the highest diagnosis versus enrolment gap in the North Central region. This intervention targets improving the turnaround time (TAT) for specimen shipment and result collection, as well as enhancing reimbursement for transportation costs.
Intervention or response: A situation analysis identified three challenged Local Government Areas (LGAs) with low case detection, primarily attributed to their terrain and underutilization of available specimen transport systems. A hub and spoke model were implemented, mapping health facilities providing TB services and laboratory diagnostics to improve access and pick up of specimen transportation evidence. Collection boxes for evidence of specimen transportation were strategically placed at diagnostic centers and hubs.
Results/Impact: This innovative approach significantly improved specimen transportation across the 3 challenged LGAs from a monthly average of 36 movements with 1,529 samples in Q3, 2023 to 323 movements with 3,805 samples in Q4, 2023. The number of samples moved in the state increased to an average of 10,176 (247%) monthly in Q4, 2023, compared to 2,925 average monthly samples transported in Q3, 2023. Facilitated by timely reimbursement processes on monthly basis rather than quarterly because of the collection box. Specimen result turnaround time improved from 1-2 weeks to 72 hours. Additionally, the number of TB cases diagnosed from previously non-reporting DOT facilities increased from 44 in December 2023 to 91 in January 2024.



Conclusions: This intervention has reignited interest in transporting samples from hard-to-reach communities and health facilities to TB diagnostic laboratories, driven by improved reimbursement periods and reactivation of non-reporting Directly Observed Treatment (DOT) centers in TB hotspot settlements. Scaling up this approach in Plateau State and similar settings is recommended to enhance TB diagnosis and treatment coverage effectively.

PP18-968-14 Data quality for TB indicators in Uganda: Can Ugandan TB data be trusted?

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Background and challenges to implementation: Recognizing the pivotal role of accurate data reported on the tuberculosis (TB) indicators in combating TB, the National TB and Leprosy Program (NTLP) – Uganda, with funding from United States Agency for International Development and other partners, conducted a comprehensive data quality assessment (DQA) across selected diagnostic and treatment (DTUs). The DQA assessed selected TB indicators, this assessment reports on the reliability and quality of data reported to and by the NTLP.
Intervention or response: This study was secondary analysis of DQA findings about the District Health Information Software 2 (DHIS2) data from 213 facilities across 75 districts during October 2021 to March 2022. Data accuracy was assessed through percentage deviations in, utilizing a 1-10 accuracy scale, where 1 indicated very poor and 10 perfect accuracy. Accuracy was rated based on deviations, with specific percentages assigned corresponding ratings. Multi-Criteria Decision Analysis (MCDA) synthesized these ratings into an overall quality score, normalizing them against the highest possible score for robust quality evaluation. This methodological approach provided a systematic assessment of HMIS and DHIS2 data quality.
Results/Impact: The results showed excellent data accuracy performance areas that the NTLP had reported through DHIS2. The overall data quality score of the NTLP data was 80% with 7 out of the 9 indicators having very good accuracy levels. With a data quality rating of 1 and 2, TPT coverage and Contact investigation coverage—had less-than-ideal data quality (quality score=15%). Unsatisfactory quality was also observed in the reporting of *presumed TB cases identified and diagnosed* with a 10% data quality score.

Indicator	Verified Number	DHIS2 discrepancy	Rating	Overall rating	Normalized Rating (Quality Score)
Roadmap Indicator					
TB Detection	9745	1%	10	8	80%
Bacteriological Diagnosis Coverage (Pulmonary TB)	5269	-1%	10		
Childhood TB Notifications	1609	4%	9		
Drug-Resistant TB Notifications	107	5%	9		
Contact Investigation Coverage	20535	-11%	1		
TB Treatment Success Rate	2075	4%	9		
TB Cure Rate*	999	3%	10		
Drug-Resistant TB treatment Success Rate	100	-3%	10		
TPT Coverage	19832	-10%	2		

Table 1. DQA findings - data based on HMIS106a reports.

Conclusions: The analysis demonstrates the stability the NTLP data reported through DHIS2. While most of the indicators showed strong reporting, there is a gap in certain areas such as contact investigation coverage and TPT. To replicate success across all metrics, the NTLP is making targeted follow-up actions to effect positive changes.

PP18-970-14 Enhancing TB case yield through deployment of designated screening staff at major private health facilities in Pakistan

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Background and challenges to implementation: Engagement with Large Private Hospitals is integral to Public-Private Mix (PPM) initiatives. These hospitals attract a significantly higher proportion of tuberculosis (TB) patients, thus raising the expectation of detecting more TB cases within their premises. However, due to the absence of effective linkages among various departments and centralized reporting systems for TB cases, a considerable number of TB patients go undetected as presumptive cases, dispersed throughout these large hospitals.
Intervention or response: Mercy Corps Pakistan has been actively involved in implementing TB control activities within the private health sector since 2010. The cumulative contribution to national TB case notifications from private health networks engaged with Mercy Corps has been estimated at 40%. In 2021, Mercy Corps initiated an intervention to extend the PPM approach in Pakistan by engaging with large private hospitals.
Designated staff referred to as „TB screeners“ were deployed at selected hospitals. They are primarily responsible for coordinating with all hospital departments, raising awareness, screening TB symptomatic patients in the outpatient department (OPD); and facilitating them through the process of examination, diagnosis, treatment initiation, and follow-up for adherence.

From July 2021 to January 2023, Mercy Corps enlisted the participation of 375 private hospitals, resulting in the notification of 69,753 TB cases. Out of these 375 hospitals, 301 received support from 237 designated staff members. Some TB screeners rotated between two or three hospitals.

Results/Impact: Hospitals supported by designated staff members reported an average of 35 TB patients per quarter, compared to only 09 TB patients per quarter in hospitals without such support.

Conclusions: The provision of dedicated staff at large private hospitals has demonstrated the potential to increase TB case notifications and contribute to improved quality of diagnosis, treatment, and adherence among registered TB patients.

PP18-963-14 Trends and patterns in TB research outputs: A bibliometric analysis from 2003 to 2023 in Ethiopia

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Background: Despite Ethiopia's significant achievements in its national tuberculosis (TB) response, it continues to face a high TB/HIV burden. Ethiopia identified research as one of the key pillars to end TB and is one of the few high TB burden countries with a national TB research roadmap.

Our aim was to explore recent trends and patterns in TB research publications in Ethiopia.

Design/Methods: We conducted a bibliometric analysis from 2003 to 2023, with particular focus on the last five years. A tailored search was developed for PubMed search engine to identify TB related publications in Ethiopia.

The analysis, conducted in RStudio, aimed to assess the alignment of research outputs with the priority areas outlined in the national TB research roadmap and to explore the regional and institutional distribution of these outputs. Results were discussed with national stakeholders to reach consensus.

Results: We identified 1,153 publications, revealing a notable growth from 11 articles in 2003 to a peak of 120 in 2019, with an average annual growth rate of 10.9%. This literature, contributed to by 2,439 authors, had an average of 7.89 co-authors per publication.

Corresponding authors were predominantly from Ethiopia, though significant contributions also came from collaborating authors in Australia, the USA, and Norway. In 2023, 90% of publications originated from the Amhara, Oromia, and Addis Ababa regions, which collectively account for approximately 50% of the country's population.

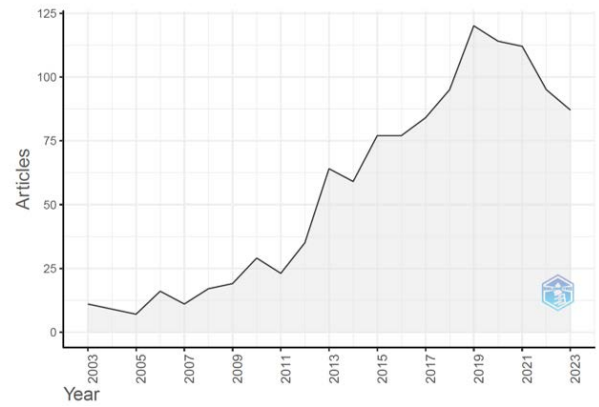

Figure. Annual scientific production related to TB in Ethiopia from 2003 - 2023.

Conclusions: The upward trajectory in TB research publications over the past two decades aligns with significant TB control investments in Ethiopia. The decline in publications since 2019 suggests the influence of COVID-19 and other external factors. The high number of publications in 2019 may reflect cumulative outputs from multiple project-supported initiatives.

Results also indicate a concentration of research activity in regions with major research institutions and underscores the need for ensuring regional equity in research efforts.

PP18-969-14 Leveraging health information helpline to improve treatment adherence and outcome of person with TB: A pilot from Jharkhand, India

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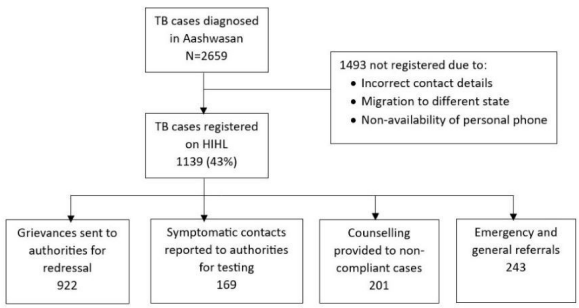
Background and challenges to implementation: The 104 Health Information Helpline (HIHL), an initiative of National Health Mission (NHM)- Jharkhand, operates in a public-private partnership mode. Staffed with health advisory officers, medical officers and counsellors, the helpline provides medical advice for common health conditions, counselling, information of health facilities and addresses grievances related to health schemes/services.

Intervention or response: Between January-June 2022, every week, a detailed line-list of new confirmed TB case in Aashwasan (a 100-days active case finding campaign) from 20 districts of Jharkhand was shared with the HIHL team for follow-up. An algorithm was prepared for guiding the health advisory officer to speak with TB patients and provide relevant information or advise. Each TB patient received 15 structured calls, with eight calls scheduled during intensive treatment phase and the rest during the continuation phase. An outcome was allocated to every valid call, prompting the implementation of necessary actions.

Results/Impact: Out of 2659 newly identified TB cases in Aashwasan, 1139 were registered in HIHL. Of the total registered, 1081 (95%) were followed till an outcome was assigned to them by the program *(Figure 1)*.



Conclusions: Each state possesses its own HIHL. Utilizing this platform can aid in improving health-care delivery by not only following-up of TB patients but also by providing correct information to the patient, escalating their request to appropriate authorities for prompt redressal, thereby, decreasing morbidity, mortality and halting the disease transmission.

PP18-965-14 Improving enrollment rate for newly-diagnosed TB cases using an active surveillance system for programme monitoring: A case study of TB LON-3 Project in Lagos

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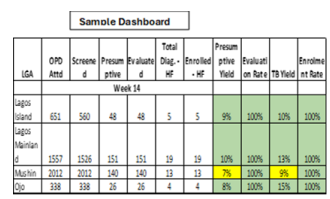
Background and challenges to implementation: Lots of effort have been put in place to scale up identification of missing TB cases in Nigeria, being the highest TB burden country in Africa. However, beyond identification of these missing cases, a lot more still needs to be done to ensure newly diagnosed are placed on treatment. It is necessary to state that the proportion of newly diagnosed cases yet to commence treatment will continue to increase especially where there are no targeted approaches to addressing it. It is for this reason that the TB LON-3 project deployed an active surveillance system for program monitoring to quickly flag gaps in patient enrolment in supported public facilities.

Intervention or response: In June 2023, owing to the observed trend of high number of patients yet to commence treatment in public facilities under the project in Lagos state, a surveillance system was set up for real-time monitoring of patients' diagnosis and enrolment.

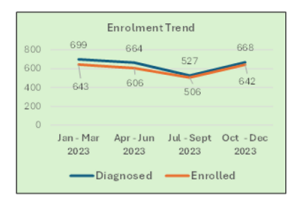
The surveillance system was further complemented with the setting up of an enrolment task force to promptly flag areas where there are gaps and alert the respective officers to follow up with the patients.

To access its impact, a six-month review of enrolment gap pre and post dissemination of the surveillance system was conducted.

Results/Impact: Between January and June 2023, enrolment gap was at an average of 57 patients per quarter. However, following the implementation of the surveillance system and task force the enrollment gap reduced by more than half at an average of 23 patients per quarter. The corresponding enrolment rate also improved from an average of 91% to 96% pre and post implementation of the surveillance respectively. See figures below:


Sample Dashboard

LGA	OPD Attd	Screened	Presumptive	Evaluated	Total Diag. - HF	Enrolled - HF	Presumptive Yield	Evaluation Rate	TB Yield	Enrolment Rate
				Week 14						
Lagos Island	651	560	48	48	5	5	9%	100%	10%	100%
Lagos Mainland	1557	1526	151	151	19	19	10%	100%	13%	100%
Mushin	2012	2012	140	140	13	13	7%	100%	9%	100%
Ojo	338	338	26	26	4	4	8%	100%	15%	100%



Conclusions: Actively following up with the patients through a surveillance system and peer review will go a long way in helping to bridge the gap in enrolment of the patients on treatment.

PP11 New technologies and methods for eliminating TB

PP11-904-14 Prevalence of high blood pressure among persons with presumed and diagnosed TB at two first level hospitals in Lusaka, Zambia

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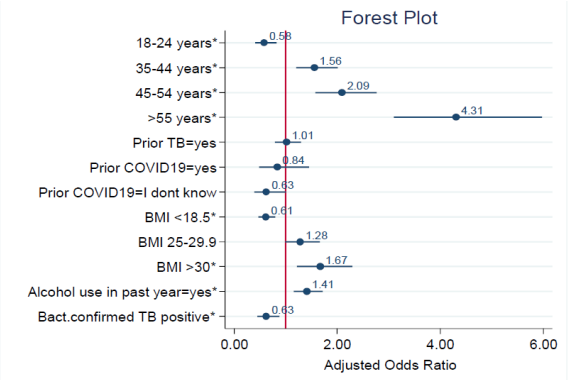
Background: Low- and middle-income countries are experiencing an increasing burden of non-communicable diseases, additionally straining health systems battling with high prevalence of infectious diseases such as tuberculosis (TB).
Design/Methods: We conducted secondary analysis of data from a cross-sectional study that enrolled consecutive persons with presumed TB, aged ≥18 years old between November 2021 and December 2022 in Lusaka, Zambia. We defined a high blood pressure (HBP) reading as any systolic ≥140mmHg and/or diastolic ≥90mmHg. Descriptive statistics were employed to summarise participant demographic and clinical characteristics while logistical regression analysis was used to identify factors associated with HBP.
Results: Of 2431 participants, 290 (11.9%) had TB, and 541 (26.9%) had HBP. Among those with HBP, 51/541 (7.8%) had TB.
Overall, 1,305 (53.6%) were female, median age was 35 years (IQR=27-45), 899 (36.9%) were living with HIV, 383 (15.7%) were overweight, and 209 (8.6%) were obese. We noted a history of tobacco use among 718 (29.5%), and 1078(44.3%) reported alcohol use during the past year.
The odds of a raised BP increased with ages 35-44 (aOR=1.56); 45-54 (aOR=2.09); and over 55 (aOR=4.31) years, alcohol use (aOR=1.41), and BMI over 30 (aOR=1.67) (Figure 1).
Conversely, participants with bacteriologically confirmed TB (aOR=0.63), aged 18-24 years (aOR=0.58) and BMI <18.5 (aOR=0.61) had lower odds of HBP. We noted no association between HBP and poor treatment outcome among those with bacteriologically confirmed TB.
Conclusions: Over 1 in 4 persons with presumed TB had HBP on initial reading. Higher BMI, alcohol use and older age were associated with increased HBP prevalence. This finding supports the need to integrate TB and NCD screening.



Abbreviations: TB-tuberculosis, Bact-Bacteriologically, BMI-Body Mass Index, *-Significant p-value

Figure 1. Forest plot for multivariate logistic regression analysis of factors associated with high BP reading among persons with presumed and diagnosed TB (N = 2,431).
*TB - tuberculosis, Bact - bacteriologically, BMI - body mass index, * - significant p-value.*

PP11-899-14 Characterisation of adolescents with TB using nationally representative data in Nigeria: An impetus for targeted interventions

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Background: Despite adolescents comprising a quarter of the Nigerian population, the adolescent Tuberculosis burden is unknown, partly due to lack of appropriate age-disaggregated data reporting. Whereas Nigeria has the second highest number of adolescents with HIV globally with an estimated incidence rate of 32 per 100,000 population, data on HIV-associated TB in adolescents are lacking.
The objective of the study was to determine the adolescent TB burden in Nigeria and the TB/HIV co-infection rate among adolescents in Nigeria utilizing routine TB surveillance data.

Design/Methods: A cross-sectional study was conducted across six purposively selected states (Edo, Oyo, Borno, Anambra, Federal Capital Territory and Kaduna) representing the six geopolitical zones in Nigeria. A standard data abstraction tool was developed to extract TB notification data from three facilities (tertiary, secondary and primary) per state for a total of 18 facilities. Data was abstracted for all ages from January to December 2022. Descriptive and Chi-square analysis were conducted.

	Total TB (%)	TB/HIV (%)	TB/HIV Male (%)	TB/HIV Female . (%)	Adolescent TB (%)	Adolescent TB/HIV (%)	Adolescent TB/HIV Male (%)	Adolescent TB/HIV Female (%)
Anambra	797 (22.1)	90 (26.3)	45 (28.5)	45 (24.1)	120 (31.7)	2 (8.3)	1 (8.3)	1 (8.3)
Edo	563 (15.6)	78 (22.8)	30 (19.0)	48 (25.7)	42 (11.1)	5 (20.8)	1 (8.3)	4 (33.3)
Borno	482 (13.4)	37 (10.8)	18 (11.4)	19 (10.2)	31 (8.2)	1 (4.2)	1 (8.3)	0 (0.0)
Kaduna	536 (14.9)	23 (6.7)	9 (5.7)	14 (7.5)	79 (20.9)	4 (16.7)	3 (25.0)	1 (8.3)
FCT	300 (8.9)	51 (14.9)	26 (26.5)	25 (13.4)	25 (6.6)	2 (8.3)	1 (8.3)	1 (8.3)
Oyo	928 (25.7)	63 (18.4)	30 (19.0)	33 (19.3)	81 (21.4)	10 (41.7)	5 (41.7)	5 (41.7)
Total	3606 (100)	342 (100)	158 (100)	184 (100)	378 (100)	24 (100)	12 (100)	12 (100)

Table 1: Distribution of Adolescent TB by state, age-group, sex and TB/HIV status

Results: Out of 3,606 notified individuals, adolescents accounted for 378 (10.4%), which varied between 6.6% in FCT to 31.7% in Anambra. Males comprised 53.4% of notified adolescent TB, similar to the proportion of males in all notified TB (59.0% (p= 0.28)). Within the 10-19 age range for adolescent, approximately two-thirds (63%) of notifications were 15 to 19-year-olds. The adolescent with HIV-associated TB rate were 6.3% (24/378) versus 9.5% (342/3606) for all notified TB (p=0.06). HIV-associated TB among all adolescent TB ranged from 4.2% in Borno to 41.7% in Oyo with no sex-based differences in TB/HIV co-infection rates for adolescents versus all TB cases (50.0% versus 53.8% respectively, p =0.84).

Conclusions: This is the first nationally representative data on adolescent TB in Nigeria. The findings suggest a higher representation of older adolescents, in the National TB data. It also gives insight into adolescent TB/HIV epidemiology across Nigeria enabling targeted adolescent-friendly interventions.

PP11-900-14 Development of the local TIBULIMS connectivity solution in Kenya for integrated connection of all existing and new TB diagnostic instruments

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Background and challenges to implementation: The Kenya NTP has implemented GXLIMS - a system that houses GeneXpert data since 2014. However, with introduction of new tools project in 2022, there was need to upgrade it to an improved and integrated solution (TIBULIMS) which includes all other WRDs; GeneXpert/ Ultra TrueNat, and CXR CAD4TB data to be under one platform.

Intervention or response: TIBULIMS was developed using Agile methodology, which resulted in accelerated system development through software re-engineering by:

• involving all key stakeholders in the development process through scoping of user needs to guarantee system acceptance, satisfaction and flexibility.

• Identifying and documenting system needs was key to ensuring the development process are aligned as per the needs.

• Final system validation by end users before rollout guaranteed the acceptability of the completed product.

Results/Impact: • Accurate test data is now available through TIBULIMS dashboards with 233 GeneXpert, 38 TrueNat and 8 CAD4TB machines now connected with result transmission happening in real-time basis. 80% of the samples were dispatched in the form of SMS and emails to clinicians via the portal-Full year 2023.

• Radiologists have read and interpret 20% of all Digital X-ray images taken with ease from anywhere in the countries and radiological report availed as soon as an image is uploaded.

• Improved commodity management via TIBULims has addressed the issue of stock outs and enhance accurate forecasting and quantification with informed resupply plans.

Conclusions: TIBULIMS has significantly improved:

• the quality of data since diagnostic data from all WRDs are now available through interactive dashboards.

• the lab-clinical interface has been strengthened through dispatch of test results via SMS and email to clinicians for quick patient intervention especially for referral patients.

• visibility to program managers for better monitoring of all devices enhancing informed decision making at key managerial areas.

• commodity management mechanism.

• monitoring of the Service Level Agreement.

PP11-896-14 Biological evaluation of spirocyclic phenol oxazole methyl scaffold as novel mmpL3 anti-tubercular agent

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Background: According to the WHO report published in 2023, TB was the world's second leading cause of death after COVID-19. The global aim of eliminating tuberculosis is jeopardized by the continuous emergence of drug-resistant strains, including multidrug-resistant (MDR) and extremely drug-resistant (XDR) strains. Hence, there is an urgent need for innovative therapeutic approaches that could not only shorten the duration of the treatment regimen but also have an effect on preventing drug-resistant forms of the disease from spreading.
Design/Methods: We present the development of a phenyl oxazole methyl (POM) core structure with spirocyclic derivatives as part of our efforts to discover innovative anti-tuberculosis agents. Derivatives of spirocyclic POM were synthesized and evaluated for their inhibitory effects on *M. tuberculosis* H37Rv. To find the target of the POM scaffold (5c), we generated resistant mutants for it. Whole genome sequencing of 5c-resistant mutants and subsequent molecular assays were performed to verify it. Time-kill kinetics and combination assays with know TB drugs were also performed to evaluate its biological activity.
Results: The POM scaffold (5c) was highly potent against wild-type and MDR clinical isolates.
Highly resistant mutants of POM5 were acquired, and SNPs of 4 isolates were identified through WGS. Their MIC range was 32 to 64 folds higher than their wild-type parent. Single nucleotide substitution of the mutants was mapped on mmPL3 252 in all mutant strains.
The computational docking study suggested that its binding mode was plausible against mmpL3. The 5c was more potent to the mmpL3 knockdown strain. The 5c showed an additive effect with known TB drugs. It also has bacteriocidal activity against Mtb H37Rv.
Conclusions: The mmpL3 inhibitor POM scaffold has good potency and drug properties. No approved drug targeting this target yet exists, and the presented research outcomes will contribute to the future discovery of novel antituberculosis drugs.

PP11-895-14 Whole genome sequencing analysis uncovers significant regional variation in clustering rates and clonal expansion of M. tuberculosis lineage 4.6.2.2 in Nigeria

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Background: Prevalence studies on drug resistance and genetic diversity in Nigeria have suggested regional distinctiveness in the phylogeography of *Mycobacterium tuberculosis* (*Mtb*), poor diversity of lineage 4 and the dominance of lineage 4.6.2.2. This unique tuberculosis (TB) landscape is thought to impact evolution and spread of Multi-drug Resistant (MDR) infection. However, a quantitative and high-resolution assessment of these claims is lacking.
Design/Methods: We employed Whole Genome Sequencing (WGS) based analysis for molecular epidemiology and population genomics assessment of three geographical regions believed to be ecologically/demographically distinct but connected in Nigeria: The North Central (NC), Southwest (SW), and Core North (Northwest and East/NWE). We profiled drug resistance genotypes, performed SNP typing, and correlated *Mtb* molecular signatures with patient characteristics from the NC region. Using various phylogenetic and molecular parameters including Terminal Branch Lengths (TBL), clustering rates, nucleotide diversity, and Pan-genome analysis, we compared the three regions to provide a clearer understanding of *Mtb* population structure and epidemiology in Nigeria.
Results: We present the first WGS analysis for TB infection dynamics in the North Central region of Nigeria. Drug resistance profiling revealed 39% resistance to at least one anti-TB drug, with 7.1% MDR TB and 18% Rifampicin-Resistant TB. All isolates belonged to lineage 4, predominantly the Euro-American (Cameroon) clade. Comparative population genomics revealed a higher genomic clustering rate (NC: 35.1%, SW: 0%, NWE: 0%), shorter TBL (p-value = $1e^{-04}$), a higher proportion of low-frequency mutations, and more cloud genes in NC region compared to other regions, and might indicate clonal expansion and increased transmission of lineage 4.6.2.2 in the NC region.

Conclusions: These findings underscore significant regional variation, with the North Central region exhibiting unique genomic epidemiology. The study highlights the complex interplay between genetic diversity, local environmental factors, and host demographics in shaping the epidemiology of TB in Nigeria.

PP11-898-14 Improving awareness of latent TB and increasing TB prevention treatment by storytelling in Gombong Muhammadiyah Hospital

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Background and challenges to implementation: Storytelling is a powerful tool that educators can use to influence, teach, and inspire their audience. Stories have the ability to convey the culture, history, and values that unite people, while also forging connections between individuals and ideas. By turning an abstract theory into a story with an emotional plot, stories can make people want to listen and thoroughly understand the message. This method is used to encourage people to prioritize their family's lung health for the overall development of the body. This is particularly important for individuals living with tuberculosis who may have children.
This Method aims to raise awareness to help prevent the spread of tuberculosis and ensure the overall well-being of the family.
Intervention or response: We began to create a personal connection with people and patients. We share a powerful story of a patient who has been impacted by drug-resistant tuberculosis.
After reflecting on this story, we inform them about the preventive drug available to prevent reactivation and eliminate the infection in the family for good. Our approach not only educates but also inspires people to share their own stories.
We encourage those who have undergone testing for latent tuberculosis to come forward and share their journey. We ask the patient to express their desire for their family to stay safe from tuberculosis by getting tested.
Results/Impact: 40 families of the patients attended the group discussion. 3 of them (7,5 %) have already been checked and treated with TPT. After the eventful storytelling and discussion session, an additional 26 people (65%) volunteered to get checked for tuberculosis latent infection with a tuberculin skin test examination. 10 people (25%) tested positive for tuberculosis latent infection.
Conclusions: This method of storytelling is successfully increasing engagement in tuberculin skin test examination and increasing the number of people enrolling in drug-resistant tuberculosis preventive treatment.

PP11-902-14 High mortality among people with post-TB lung disease: An analysis of Uganda national level data (2020-2023)

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Background and challenges to implementation: In 2020, it was estimated that there were 155 million tuberculosis survivors globally. These patients are currently not followed up by national TB and Leprosy program. However, monitoring and clinically evaluating these patients after treatment is important, since up to 38.6% of them develop post-Tuberculosis lung disease (PTLD) in the year following treatment. In addition, long-term post-treatment mortality rate among patients successfully treated for TB is almost three times higher than the general population. We aim to provide evidence using national surveillance data for the need to focus more resources on the growing problem of PTLD.
Intervention or response: We abstracted surveillance data from the national District health information system(DHIS2) on the number of patients diagnosed with TB for the period January 2019 to December 2022 and those diagnosed with post TB lung disease for the period January 2020 to December 2023. The Man-Kendal test for trend analysis was conducted for identified PTLD patients
Results/Impact: From January 2020 to December 2022, 230,203 patients were diagnosed with TB. Of these 140,550 (61.2%) were males and, 90.6% were reported successfully treated by December 2023.
However, from January 2021 to December 2023, 2,517 patients were admitted in hospitals around the country due to PTLD. The majority admitted were males 1,348 (58.5%), 94.8% were persons >5 years.
During the three years, 214(9.5%) of all patients with PTLD died. The highest proportion of deaths were in East (33.4%) and North Eastern regions (32%) which have the highest poverty index in Uganda. There was an observed significant increase in PTLD patients reported annually ($P<0.0001$)
Conclusions: This surveillance data highlights a substantial burden for PTLD and associated mortality among patients who complete treatment. Follow- up of these patients particularly in regions with high levels of poverty should be prioritized by the National TB and Leprosy program

PP11-894-14 Baseline PET-CT features predict lung function at 12 months in adolescents treated for pulmonary TB

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Background: PET-CT with fluorine-18 fluorodeoxyglucose (F-18 FDG) has been utilized as a biomarker in adult TB research, its utility as a predictor for long-term outcomes remains unexplored.

This study aimed to investigate whether baseline clinical and F-18 FDG PET-CT features as surrogate for disease severity in adolescents with TB could predict lung function outcomes at 12 months.

Design/Methods: In a prospective observational cohort study in Cape Town, South Africa, 50 adolescents with newly diagnosed microbiologically confirmed pulmonary TB were recruited, 10 had multidrug-resistant TB 40 drug-susceptible TB. Two weeks post-treatment initiation, participants underwent F-18 FDG PET-CT imaging. Spirometry lung function was done 12 months after treatment start.

Linear models and logistic regression were used to identify baseline clinical and PET-CT (cavity size on CT, and total glycolytic activity [TGA]) were corrected for lung volume) predictors associated with abnormal spirometry lung function at 12 months. Area under the curve (AUC) was calculated with leave-one-out cross-validation (LOOCV) and reported with 95% confidence intervals (CI).

Abnormal spirometry was defined as z-score < -1.64 for forced expiratory volume in 1 s (FEV1) and/or forced vital capacity (FVC) and/or FEV1/FVC.

Results: Spirometry at 52 weeks was successful in 35 (60%) adolescents, with a median age of 17.0 years (interquartile range 15-18), 21 (60%) were female, 3 (9%) were living with HIV, 10 (29%) were smokers and 7 (20%) had a recent history of TB.

Cavity size was the strongest univariable predictor. Logistic regression models including cavity volume at baseline alone, could predict abnormal spirometry at 52 weeks, with a LOOCV AUC of 0.783 (0.782 - 0.785 95% CI), which improved to 0.811 (0.809- 0.812 95% CI), when adding TGA and previous TB to the model.

Independent variables in logistic regression model with normal or abnormal spirometry at week 52 as dependent variable	AUC (95% CI)
Previous TB	0.662 (0.661 - 0.664)
Smoking status	0.507 (0.506 - 0.507)
Age	0.559 (0.557 - 0.561)
Sex	0.516 (0.514 - 0.518)
Drug resistance	0.548 (0.546 - 0.55)
Total cavity volume	0.783 (0.782 - 0.785)
TGA	0.640 (0.638 - 0.642)
Total cavity volume, TGA	0.759 (0.757 - 0.761)
Total cavity volume, previous TB	0.820 (0.819 - 0.822)

Conclusions: The combination of cavity size on PET-CT and previous history of TB demonstrates highest predictive value of post-therapy lung function.

PP11-901-14 Lessons learned from multi-country assessment on the development of post-TB lung disability management package for future TB programming

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Background and challenges to implementation: TB-associated disability including Post TB Lung disability (PTLD) is one of the components in the TB care spectrum. However, there is limited evidence on PTLD interventions. A feasibility assessment was conducted at select sites in Kenya, Uganda, Tanzania and Malawi with support from the Global Fund TB Strategic Initiative to inform the development of PTLD service package for future TB programming.

Intervention or response: A needs assessment was conducted to understand the feasibility for implementing PTLD programmatic services. The information gathered

from the needs assessment was used to develop practical manuals with specific standard operating procedures and algorithms for assessing individuals treated and cured TB for PTLD with emphasis of identifying individuals with recurrent TB, and those eligible for pulmonary rehabilitation.
Programmatic draft tools were developed and implemented at the sites selected and included engagement with communities and training of health care workers.
Results/Impact: Countries successfully designed and implemented PTLD algorithms and service package including programmatic recording tool. Needs assessment findings supported countries to organize PTLD services for instance Tanzania included health facilities in non-mining settings and screening expanded to include individuals completing or about to complete TB treatment.
Uganda identified PTLD in individuals competing TB treatment within 2 years, Kenya screened PTLD in individuals competing TB treatment whereas Malawi screened presumptive PTLD from community with varying duration of TB treatment.
Programs identified individuals with presumptive PTLD, recurrent TB and PTLD eligibile for pulmonary rehabilitation as follows; Kenya - 438, 0, 63 (77%): Malawi -51, 2 (4%), 30 (61%): Tanzania-710, 64 (9%),224 (60%) and Uganda 350, 6(2%), 70 (65%) respectively. Tanzania initial screening has a considerable clients from communities, thus high recurrent TB identified.
Conclusions: TB programs demonstrated the feasibility of integrating PTLD in the continuum of TB care, thus improved the quality of TB care including preventing TB transmission through active detection of recurrent-TB.

PP17 Voices of TB

PP17-959-14 The role of community leaders (traditional rulers) in increasing community diagnosis of TB in Katsina State

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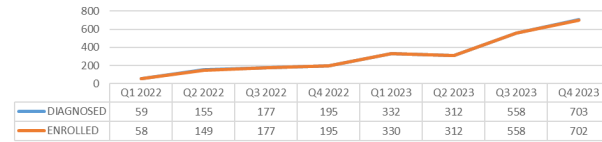
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in Nigeria, particularly in Katsina State, where barriers to early diagnosis persist. KNCV Nigeria, with funding from USAID, is implementing community TB screening activities in Katsina state, taking services to the doorstep of the patients in the communities. This paper explores the pivotal role of community leaders, especially traditional rulers, in increasing community diagnosis of TB. Given their influence and authority, they play a crucial role in mobilizing communities and addressing TB-related stigma, thereby facilitating early case detection and treatment initiation.
We present results from a community intervention showcasing the role of community leaders in increasing the diagnosis of TB cases in Katsina state, Nigeria.
Intervention or response: This is a cross-sectional review of Program-level data for KNCV-implemented community TB screening activities for 2022 and 2023 in Katsina. Data was reviewed when the traditional rulers were not engaged and compared with when they were engaged. A trend line was used to show the case detection increase over time.
Results/Impact: The trend line shows a marked increase in case detection and enrolment from Q4 of 2022 when the traditional rulers were engaged as shown in the figure below.



	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
DIAGNOSED	59	155	177	195	332	312	558	703
ENROLLED	58	149	177	195	330	312	558	702

Figure. Community screening case detection trend.

Conclusions: Leveraging the influence and leadership of traditional rulers holds promise for improving community diagnosis of TB cases in Katsina State and advancing towards the broader goal of TB elimination in Nigeria. Strengthening collaboration between traditional leaders, healthcare providers, and policymakers is essential for sustaining and scaling up community-based TB diagnosis initiatives.
Moreover, investing in capacity-building programs for traditional rulers and community health workers can enhance their effectiveness in TB control efforts. We recommend that the National TB & Leprosy Control Program (NTBLCP) through the state TB programs formally engage the traditional rulers as part of the community mobilization structures to help eradicate TB in their respective communities.

PP17-951-14 Project LEAD (Leveraging, Engaging, Advocating to Disrupt TB transmission): A model of comprehensive TB interventions for urban ultra-poor in four metropolitan cities of India

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Background and challenges to implementation: Suboptimal TB service coverage of urban ultra-poor (unhoused individuals, migrants, unauthorized slums) is a major challenge in India's National TB Elimination Program (NTEP). High mobility, alcohol and tobacco use, stigma, poor awareness, and comorbid conditions (malnutrition and chronic lung ailments) increase their vulnerability to TB.

Humana People to People India (HPPI), a national Indian non-governmental organization created LEAD model in four Indian cities - Delhi, Hyderabad, Howrah, and peri-urban Mumbai. LEAD demonstrated accelerated comprehensive TB services for urban ultra-poor through multisectoral coordination with support of United States Agency for International Development's TB Implementation Framework Agreement, implemented by JSI Research & Training Institute, Inc., and supported by NTEP, and John Snow India Private Limited.

Intervention or response: Intervention or response: LEAD is implemented by city-specific teams supported by a central Project Management Unit (PMU) of HPPI, using three strategic approaches:

- Leverage existing public, private, and non-profit health facilities to generate standard and quality TB services.
- Engage health department, urban development, welfare schemes, civil society organizations, TB champions and stakeholders (religious organizations, charitable trusts, job-contractors, business groups) for stronger social support for people with TB (PwTB).
- Advocate to mitigate stigma and discrimination, promote right-based and gender-responsive services, and ensure equity in TB services.

Results/Impact: Between August 2023 to February 2024, LEAD screened 431,447 people in four cities, detected 13,556 presumptive cases and tested 10,888; 2,356 PwTB were detected of whom 2,305 were put on treatment. HPPI screened 2,424 household contacts and put 683 on TB preventive treatment. The treatment adherence rate was 96% with decline in lost-to-follow-up and mortality. Artificial intelligence-aided cough/sound-based screening and mass chest X-ray showed promising results improving case detection. LEAD established effective patient-support system through concerted multi-sectoral engagement.

Conclusions: LEAD model demonstrated a unified approach with service providers, stakeholders, and community players to optimize TB services for India's urban ultra-poor.

PP17-952-14 Addressing gender disparities in TB diagnosis, treatment, and care: Insights from the KNCV TB LON Project in Nigeria

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Background and challenges to implementation: Acknowledging the prevalence of tuberculosis (TB) in men as opposed to women, KNCV Nigeria, through the USAID funded TB LON 1&2 project, embarked on a transformative intervention with the Portable Digital Xray (PDX) machine aimed at reaching more men with TB. This is expected to increase TB yield, and by extension, address challenges surrounding TB screening in men such as screening of asymptomatic TB patients, presumptive TB patients in denial, and more importantly, the poor health-seeking behaviour of men. The PDX uses artificial intelligence to address these challenges and improve Presumptive TB yield. The TB LON project utilizing the PDX strategically focused on hard-to-reach communities and targeted areas with higher concentrations of the male gender.

Intervention or response: KNCV Nigeria deployed 9 PDX machines equipped with computer aided detection for TB (CAD4TB) software across 8 out of 14 TB LON implementing states. Mapping exercise was done targeting male dominated settings in hard-to-reach communities. Screening was done using a structured algorithm to identify presumptive TB cases using the CAD4TB 50+ score as cut-off. Presumptive TB cases were promptly evaluated. Intervention data from January to December 2023 was collated and analyzed.

Results/Impact: There was slightly higher percentage of males (55%) that was reached compared to females. Presumptive TB yield was also higher in males (60%) when compared to females, resulting in 70% of male TB cases.

Gender	PDX-CAD Target population	PDX-CAD Clients screened for TB	PDX-CAD Clients presumed to have TB	PDX-CAD Presumptive cases evaluated for TB	PDX-CAD Clients diagnosed with all tools	PDX-CAD All forms of TB patients started on treatment
Female	64,718	64,617	4,904	4,886	850	831
Male	79,728	79,665	7,194	7,178	1,987	1,979
Total	144,446	144,282	12,098	12,064	2,837	2,821
% Male Contribution	55.2%	55.2%	59.5%	59.5%	70.0%	70.1%

Conclusions: The intervention using PDX machines made significant contribution in addressing challenges to presumptive generation in males, ranging from symptom denial, poor health-seeking behaviours, to absence of symptoms. It also contributed to increase in TB case-finding among males arising from higher presumptive yield.

PP17-956-14 Bearing the burden: Community survey to map out-of-pocket expenses among people affected with TB in Karnataka, India

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Background: The END TB strategy targets a reduction in Tuberculosis (TB) incidence, mortality, and catastrophic out-of-pocket expenditure (OOPE). Despite India providing free diagnosis and treatment for TB through public health facilities, more than half are still facing substantial direct and indirect costs, risking impoverishment(1). State-specific estimations of OOPE are crucial for designing strategies to mitigate financial burdens and monitoring progress against baseline indicators.
This study aims to quantify the OOPE, associated with TB services in Karnataka, where data on this topic is limited.
Design/Methods: A sub-group analysis was conducted from the community-based survey conducted for Sub-national certification of TB free status in 12 districts of Karnataka. The survey was conducted by trained healthcare workers in each district.
The survey was carried out in 10 villages of each district to collect data regarding type of care sought, cost incurred of diagnosis and treatment. The data was analyzed using MS Excel, Median and Inter Quartile range was calculated to measure ***Catastrophic OOPE*** (<20% of family income).
Results: The study encompassed a cohort of 472 people affected with TB, comprising 375 past history and 106 current history of TB treatment, identified across 12 districts. The out-of-pocket expenditure was grossly more in private sector in comparison with govt sector. In the govt sector median expenditure on diagnosis was INR 100 and expenditure on treatment was Zero. The private sector in contrary had a high expenditure of 2000 & 3000 INR for diagnosis and treatment. A total of 151 out of 472 (32%) people with TB had incurred catastrophic out of pocket expenditure among people affected with TB.

Indicators for Out-of-pocket expenditure	Median expenditure in Government sector in USD (Inter Quartile range)	Median expenditure in Private sector in USD (Inter Quartile range)
Cost of diagnosis in UDS	1.2 (0-12)	24 (12-60)
Cost of treatment	0 (0-8.4)	36 (24-99)
Indirect cost	6 (2.4-12)	12 (6-27)
Total Loss of wages	12 (2.4-36)	36 (12-120)
Total monthly family income	120 (60-168)	132 (120-301)
Total monthly family expenditure	60 (36-120)	96 (60-120)

Conclusions: More than one-third of people affected with TB in Karnataka are facing catastrophic out of pocket expenditure.
Conducting in-depth studies to elucidate the underlying reasons for these costs and addressing broader social determinants are imperative steps to effectively tackle this challenge.

PP17-957-14 Enhancing TB healthcare in tribal communities: Lesson from India's National TB Programme

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Background: India's 104million population reside in tribal regions. TB notification rate are double in tribal regions; adverse social determinants and lack of health infrastructure make tribals vulnerable for TB. India introduced special TB package in tribals.
We conducted this study to assess TB treatment services and outcomes among tribals. The premise of this study is to test the hypothesis that sub-optimal TB treatment services led to unfavourable outcomes among tribals.
Design/Methods: We conducted desk review and interview with the programme managers to gather background information on health services in tribal regions. Two million notification data of 2021 cohort during COVID-19 pandemic that disrupted essential health services was stratified by tribal and non-tribal regions. Characteristics, post-notification treatment services provided to persons-with-TB and their outcomes was analysed. Chi-square test was used to determine statistical significance at $p<0.05$.
Results: In 2021, 179,394 persons-with-TB were notified from tribal regions, accounting for 8.7% of total TB notifications. Ratio of pulmonary and extra-pulmonary TB was 6:1, compared to 3:1 in non-tribals, indicating towards sub-optimal services for detection of extra-pulmonary TB. Paediatric-TB was 5% in either region.

Initial loss-to-follow-up (i.e. notified but not initiated TB treatment) was significantly lower in tribals (1.8% vs. 4.1%, p<0.05) and major reasons were death, untraceable due to incorrect address or migration and treatment refusal. However, treatment refusal is 8% among tribals compared to 10% in non-tribals (p<0.05).
Bacteriological confirmation (57% vs. 42%, p<0.05) and treatment success (91% vs. 86%, p<0.05) was significantly higher in tribals.

Figure 1: Landscape of health infrastructure and services in tribal regions of India

- **Tribal population:** 104 million (8.7%)
- **Microscopy centres:** 4308 (one per 25,000 population)
- **GeneXpert / TrueNAT:** 366 (one per 0.3 million population)
- **Joint Action Plan** was developed with a goal to reduce incidence of TB and death due to TB in tribal population in the country
- **Ashwasan Campaign:** 100-day village level campaign to increase awareness and conduct Active Case Finding (ACF) for TB
- **Tribal Support Incentives:** Over 5.5 million USD disbursed through direct benefit transfer (DBT) in last 5 years.

Table 1: TB notification and treatment services in tribal and non-tribal regions of India (2021)

#.	Indicator	Tribal regions	Non-tribal regions	Chi-square test
		Numbers (%)	Numbers (%)	
1	Total TB notification at diagnosis	179394 (8.7%)	1892424 (91.3%)	
2	Ratio of pulmonary and extra-pulmonary TB	6:1	3:1	
3	Bacteriological confirmation of diagnosis	102402 (57%)	789122 (42%)	p<0.05
4	Paediatric TB notification	8483 (4.7%)	87191 (4.6%)	p>0.05
5	Persons-with-TB started on treatment	176212 (98%)	1817277 (96%)	p<0.05
6	Initial loss-to-follow-up	3182 (1.8%)	75147 (4.1%)	p<0.05
7	Reason for initial loss-to-follow-up			
7a	Treatment refusal	259 (8%)	7175 (10%)	
7b	Untraceable due to incorrect address	565 (18%)	12669 (17%)	
7c	Untraceable due to migration	356 (11%)	4216 (6%)	
7d	Died	585 (18%)	10391 (14%)	
7e	Could not be evaluated	1417 (45%)	40696 (54%)	
8	Treatment success rate	159792 (91%)	1569026 (86%)	p<0.05

Conclusions: Our study provides valuable insights into TB services in tribals. Contrary to the expectation, the study rejected hypothesis. Tribals had better health actions following notifications and treatment success rates even during COVID-19 pandemic. However, better access to tools for TB screening, prevention, detection, care, and social protection for all forms of TB is needed in tribals.

PP17-954-14 Anaemia among persons with TB in tribal district of Odisha: A critical age-gender analysis

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Background and challenges to implementation: Different vulnerabilities, both clinical and social, affect the treatment outcomes of persons with TB. Some of the vulnerabilities are recorded by the NTEP at the time of treatment initiation. However, measurement of haemoglobin levels among newly diagnosed persons with TB is not adequately done. NHFS data suggests a high prevalence of Anaemia in India. Lack of assessment of anaemia makes it difficult to identify those who need additional nutrition support to recover fully.
Intervention or response: REACH, as part of USAID funded ALLIES project implemented a Differentiated Care Model in three tribal TUs in Mayurbhanj district in Odisha. TB Survivors, trained as TB Champions facilitated the testing of haemoglobin among newly enrolled people with TB of 18+ years of age, after their consent. The blood sample collection for testing of haemoglobin was done in the Government run laboratories by trained healthcare workers. Men with Hb levels of ≤10 gram and women with ≤9 gram were marked as anaemic.
Results/Impact: The findings indicate that in the age group of 45-60, men (61%) and women (67%) have the highest percentage of anaemic people. In the age group of 18-45 men (51%) and women (51%) have similar proportion. In 60+ age group 44% of women and 52% of men have anaemia.

Age Group	Screened Men	Screened Women	Total Screened	Men reporting Anaemia	Women reporting Anaemia	Total people reporting Anaemia
Between 18 and 45	210	106	316	112 (53%)	54 (51%)	166 (53%)
Greater than 45 and less than 60	95	42	137	58 (61%)	28 (67%)	86 (63%)
60 or more	65	32	97	34 (52%)	14 (44%)	48 (49%)
Total	370	180	550	204 (55%)	96 (53%)	300 (55%)

Conclusions: As indicated by NHFS 5, there is a higher percentage of anaemia in all groups, indicating an immediate need of anaemia testing among people with TB and specially among the people with TB of more than 45 years of age to minimize the risk of relapse which is critical for achieving the target of TB elimination by 2025. This needs to be addressed with additional nutrition support and supplementary distribution of vitamin iron medicines to people reporting anaemia.

PP17-960-14 Improving access to TB diagnosis using the portable digital X-ray machine: A comparison of TB yields in accessible and inaccessible communities in Delta State, Nigeria

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Background and challenges to implementation: A portable X-ray machine with a computer aided detection using Artificial Intelligence (AI), is a smaller and mobile version of a fixed X-ray unit. It enables radiographers to take X-ray images of patients without calling them into a separate lead-lined room and as such can be mobilized to hard-to-reach communities.

Artificial Intelligence (AI) - powered diagnostics refers to the use of advanced computer algorithms and machine learning techniques to analyse medical data that assist in disease diagnosis. This technology leverages on large datasets and complex algorithms to identify patterns and correlations that may not be detected by traditional diagnostic methods.

The major goal of using AI in medical diagnostics is to improve the accuracy, speed, and efficacy of diagnosing medical diseases. It also seeks to provide vital information and support to healthcare practitioners during the diagnosis and treatment of patients.

Intervention or response: The objective of this study was to compare tuberculosis yield in hard to reach communities and accessible communities using the Portable Digital X-ray with Computer Aided Diagnosis using AI.

The study was a retrospective study comparing data for a 6 month period of tuberculosis cases diagnosed using the PDX-CAD machine in hard to reach communities and accessible communities in Delta state.

Results/Impact: The results, depicted in the table below, indicate a notable increase in tuberculosis yield during the six-month study period in hard-to-reach communities compared to accessible communities. This stems from the underserved nature of these communities, highlighting numerous unmet needs contributing to the higher tuberculosis yields.

Indicators	Period					
	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
Cumulative No of presumptive cases (PDX_CAD Intervention)	131	115	166	74	224	184
Cumulative No TB cases diagnosed	21	22	22	13	35	37
TB Yield (Cumulative)	16%	19%	13%	18%	16%	19%
Total No of presumptive (**Accessible communities**)	87	85	96	48	180	126
Total No TB cases diagnosed	11	10	12	8	22	20
TB Yield (Accessible communities)	12%	11%	13%	16%	12%	16%
Total No of presumptive (**Hard to reach communities**)	44	30	70	26	44	44
Total No TB cases diagnosed	10	12	10	5	13	13
TB Yield (Hard to reach communities)	22%	40%	14%	19%	30%	25%

Conclusions: The mobile PDX-CAD machine due to its mobility and easy deployment to communities that would otherwise been inaccessible to care would assist in finding missing tuberculosis cases as it will help provide access to diagnostic services to underserved population.

PP17-955-14 Breaking the silence on TB through innovative communication

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Background and challenges to implementation: With the third highest TB prevalence globally, despite modern advances in diagnosis and treatment, more than 70 Filipinos lose their lives to TB every day.

While strategic communication interventions and efforts have improved over the years, TB remains an underrecognized health threat in the country with limited media engagements and social conversations drawing attention to it.

Intervention or response: The USAID TB Innovations and Health Systems Strengthening Project developed a multi-channel social and behavioral communication campaign (SBCC) called „Para Healthy Lungs Pa-check ka Lungs" (To have healthy lungs, get them checked).

The campaign and events centered around World TB Day, occurring annually in March. Communications channels included social media (e.g., Facebook, YouTube), out-of-home media (e.g., billboards and bus advertisements), and mass media (e.g., TV, radio, newspapers).

Results/Impact: The campaign created national noise that stimulated dialogues from the participants and the Filipino people. In the three months leading up to World TB Day, individuals reached by the "Health Lungs Philippines" social media page increased from 85,000 in 2023 to over 11 million individuals in 2024. In addition, the nation made history on World TB Day 2024 when 5,596 Filipinos formed the world's largest human lung formation as a call to end the TB epidemic.

These social media and in person activities increased the number of traditional media pickups from 0 in 2023 to 69 in 2024.

Conclusions: The SBCC campaign created national buzz and stimulated dialogue around TB, and became a call to action and a show of the country's shared commitment to overcome TB. The innovative approach to promote TB awareness and health literacy breaks the silence around

TB, garners media and public attention, engages stakeholders and decision makers, and brings TB to the top of the national public health agenda.

Result	Platform	January - March 2023		January - March 2024	
Increased Reach	Social media (Healthy Lungs Ph)	85,000 people		11,000,000 people	
Increased participant engagement	In-person activity (World TB Day)	800 people		5,596 people	
Increased media engagement	Traditional media pickups (online, radio, television, and in print)	Period	No. of media pickups*	Period	No. of media pickups*
		March 5-11	0	March 3-9:	0
		March 12 – 18	0	March 10-16:	27
		March 19-25	0	March 17-23:	18
		March 26-31	0	March 24-30:	24

*The frequency with which the initiative has been featured in formal television and newspaper outlets in the Philippines as measured by the project.

Table 1. Increase in social media, traditional media and in-person activity angagement around World TB Day from March 2023 to March 2024, Philippines.

PP17-958-14 Strengthening TB elimination through public-private partnerships in tribal district, Gadchiroli, India

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Background and challenges to implementation: The incidence of Pulmonary Tuberculosis (TB) among the tribal populations is reported to be 432 per 100,000 individuals[1].

The scarcity of healthcare resources, coupled with distinct health disparities prevalent in tribal areas, poses significant challenges to the effective diagnosis and management of TB. NGO hospitals, particularly those operating in the tribal district of Gadchiroli, acknowledge the imperative necessity for enhanced TB diagnostic and treatment services within these underserved communities. This enhancement is anticipated to contribute to an increased detection rate of TB within the district.

Intervention or response: The District TB Officers signed Memorandum of Understanding (MoU) with 3 NGOs so that free TB services are offered to the affected community. The intervention included a comprehensive range of services such as health screening, establishment of TB diagnostic center, X-ray facility, specialized Inpatient Department (IPD) for TB patients, extensive home visits to TB patients , health awareness campaigns, continuous follow-up with TB patients, sputum sample collection for diagnostics, (mWRDs) Molecular WHO recommended rapid diagnostics facility and the innovative utilization of induced sputum techniques.

Furthermore, the intervention comprised the rehabilitation of extremely vulnerable patients, showcasing a holistic approach to healthcare delivery.

Results/Impact: The collaborative endeavors of non-governmental organizations have significantly enhanced the diagnostic yield for tuberculosis cases within the district, culminating in an average increment of 9%.There's a decrease in the percentage of sputum positivity from 12% in 2021 to 9.4% in 2023, yet it is higher than public sector (7%).

Year	Total OPD	% Referral	Presumptive TB cases	Sputum Positive on microscopy	Sputum positivity rate (%)	TB diagnosed by chest X-rays	Total TB diagnosed by NGO Hospitals	TB diagnosed by District	TB cases contribution by NGO Hospital(%)
2021	65567	1	663	80	12	72	152	1461	10.13
2022	77164	1.1	861	97	11.2	91	188	2009	9
2023	90375	1.18	1075	102	9.4	69	171	2047	8.35

Conclusions: The concerted efforts of NGO hospitals in the Gadchiroli district have been pivotal in augmenting early detection of TB cases. Their dedication to providing advanced diagnostic tools, such as X-ray facilities and TB management underscores a steadfast commitment to combating TB. This initiative not only exemplifies effective disease management but also reinforces the crucial role of NGOs in fostering health empowerment within tribal communities.

PP17-953-14 Economic and social consequences of TB care through informal providers in North East Nigeria: A cost estimation study

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Background: In Nigeria, 69% of households with people affected by TB face catastrophic costs and people spent an average of 406 USD per TB episode. Interventions that engage informal providers in TB care can help identify more people with TB and link them to care earlier. However, the economic and social impact of such interventions on household remains poorly understood.

Design/Methods: We conducted surveys among people diagnosed with drug-sensitive TB as part of an intervention engaging patent medicine vendors (PMV) and traditional healers (TH) in northeast Nigeria, using a modified version of the World Health Organization (WHO) patient cost survey tool. The data was used to estimate treatment related cost and productivity losses.

The primary outcome was the incurrence of catastrophic costs, defined as total costs exceeding 20% of annual household income. Secondary outcomes included the prevalence of adverse social events such as food insecurity, experiencing stigma, unemployment, and coping costs.

Results: Among 199 respondents, the total cost of accessing TB care averaged USD 161, with 27% of people treated incurring catastrophic costs. People referred through PMVs earned more and incurred significantly higher costs. People with TB referred by TH had less household income to start with and suffered more adverse social consequences.

Among people in the poorest income quintile, 76% experienced catastrophic costs, compared to 2% in the highest income quintile. There was a 50% increase in households forced into poverty, 94% experienced food insecurity. To cope, 71% of patients sold assets, while 68% resorted to borrowing.

Comparing economic and social consequences incurred for TB by referring provider*

Item	All participants (N=199)	PMV (n=87)	TH (n=112)	P value**
Total costs TB* episode Median (IQR)				
Total medical costs	58 (46-76)	62 (48-76)	54 (36-77)	**0.02**
Total non-medical costs	51 (33-77)	55 (35-77)	49 (33-77)	0.43
Direct costs TB episode	124 (90-147)	126 (93-147)	115 (86 -149)	0.12
Indirect costs total episode	27 (12-65)	36 (17-91)	21 (7-52)	**<0.01**
Total costs episode	161 (103-231)	171 (126-266)	145 (99-210)	**<0.01**
Effects of TB on Household income				
Monthly HH income before TB (USD)	101 (68-144)	120 (72-156)	96 (67-140)	**0.02**
Monthly HH income post TB (USD)	60 (48-108)	96 (53-156)	56 (48-72)	**<0.01**
Catastrophic cost incurrence **n (%)**	53 (27)	25 (29)	28 (25)	0.06
Adverse social events TB episode n (%)				
Poverty headcount pre-TB***	87 (44)	29 (33)	58 (52)	**<0.01**
Poverty headcount post-TB***	123(62)	27 (31)	96 (86)	**<0.01**
Food insecurity experienced	187 (94)	86 (98)	101 (91)	0.3
Borrowing as part of coping costs	136 (68)	38 (44)	25 (22)	0.2
Sale of assets as a coping mechanism	146 (71)	40 (46)	13 (12)	0.2
Loss of employment	151 (76)	2 (2)	45 (40)	**<0.01**
Experienced stigma	34 (17%)	5 (6%)	29 (26)	**<0.01**

PMV= Patent medicine vendors; TH= traditional healers;
*Costs and income expressed in USD (2022).
**Comparison between cohorts using Chi-squared test/ Fisher's exact test/ Wilcoxon rank-sum tests, as applicable;
***Poverty line defined as personal income <USD 1.90/day.

Conclusions: People with TB still face significant economic and social consequences. Engaging informal providers in Nigeria can mitigate the financial burden of TB care compared to those identified through routine care. Social protection interventions are essential to alleviate the financial strain and social disruption experienced due to TB in Nigeria.

PP13 3 in 1: TB modeling - VHC - digital health technologies

PP13-916-14 Modelling the epidemiological and economic impact of digital adherence technologies with differentiated care for TB treatment in Ethiopia

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Background: Digital adherence technologies (DAT) are a potential tuberculosis (TB) treatment support tool to improve outcomes and reduce associated costs for both patient and healthcare providers. However, recent trials suggest that despite a significant reduction in costs, DAT interventions may have limited to no short-term epidemiological impact.

Here, we use data from a large trial (PACTR202008776694999) to estimate the potential long-term epidemiological and economic impact of DAT interventions in Ethiopia, in the context of the WHO End TB Strategy.

Design/Methods: We developed a compartmental transmission model for TB in Ethiopia, parameterised with patient and provider costs. We compared the epidemiological and economic impact of two DAT interventions to the current standard of care; a digital pillbox and medication labels, assuming each was introduced in 2023.

We projected TB incidence, mortality and costs to 2035, and conducted an epidemiological threshold analysis to identify the maximum possible epidemiological impact of a DAT intervention by assuming 100% treatment completion.

Results: We estimated small and uncertain benefits of the pillbox intervention, a reduction compared to standard of care of 0.4%(-0.8, 3.1) and 0.7%(-1.6, 5.4) in incidence and deaths respectively. However, large total provider 162,800,000$ (118,000,000, 210,643,000$) and patient 2,900,000$ (936,000, 4,851,000$) cost savings over 2023–2035 were also observed. This translated to a 50.2%(35.9, 65.2) reduction in total costs of treatment (excluding prediagnosis costs). Results were similar for the medication label intervention. The maximum possible epidemiological impact a theoretical DAT intervention could achieve over the same timescale would be a 3%(1.0, 8.3) reduction in incident TB and an 8.2%(3.4, 19.3) reduction in TB deaths.

Conclusions: DAT interventions, while showing limited epidemiological impact, could help save substantial TB treatment costs for both patients and the healthcare

provider. This is primarily a result of a reduction in unit costs, which is driven in turn by human resource requirements.

PP13-923-14 Innovative integration: Digital CXR screening data on national LIMS for TB surveillance in Kenya

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Background and challenges to implementation: The Kenya tuberculosis (TB) program utilizes TIBU Laboratory Information System (LIMS) as the national data repository for all diagnostic data. With the introduction of eight Computer-Aided detection software enabled portable Digital Chest X-ray (CAD-DCXR) for TB screening, there was need to integrate screening data onto the same platform to facilitate reporting, disease surveillance and monitoring. We document the processes and lessons learned in the process of integrating DCXR systems to TIBULIMS through an Artificial Programming Interface (API) gateway.
Intervention or response: Through a multi-stakeholder workshop, needs of various users were collected, use cases, dashboard features and reports were scoped for development. A software code to facilitate data exchange between the eight devices and TIBULIMs, and user interfaces were developed. Thereafter, stakeholders including radiologists, radiographers and clinicians had hands-on experience with the CXR module and validated its features in a workshop. The code was successfully pilot tested, user sensitization conducted, and remote support offered through a dedicated help desk.
Results/Impact: The API fetches data from the eight devices from the primary storage (CAD boxes) to the CAD cloud and then to TIBULIMS. The TIBULIMS dashboard provides statistics related to usage of each of the integrated devices, including the total number of images taken, disaggregated by CAD score, age, lab results, radiologists report and CXR site of interest. Radiologists access and report on images within a turnaround time of less than an hour. At the point of care, the clinician has access to the images, AI report, radiologists report and laboratory results on one platform.
Conclusions: The integration provided streamlined access to comprehensive screening and diagnostic data for informed clinical decision-making. Additionally, the availability of detailed statistics related to device usage and screening outcomes provides valuable insights for program evaluation and resource allocation.

PP13-918-14 Prognostic value of health-related quality of life on mortality in people with rifampicin-resistant TB

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Background: Health-related quality of life (HRQOL) has emerged as an important outcome measure in clinical decision-making. However, its predictive value for mortality in patients receiving treatment for Drug-Resistant pulmonary tuberculosis (DR-PTB) remains uncertain.
This study aimed to assess the added value of HRQoL in addition to clinical characteristics in predicting mortality, and to develop and validate simplified prediction tool.
Design/Methods: We used data from the Sequencing Mycobacteria and Algorithm-determined Resistant Tuberculosis Treatment (SMARTT) clinical trial in South Africa. Variables for the clinical characteristics model were selected using stepwise selection with Wald's test.
A risk prediction tool was developed using multivariable logistic regression. Model performance was evaluated using discrimination (area under the receiver operating characteristics - AUC) and calibration (calibration plots and Hosmer-Lemeshow goodness of fit test (HLT)). The model was internally validated using bootstrapping technique, and a simplified risk score was created.
Results: The incidence of mortality was 19%. The optimal combination of predictive clinical characteristics was age, gender, anemia, mycobacterial load and previous treatment of TB. The baseline model with these variables had an AUC of 0.766 (0.68 to 0.83) and HLT p-value of 0.921. The final model included the clinical characteristics model and HRQoL utility score and had an AUC of 0.865 (0.79 to 0.91, PHLT = 0.971).
The simplified risk score based on the final model categorized participants as low risk (79%), intermediate risk (28.4 %) and high risk (12.8%), with corresponding mortality risks of 4.8%, 25% and 66.7% respectively.
Conclusions: This study lends support to the use of baseline HRQOL data in routine clinical practice in addition to data on age, gender, anemia, mycobacterial load and history of TB treatment for the prediction of mortality for patients with RR-TB.

PP13-922-14 Regional patterns of barriers to TB services in mining communities: A case of Shinyanga, Geita and Manyara, Tanzania

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Background and challenges to implementation: TB-affected communities, particularly miners, face countless challenges in accessing quality TB services. Community-Led Monitoring (CLM) efforts empowered mining communities to identify and report health and support service barriers as well as stigma-related barriers preventing access to TB services in Tanzania.
We aim to describe regional patterns of challenges experienced by mining communities when receiving TB services from three CLM implementing regions.
Intervention or response: MKUTA in collaboration with East, Central and Southern Africa Health Community (ECSA-HC) adopted and customized a digital mobile CLM tool (OneImpact - TBKiganjani), to investigate challenges experienced by mining communities receiving TB treatment in three Tanzanian regions, Manyara, Shinyanga and Geita using Community Health Volunteers (CHVs).
Results/Impact: A total of 7,155 challenges were reported by 50 trained Community Health Volunteers. Demographically, in all regions, men reported 72% of all challenges, and those with ages between 31 – 45 (xx).
In terms of TB services, Manyara and Shinyanga reported access to TB services as a major challenge constituting 55% and 68% of all challenges reported in the two regions, respectively.
Geita, on the other hand, reported quality of TB services as a major service barrier (75%). Regarding TB support services, 94% and 53% of these reported lack of support services such as nutrition, counselling and financial support were widely reported in Geita and Shinyanga, respectively. while stigma-related barriers dominated in Manyara at 45%. Lack of social protection schemes for miners was a challenge reported in all regions.
Conclusions: OneImpact approach offers a platform to engage communities, giving them opportunity to participate in improvement of TB services. Barriers in TB care and support services, stigma and human right violations are prevalent in mining communities.
Interventions to address noted challenges are important to ensure TB services are accessible to all affected communities particularly key populations such as those in mining areas.

PP13-921-14 Coordination of health partners for their buying and rationalisation of resources to local innovation implementation: The case of CASTTB+ campaign in Uganda

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Background and challenges to implementation: The outbreak of COVID – 19 retarded Uganda's progress made towards the delivery of minimum universal health care package at community level. The National TB and Leprosy Program (NTLP) coordinated Health Partners for the design, planning and budgeting for the implementation of an innovative integrated Community Awareness, Screening, Testing, Prevention and Treatment of TB and other conditions approach (CAST-TB+).
Intervention or response: The NTLP coordinated partners (Donors, CSOs, Districts & MDAs) for the design, planning and budgeting for an ambitious and innovative integrated approach CAST TB+.
The outputs were not limited to the development of implementation package, VHT tool kit, provision of medical supplies and commodities, One pager with the basic health messages to be left in every visited household and allocation of finances.
CAST-TB+ is implemented in March and September every year embracing the Door to door visitation by Community health workers, hotspot and contact evaluation by health workers within a period of five-days across the country.
Funding is through the Government of Uganda, Global Fund and U.S. Government. CAST TB + implementation covers HIV, malaria, malnutrition, WASH, and maternal and child health.
Results/Impact: 26 partners offered technical and financial support to the CAST TB+ campaign reaching to 3,587 villages, 122,609 households and 349,710 people with the basic integrated health messages; 363 TB, 9 TB Multidrug resistant, 7,435 malaria, 11 leprosy, 90 HIV, 182 eligible PLHIVs initiated onto TPT, 625 children & 120 women who were malnourished notified and linked to care. 86.6% of pregnant mothers attending antenatal care with 90.6% of the children fully vaccinated against the immunizable diseases.
Conclusions: Meaningful coordination of Health Partners for the integrated CAST TB+ led to provision of the required technical, financial and human resources for delivery of universal health package at community level thereby improving peoples' livelihood.

PP13-920-14 Wide variation in the proportion of TB-related catastrophic costs among regions of Ethiopia

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Background: TB has disproportionally impacted people and communities with fewer socio-economic resources, including differences in the distribution of catastrophic costs due to TB care across countries. We compared the incidence of catastrophic costs due to TB in four regions of Ethiopia.

Design/Methods: During November 2020- March 2021, the USAID Eliminate TB Project conducted a cross- sectional study in four regions of Ethiopia to determine catastrophic costs due to TB. One-third of the health facilities were selected to participate in the study in each district of 18 zones of these regions. TB patients were randomly selected from the study health facilities.

Structured interviews were conducted using the World Health Organization TB patient TB cost survey tool. Catastrophic cost was defined when the total direct and indirect cost due to TB was at least 20% of the annual income of TB patients.

Results: A total of 433 TB patients were interviewed: 159 (36.7%) from Oromia, 33.1% (143) from SNNP, 24.7% (107) from Amhara, and 5.3% (24) from Sidama. The proportion of catastrophic costs among patients in Amhara, Oromia, Sidama, and SNNPR were 64.5% (70), 54.7% (87), 34.8% (8), and 44.8% (64), respectively.

Compared to TB patients from Sidama and SNNP, TB patients from Amhara and Oromiya regions were 70% (COR: 0.29, 95% CI [0.11, 0.76]) and 54% (COR: 0.246, 95% CI [0.27, 0.75]) more likely to incur catastrophic costs due to TB, respectively.

Conclusions: In Ethiopia, despite the implementation of similar policies and strategies aimed at combating TB across different regions, there is significant variation in the proportion of TB patients experiencing catastrophic costs related to their treatment.

PP13-919-14 Impact of interventions for engagement of health and wellness centres on programme output indicators in Parbhani district of Maharashtra, India

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Background: While India has made impressive strides towards eliminating tuberculosis, several steep challenges remain, one being doorstep delivery of quality assured services. India's rural population (>65% of the total) is vastly served by sub-centres, the peripheral outposts of the healthcare system. Recently, most of these have been transformed into Health & Wellness Centres, aimed at providing comprehensive primary health care.

For the NTEP infrastructure, HWCs represent the last mile, the point where screening and enrolment may begin and treatment and care be provided. This study assessed the trends in engagement of the HWCs in Parbhani, a predominantly rural district in western India, with specific interventions conducted to improve the same.

Design/Methods: Analysis - Retrospective data of 2022 and 2023, sourced from registers on Nikshay (India's official database for all tuberculosis related data).

Interventions -Training of CHOs (Community Health Officers, in charge of HWCs), feedback and troubleshooting from field level NTEP staff with involvement of THOs and District Health Officer, team-building exercises and recognition of efforts for NTEP staff, addressal of grievances of ASHA and other community volunteers, engagement with HWCs and the public on multiple platforms, especially social media.

Results: Share of HWCs in total public sector enrolments, grew from 66.0% to 75.8%, backed by an increase in absolute numbers. Percentage of cases treated at HWCs rose from 21.8% in 2022 to 26.7% in 2023. Treatment success rate for persons treated at HWCs in 2022, was 92.6%, outperforming other public health facilities (84.8%), a difference found statistically significant.

Year (Jan to Dec)	% of public sector presumptive enrolment from HWCs	% of public sector cases treated at HWCs	Treatment success rate among persons treated at other PHIs (RH/SDH/ PHC/others)	Treatment success rate among persons treated at HWCs	Statistical significance in difference among treatment success rates
2022	5105/7623 (66.0%)	272/1243 (21.8%)	84.8%	92.6%	0.000875, significant at p<0.05
2023	6892/9087 (75.8%)	289/1082 (26.7%)	-	-	

Conclusions: There were significant improvements in HWC engagement under NTEP in Parbhani district as described, with favourable outcomes.
While multiple factors are certain to have played a role, the interventions mentioned have visibly resulted in better involvement and ownership towards NTEP at multiple levels, including CHOs, NTEP staff and community health volunteers & workers.

PP13-917-14 Estimating the impact of multiple external shocks on the incidence and mortality of TB in Ethiopia: Results from modelling exercise

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Background and challenges to implementation: Ethiopia has encountered various crises like the COVID-19 pandemic, conflicts, and droughts, exacerbating factors conducive to Tuberculosis (TB) transmission. A 13-year-old prevalence survey data, alongside a notable rise in TB case notifications, posed measurement challenges.
To address this, we conducted epidemiological modeling to evaluate Ethiopia's current TB status and project future trends under the NSP implementation.
Intervention or response: We utilized the TB Impact Measurement and Estimation (TIME) modeling tool which is an epidemiological transmission model. Data for the modeling were sourced from the global TB database, national reports, publications, and extensive discussions with national TB program staff and stakeholders.
A webinar was organized to present the model outputs to the global TB community for feedback and input. The modeling considered both the current shocks affecting the country and a scenario without shocks.
Results/Impact: The model indicated that Ethiopia was on track to achieve the end TB target milestone by 2020, with projections suggesting achievement by 2025 in the absence of shocks.
However, considering the impact of recent shocks, the model projected an increase in TB incidence for the first time in a decade. Specifically, TB incidence rates were projected to reach 156 per 100,000 population in 2025 and remain at this level until 2030 in the presence of shocks.
Conversely, without shocks, the projected incidence rates were 114 and 107 per 100,000 in 2025 and 2030 respectively. Similarly, the projected number of deaths were about 33,771 in 2025 and 37,311 in 2030 in the presence of shock whereas 20,155 in 2025 and 20,342 in 2030 with out shock.

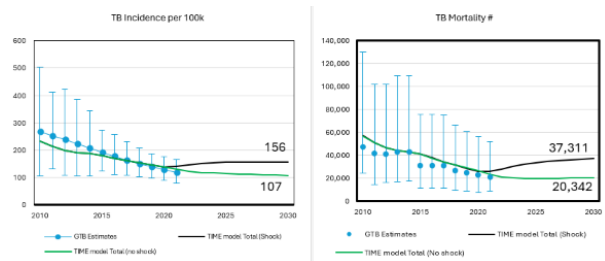

Figure 1. Baseline model projection of TB incidence and mortality with and without shock.

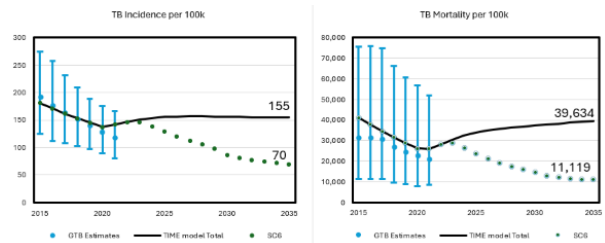

Figure 2. Selected scenario (SC6) model projection of TB incidence and mortality.

Conclusions: Our modelling results suggest that multiple external shocks contributed to the reversal of Ethiopia's TB incidence and associated death. Aggressive interventions and shock resilient TB program framework will be needed to achieve the envisaged END TB targets.

PP13-924-14 Strengthening service integration in disease control through artificial intelligence in Nigeria: Implementation strategies and lessons learned

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Background and challenges to implementation: The use of Computer Aided Detection (CAD) enabled digital X-ray machines for active TB case-finding activities by the USAID TB-LON 3 project implemented by the Institute of Human Virology, Nigeria, has changed the narrative in TB case-finding and enhanced service integration for other diseases in community settings. The two artificial in-

telligence (AI) software used on the project are *CAD4TB* and *qXR* for Delft and Fujifilm X-ray machines, respectively. These AI-enabled Portable Digital X-ray machines were used to quickly triage clients with normal and abnormal chest X-ray for further evaluation.

Intervention or response: A total of **54,184** clients were screened between March 2022 to March 2023 using CAD enabled X-ray machine, the AI predicted **6,161 (11.4%)** X-ray images as abnormal images (presumptive TB clients and other diseases). These clients' images were sent to the Six (6) Consultant Radiologists for review.

The results of the radiological review were used to place clinically diagnosed TB patients on treatment, while clients with other ailments were referred for appropriate care.

Results/Impact: Out of 6161 X-ray images reviewed by the Radiologists, 4525 (73.5%) were normal radiographs, 808(13.1%) were suggestive of pulmonary TB while 828 (13.4%) were other diseases conditions.

These disease conditions were further analyzed as follows; heart disease 70.5%, Pneumonia 22.0%, Pleural Fibrosis 2.9%, Calcified Granuloma 2.7%, Parasite invasion 1.0%, Carcinoma 0.6%, Cystic Bronchiectasis 0.2%, and Hepatomegaly 0.1%.

Conclusions: Other disease conditions diagnosed and linked to care will have gone unnoticed due to the health-seeking behavior low-income earners and the conditions might have deteriorated, thus leading to untimely death. Hence, service integration of multiple disease control activities has proven to be an effective way of resources management in resource limited settings.

PP13-925-14 Mobile application for TB screening: A game-changer in TB prevention and care

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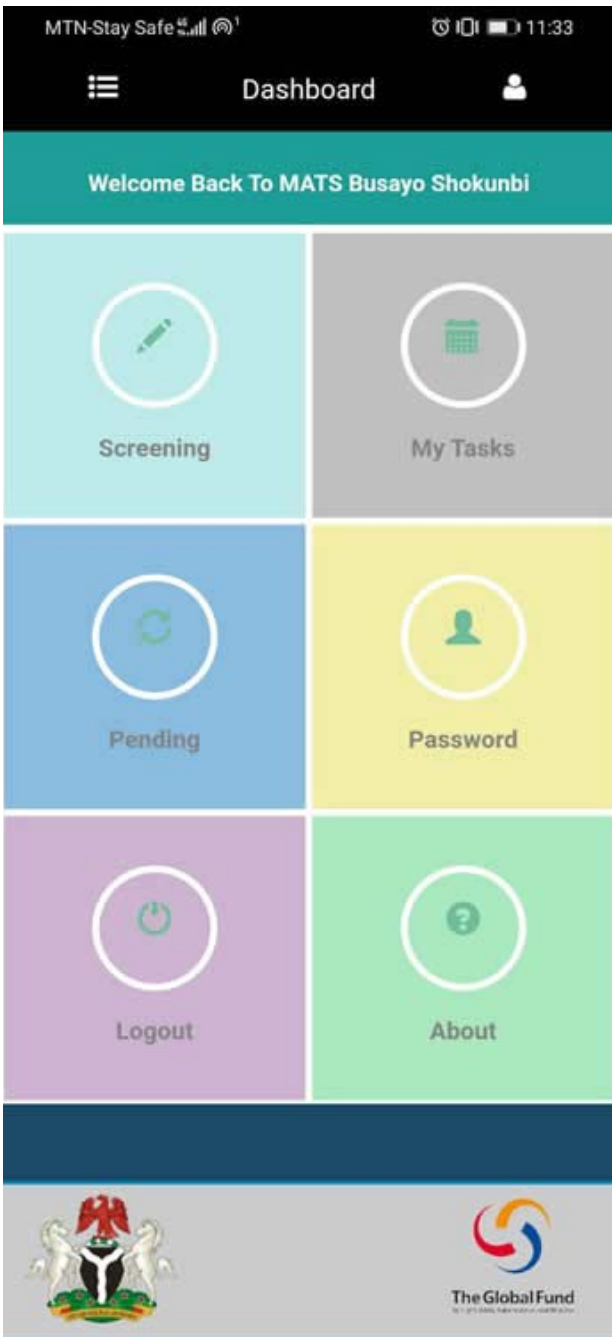
Background and challenges to implementation: Tuberculosis (TB) remains a global health challenge, especially in resource-constrained regions like Nigeria. The Mobile Application for Tuberculosis Screening (MATS) offers a digital solution for TB control. This study evaluates MATS' effectiveness in TB screening and its potential for broader applications.



Intervention or response: A pilot project was conducted in hard-to-reach communities in two Niger Delta States. MATS, operating on Android devices, screened participants following the WHO's TB screening algorithm. Those with a CAD4TB score ≥60 underwent further diagnostic assessment.

Results/Impact: Out of 2,203,835 participants, 20,770 presumptive TB cases were identified, with a prevalence of 0.25%. Males had a higher proportion of confirmed TB cases than females.

MATS is currently deployed in 6,552 healthcare facilities, with 8,255 healthcare professionals using it actively. MATS enables patient follow-up, generates detailed reports, provides real-time data access, operates offline, and streamlines presumptive referrals.

Conclusions: MATS effectively screened for TB in hard-to-reach communities, with high prevalence rates indicating its efficacy. Nationwide deployment in other Tuberculosis treatment is recommended due to its simplicity, real-time capabilities, and integration with existing health systems.

PP14 Imaging tools for TB diagnosis

PP14-932-14 Artificial intelligence assisted pulmonary TB detection from chest radiographs: A facility-based cross-sectional study at a TB specialised hospital in Ethiopia

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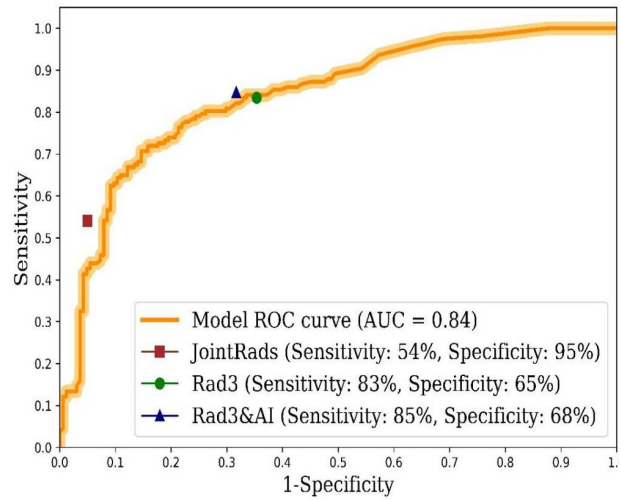
Background: AI is increasingly embraced for detecting TB and related abnormalities worldwide. This study retrospectively evaluates the performance of AXIR-CX (version 2.5.0), an AI software developed by RadiSen in South Korea, for detecting TB using radiographs from Kidus Petros hospital.
Design/Methods: We collected Xpert results and chest radiographs of 1,579 (with 10% positives) individuals seen at the hospital in 2023. The AI's predictions were evaluated on the entire dataset. Subsequently, a subset of 321 radiographs (49% positives) were interpreted by three radiologists, two from South Korea and one from the hospital, with 10+ years of experience.
The radiologists rated the radiographs for TB presence on a scale of 0 to 5, while the AI software provided probability values (0-100%). We compared predictive performances of the hospital's radiologist (without and with the help of AI), the joint South Korean radiologists, and the AI against Xpert results.
Results: In the entire dataset, the AI predicted with sensitivity, specificity, and accuracy of 71%, 83%, and 82% respectively with an AUC of 0.83. In the sampled dataset of 321 cases, the joint radiologists (JointRads) demonstrated sensitivity, specificity, and accuracy of 54%, 95%, and 75% respectively while the AI achieved specificity and accuracy of 92% and 73% at a similar sensitivity level.
The hospital's radiologist (Rad3) achieved sensitivity, specificity, and accuracy of 83%, 65%, and 74% respectively. At the same sensitivity level, the AI exhibited specificity and accuracy of 67% and 75%. When the radiologist was assisted by AI (Rad3&AI), a slight improvement was observed, with sensitivity, specificity, and accuracy reaching 85%, 68%, and 76% respectively.



Conclusions: The AI demonstrated a capacity to identify tuberculosis with similar accuracy to skilled radiologists. Collaborative work between a radiologist and AI yields enhanced predictive performance. These findings indicate the potential usefulness of AI in hospital triage scenarios.

PP14-928-14 Parallel screening algorithm using WHO symptom screen and portable digital X-ray with artificial intelligence: A strategic approach to optimise TB case finding

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Background and challenges to implementation: Globally, only 7.5 of the 10.6 million people estimated to have TB were notified in 2022. To close this gap, there's need to identify quality presumptive TB that will translate to high TB yield thereby making it difficult for true TB case to escape a screening process. Parallel screening algorithm that combines the use of the WHO 4 symptom screen and portable digital x-ray with CAD was adopted by KNCV Nigeria to help close the gap on missing TB cases in Nigeria.
Intervention or response: 7 PDX+AI in 6 states were deployed, clients are verbally asked of the 4 TB symptoms, if the answer is yes for 1 or more symptom the client is identified as presumptive TB. All the clients are further screened with PDX+AI, those with score ≥ 50 were documented as presumptive TB. All the presumptive TB were

evaluated with either GeneXpert, Truenat or TB lamp and those with negative result were further reviewed by radiologists.

Results/Impact: Using January to December 2023 data across 6 states, a total of 113,259 persons were screened, presumptive TB are categorized, Presumptive with symptoms and CAD ≥ 50, Presumptive with CAD ≥ 50, Presumptive with symptoms and CAD≥50. Groups with CAD scores ≥50 had higher TB yield.

Groups	Number of presumptive	Bacteriologically Dx	Clinically Dx	Total cases Diagnosed	TB yield
Presumptive with Symptoms + CAD ≤50 (A)	6367	245	278	523	8%
Presumptive with CAD ≥50 (B)	32	4	9	13	41%
Presumptive with Symptoms + CAD ≥50 (C)	2903	903	667	1570	54%

Conclusions: The parallel screening algorithm has made it easier to identify TB cases even if CAD score is low. Presumptives with CAD ≤50 had TB yield of 8%, against 54% if the CAD was ≥50. This algorithm has made it possible for TB cases to be diagnosed, if the 8% yield from symptoms screen was undiagnosed, it would have been a source of infection as a resulting in TB cases, hence this finding could remain as advocacy tool for the adoption of the parallel screening algorithm to optimize TB case finding interventions.

PP14-926-14 CT radiographic findings associated with incident TB among individuals with trace sputum Xpert results during TB screening

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Background: When used for systematic TB screening, Xpert Ultra ("Ultra") sometimes reports "trace" results, yet only a minority of these individuals have microbiologically confirmed tuberculosis (TB). Microbiologically-negative individuals with "trace" sputum might be in early stages of TB and imaging findings may precede microbiological positivity. Therefore, we compared baseline imaging characteristics between those who developed incident TB and those who did not among trace-positive individuals with a negative diagnostic evaluation.

Design/Methods: We conducted community-based TB screening in Uganda using Ultra. Individuals with trace results underwent a comprehensive evaluation including chest CT and X-ray, sputum cultures, repeat Ultra, and clinical examination. CTs were read by at least two radiologists using a structured form that captured the presence/absence of specific abnormalities (e.g., consolidation, nodules, cavities) and consistency with active and prior TB. Those not diagnosed with TB at baseline were followed for up to 24 months.

We compared initial CT findings between participants who developed TB during follow-up and those who did not using Fisher's exact statistical test.

Results: A total of 62 individuals with trace Ultra screening results and negative baseline TB diagnostic evaluations were included (53% male, median age 32.5 [IQR 27-38]), 11% with HIV infection, 26% previously treated for TB). Among these individuals with trace screening results, 19 (31%) developed TB during the follow-up, of whom 11 (58%) had a baseline CT rated as highly or somewhat suggestive of active TB. TB incidence was higher in those with any abnormality on baseline CT than in those without (100% vs 35%; p<0.01). Nodules and septal thickening were also significantly associated with incident TB (Table 1).

CT radiographic characteristics	Individuals with trace screening results and no TB at baseline or in follow-up (n=43)	Individuals with trace screening results with no TB at baseline who developed incident TB (n=19)	p-value
Any abnormality, n(%)	15 (35%)	19 (100%)	<0.01
Consolidation, n(%)	3 (7%)	4 (21%)	0.19
Ground-glass opacity, n(%)	3 (7%)	1 (5%)	1.00
Nodule, n (%)	13 (30%)	17 (89%)	<0.01
Septal thickening, n(%)	10 (23%)	10 (53%)	0.04
Cavitation, n (%)	2 (5%)	4 (21%)	0.07
Parenchymal fibrosis, n(%)	12 (28%)	10 (53%)	0.09
Suggestive of active TB, n (%)	5 (12%)	11 (58%)	<0.01
Suggestive of prior TB, n (%)	12 (28%)	12 (67%)	0.01

Table 1. Demographic, clinical, and radiographic Characteristics among Trace individuals with no TB at Baseline

Conclusions: Individuals with baseline CT abnormalities were more likely to develop TB following a trace Ultra screening result.

PP14-929-14 Revolutionising TB education: TB portals' unmatched repository of annotated clinical images

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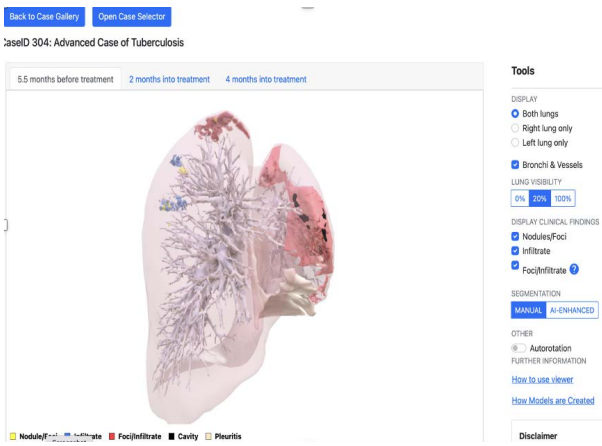
Background: For the last ten years, NIAID TB Portals program bridges the gap between traditional medical training and the future of AI-assisted healthcare, ensuring that the next generation of doctors is prepared for the technological advancements shaping the future of medicine.
For doctors and radiologists, especially those in training, access to a wide array of tuberculosis lung images, meticulously annotated with clinical findings and diagnostic insights, provides a unique opportunity for hands-on learning. Such exposure is crucial in developing the visual diagnostic skills needed to identify and understand the varied manifestations of TB across different populations and stages of the disease.
Design/Methods: In the rapidly evolving landscape of medical education, particularly with the advent of artificial intelligence (AI) in healthcare, the TB Portals database sets a new standard by offering an unprecedented collection of thousands of clinical images (10820 chest X-rays, 1700 CTs), at least half from cases of drug-resistant tuberculosis. This vast repository starkly contrasts with the limited selection traditionally available through textbooks and online medical encyclopedias, which offer at best dozens of images for study.
Results: TB Portals is helpful in the transition towards integrating AI into clinical practice, providing human and AI annotations for thousands of images.



Conclusions: The resource not only offers a platform for AI algorithms to learn from a broad and complex set of clinical images, but also allows medical professionals to become familiar with AI tools and annotations.

PP14-933-14 Applying innovative solutions for TB diagnosis through artificial intelligence in services disruption situation in Ukraine

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Background and challenges to implementation: According to WHO data, up to 30% of people with TB are undetected in Ukraine. In the conditions of a full-scale war, the provision of medical care for 20% of the population is limited due to active hostilities. More than 1,600 medical facilities were destroyed. The number of radiologists is insufficient due to migration, and due to prioritization of provision of medical care for other health conditions (such as injuries). To overcome those challenges AI tool was actively applied.
Intervention or response: In 2023, three AI for automated analysis of X-ray systems were implemented, which required the introduction of new models for medical care in three regions. Those systems are successfully used in everyday practice, which greatly facilitates and accelerates the process of diagnosing tuberculosis and other lung diseases. The plan is to buy 19 portable X-ray machines equipped with AI technology, and then acquire an additional 19 AI systems in 2024 to expand the use of artificial intelligence in Ukraine.
Results/Impact: A the result, in those regions TB case detection improved by 15% compared to the other regions and by 20% compared to the previous years. The use of the AI software in tandem with a portable X-ray machine for examination in de-occupied territories and territories close to military operations, as well as in areas where the medical infrastructure has been destroyed, allows us to mitigate the challenges associated with war and improve the diagnosis of TB.
Conclusions: The use of AI systems for reading X-ray images increases the accuracy of diagnosis and reduces the time to obtain results, improving the efficiency of the medical process in health emergencies.

PP14-930-14 Lessons learned from Bangladesh: Child TB screening by using AI-based portable X-ray systems

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Background and challenges to implementation: Proportion of children with tuberculosis (TB) is expected to be between 10% to 12% of the total burden. According to WHO global TB report, only 3.4% among the notified TB cases were children in Bangladesh in 2022. Diagnosis of child TB remains a major challenge for the program. While portable X-ray equipped with Artificial Intelligence (AI) is being widely rolled out across the high burden countries, utility of this tool in child TB diagnosis is still not well evidenced.

Intervention or response: Under the National TB Control Programme (NTP), portable chest X-ray systems with AI has been rolled out in 13 districts since January 2023 in Bangladesh. These machines are transported to areas without access to digital X-ray systems and people with symptoms consistent with TB as well as household contacts of people with bacteriologically positive TB undergo chest X-ray. We aimed to explore AI generated score distribution among the children aged between 4-14 years diagnosed with TB.

Indicators	AI Score (0-<30)	AI Score ≥30	AI Score ≥40	AI Score ≥50
Child TB Presumptive Screened and bacteriologically tested	3390	662	283	61
Bacteriologically Positive	5	9 (1.4%)	8 (2.8%)	7 (11.4%)
Clinically Evaluated	3126	563	247	54
Clinically Diagnosed	21	31 (5.5%)	26 (10.5%)	15 (27.7%)
Any TB Diagnosis	26	40	34	22
Sensitivity of AI score at cut-off (95% CI) considering bacteriological positivity		64.3 (35.1-87.2)	57.1 (28.9- 82.3)	50.0 (23.0-77.0)
Specificity of AI score at cut-off (95% CI) considering bacteriological positivity		83.8 (82.7-85.0)	93.2 (92.4-93.9)	98.7 (98.3-99.0)
Sensitivity of AI score at cut-off (95% CI) considering any TB positive diagnosis		60.6 (47.8-72.4)	51.5 (38.9-64.0)	33.3 (22.2-46.0)
Specificity of AI score at cut-off (95% CI) considering any TB diagnosis		84.4 (83.2-85.5)	93.8 (93.0-94.5)	99.0 (98.7-99.3)

Results/Impact: From Jan'23 to Dec'23 a total of 4052 children undergone X-Ray. Of them only 61 were identified with above NTP determined cutoff value (50). All 61 AI suggested individuals were tested bacteriologically and seven (11.4%) were bacteriologically positive and among 54 bacteriologically negative children, 15 (27.7%) were diagnosed clinically as TB.

Among the 3991 children with lower than threshold AI score, seven (0.18%) were bacteriologically positive. Among the rest, 37 (1%) were clinically diagnosed as TB. Considering increasing cut-off values, the sensitivity decreased from 64.3% at 30 to 50% at AI score of 50 while specificity increased from 83.8% to 98.7% against bacteriological positivity.

Conclusions: Considering the complexity of child TB diagnosis, the AI score can be very much helpful with its high specificity especially with higher threshold. However, the sensitivity needs improvement for this to be more helpful in screening children.

PP14-931-14 Improving the diagnostic yield of TB from screening using digital X-ray fitted with computer-aided detection software: Lessons from programmatic implementation in Uganda

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Background and challenges to implementation: Uganda is among the 30 high TB/HIV burden countries globally. The national TB leprosy program adopted the WHO recommendation for the use of digital X-rays and computer-aided detection (CAD) for systematic TB screening.

We present lessons from using program data to determine the optimal threshold score for CAD, to improve the diagnostic yield of TB.

Intervention or response: Twelve portable digital X-rays with CAD4TB technology were deployed for TB screening at health facilities and communities. Health workers were trained and mentored on X-ray use and the screening algorithm.

We collected sputum samples from all individuals with any CXR abnormalities, for X-pert test and those confirmed with TB were initiated on standard TB treatment. Health facilities reported X-ray screening data using the TB management information system (TB-MIS), for analysis

Results/Impact: Overall, 21,434 individuals were screened with CXR in 2022 and 2023. Of these, 54% were female and 5.3% were PLHIV. Sputum samples were collected from 8,025 individuals with any abnormality on CXR and 7,751 (96.6%) were tested with X-pert. A total of 625 (8.1%) individuals were confirmed to have TB and started on TB treatment.

TB positivity rate was highest among those with CAD4TB score of 50 or more, increasing from 15.3% at CAD4TB score of 50 or more to 59.5% at CAD4TB score of 90 or more. Of the PLHIV with positive X-pert, 24% (13/54) had a CAD4TB score below 50.

Number screened with CXR	Number screened with CXR who are HIV positive	CAD score	Abnormal CXR whose samples are referred for X-pert test	Samples tested with X-pert	Number of confirmed TB patients	Positivity rate (%)	Confirmed TB patients who are HIV positive
11,179	531	<30	3,994	3,872	34	0.9%	9
2,398	96	30-39	1,085	1,065	12	1.1%	1
4,299	241	40-49	1,148	1,087	23	2.1%	3
1,739	85	50-59	504	478	73	15.3%	2
716	54	60-69	446	428	103	24.1%	4
484	48	70-79	344	330	111	33.6%	14
276	26	80-89	204	200	96	48.0%	5
343	47	90-100	300	291	173	59.5%	16
21,434	1,128 (5.3%)		8,025 (37.4%)	7,751 (96.6%)	625	8.1%	54 (8.6%)

Conclusions: High TB diagnostic yield can be achieved from digital X-ray screening at CAD4TB threshold score of 50 or more and potentially saves X-pert tests required, given the low TB positivity at CAD4TB score below 50. The national TB program and partners should strengthen sputum testing among individuals with CAD4TB score of 50 or more and consider a lower CAD threshold score for PLHIV, to improve tuberculosis case detection.

PP14-927-14 Can AI-assisted chest radiography be useful for early TB detection and treatment in resource-limited areas of Punjab, India?

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Background and challenges to implementation: In India's National Prevalence Survey, 41.2% additional diagnostic yield was obtained from X-ray screening thereby emphasising its importance as a critical screening tool in the TB care cascade. Screening through X-ray is quite relevant in Punjab, however, there is an acute shortage of radiographers in the state. To address this gap, the state implemented Artificial Intelligence (AI) aided chest radiography in peripheral health facilities. The study aims to assess the impact of AI-assisted chest radiography on TB care cascade in resource-limited settings.

Intervention or response: The AI-powered tool was deployed in May 2023 at six health facilities of Punjab, selected based on the shortage of radiographers and high outpatient load. The existing staff were trained to upload X-rays on the portal. Sputum samples from those tagged as presumptive TB by the AI were tested in GeneXpert. The impact of this intervention was quantitatively assessed for i) coverage, ii) diagnostic yield, and iii) turnaround time. Data was analyzed for the study period May2023-September 2023, in SPSS ver22.

Results/Impact: Among the six health facilities, a total of 5778 Chest X-rays were uploaded. Of these, AI tool tagged 1098 (19%) X-rays as presumptive TB. After further testing on GeneXpert, 180 (16%) were microbiologically confirmed with TB and started on treatment. This translated to a diagnostic yield of 2.6% to the GeneXpert tests done during the study period. Additionally, the reporting turnaround time decreased significantly, from a single day to only 1-2 minutes.

Conclusions: AI-assisted chest X-ray is a powerful tool to increase the yield of presumptive tests and TB diagnosis, especially in resource-limited settings. The intervention is scalable and replicable in high-burden geographies for improving early TB case detection and treatment.

E-POSTER SESSION (EP)

EP07 TB Elimination through accessibility

EP07-657-14 Improving diagnostic accuracy of TB in adults through the use of stool specimens for the diagnosis of pulmonary TB in adults

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Background and challenges to implementation: Accurate diagnosis of tuberculosis is crucial for effective disease management and control. However, achieving this accuracy poses a significant challenge, particularly in cases where obtaining sputum samples for testing is difficult. In 2020 the national TB program in Zambia adopted the use of stool both in children and adults as well to improve bacteriological confirmation of TB in presumptive TB patients who are unable to produce sputum based on the in-country validation study.
The objective of this study was to investigate the impact of using stool for TB diagnosis in patients who are unable to produce sputum on TB notifications.
Intervention or response: Adults of 15 years and above were routinely screened for TB and those presumptive TB patients who were unable to produce sputum were asked to submit stool. The stool specimen was processed using the Simple one step method and tested on GeneXpert using Xpert MTB/RIF ultra-cartridges. The lab results including stool were routinely reported using odk and visualized through power BI. Validation was conducted to compare the results from respiratory and stool specimens using the Xpert MTB/RIF Ultra assay.
Results/Impact: Out of 4253 adult stool samples analyzed from very sick patients, MTB was detected in 284 (6.7%) translating to a 1.6% contribution to the total bacteriologically confirmed new cases. The stool positivity yield is the same as the respiratory specimen. In the validation study, there was a concordance between respiratory and stool specimen Xpert results of 95%.
Conclusions: stool is a good alternative to pulmonary specimen in the diagnosis of PTB in adults who cannot produce sputum. Stool is easier to collect and implement at lowest level of care thus increasing coverage and access.

EP07-658-14 Implementation of *N-acetyltransferase 2 (NAT2)* genotype testing services for people with TB in a provincial hospital in northeastern Thailand

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Background: The risk of anti-TB drug-induced liver injury (DILI) is higher among those with *NAT2* slow acetylator (SA) genotypes, due to the slow metabolism of isoniazid (INH). Considering the high prevalence of the NAT2-SA in Thailand, the Ministry of Public Health has introduced the *NAT2* genotype testing services to reduce the risk of DILI. This study aims to describe the ongoing implementation of personalized medicine for TB treatment in Thailand.
Design/Methods: Roi Et Hospital, located in northeastern Thailand, initiated *NAT2* testing for TB patients at the time of TB diagnosis, from October 2021 to December 2023. Based on the results of the tests, INH doses were adjusted for patients who developed DILI. *NAT2* genotypes were classified into four types based on single nucleotide polymorphisms from six loci: rapid acetylator (RA), intermediate acetylator (IA), non-ultra slow acetylator (non-ultra-SA), and ultra slow acetylator (ultra-SA). We analyzed the prevalence of DILI and their treatment outcome as a result of INH dose adjustment.
Results: A total of 342 TB patients underwent *NAT2* testing. The distribution of genotypes was as follows: RA (47 cases, 14%), IA (148 cases, 43%), non-ultra-SA (30 cases, 9%), and ultra-SA (118 cases, 34%). The prevalence of DILI was observed to be 10%, 14%, 46%, and 47% for each genotype, respectively.
Among patients with DILI who had non-ultra-SA and ultra-SA genotypes, 57.1% (8/14) and 19.6% (11/56) successfully completed the standard regimen by reducing the INH doses from 5mg/kg/day to 2.5mg/kg/day without extending treatment duration.
Conclusions: The NAT2-SA genotype, particularly the ultra-SA type, is highly prevalent in Thailand and is associated with an increased risk of DILI. The Thai TB control guidelines should be updated to effectively incorporate the use of *NAT2* genotype testing, ideally accompanied by therapeutic drug concentration monitoring of INH, to optimize TB treatment outcomes.

EP07-659-14 Diagnostic yield of Xpert Ultra in stool specimens from children attending the private health sector in Pakistan

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Background and challenges to implementation: The diagnosis of tuberculosis (TB) in children presents a challenge primarily due to the lack of sensitive diagnostic tests and the difficulty in obtaining respiratory specimens. Diagnosis in children is frequently reliant on clinical assessment and basic investigations for pulmonary TB.
In 2021, the World Health Organization (WHO) endorsed the use of Xpert MTB/Ultra for testing stool samples in children, offering a promising diagnostic approach.
Intervention or response: Pakistan possesses a substantial private health sector., where Mercy Corps Pakistan has been actively engaged in implementing TB control activities across 119 districts. This engagement encompasses a vast network of over 14,000 general practitioners, including pediatricians, pulmonologists, and other medical specialists, along with 380 large private hospitals. Private healthcare providers within this sector receive training on WHO guidelines for Childhood TB Management and Xpert testing facilities have been established for TB diagnosis. Additionally, private laboratory staff are trained in Xpert testing for both sputum and stool specimens.
Results/Impact: In Pakistan, twenty-eight Xpert testing sites were established in 24 districts within the private sector. In 2023, a total of 120,180 Xpert Ultra tests were conducted with 20.8% (n= 25,045) yielding positive results for Mycobacterium tuberculosis (MTB). Among these, 650 TB cases (2.6%) were reported as rifampicin resistant. Stool testing was implemented at 17 of these sites during this period, where 2,042 stool specimens were examined. MTB was detected in 127 (6%) samples, while 3 (2.3%) of these cases reported as rifampicin resistant.
Conclusions: The utilization of Xpert testing for stool specimens holds significant potential in augmenting the identification of bacteriologically confirmed TB cases and detecting rifampicin resistance at an early stage in children. This underscores its critical role in improving tuberculosis diagnosis and management within pediatric populations.

EP07-660-14 Genome sequencing of M. tuberculosis complex strain from Lesotho

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Background: It is essential to understand the genetic diversity and transmission dynamics of *Mycobacterium tuberculosis* complex (Mtbc) strains in order to gain detailed molecular epidemiological data that can be used to define targeted interventions to reduce tuberculosis (TB) rates and facilitate accurate diagnosis. Here, whole genome sequencing (WGS) allows high resolution characterization of clinical Mtbc strains. Lesotho has very little experience with WGS.
We performed a WGS pilot study to get first insights the phylogenetic diversity, resistance rates and clusters of Mtbc strains collected in Lesotho.
Design/Methods: DNA was extracted from 129 Mtbc from February 2022 to June 2023 strains at the National Reference Laboratory in Lesotho using the CTAB method, and send to the National Reference Center for Mycobacteria in Borstel, Germany for WGS. WGS data were used for further phylogenetic strain classification, resistance prediction, and a cluster analysis.
Results: Of the 129 DNA samples, 95 were sequenced with good quality. Out of these, the strains were classified in the following lineages: Beijing family (22%), LAM (18%), S-type (18%), Mainly T (11%), X-type (15%), East Africa Indian (EAI) (7%), Haarlem (5%), Delhi-CAS (2%), and H37Rv-like (2%).
Resistances were predicted as follows: 66% fully susceptible, 4% as rifampicin resistant (RR); 14% as multidrug resistant (MDR); and 1% as extensively drug resistant.
With 14%, cluster rate was found to be low. Still, one cluster with four strains with a diagnostic escape rifampicin resistance mutation (I491F) was found.
Conclusions: Our findings showed that Beijing, LAM, and S-type strains are representing the majority of Mtbc strains in Lesotho. We found a significant number of MDR Mtbc strains, four of which with a diagnostic escape mutation not detected by conventional molecular assays for detection of RR resistance.
Future molecular epidemiological investigations are essential to get more detailed information on the determinants of drug resistant TB in the country.

EP07-661-14 Revitalising access to diagnostics after conflict in Tigray region, Ethiopia

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Background and challenges to implementation: Despite outsourcing integrated specimen referral service to the postal office, access to tuberculosis (TB) rapid diagnostic services was interrupted due to conflict in Tigray for two years. The study aims to describe engagement of different modalities of specimen transportation to revitalize and ensure access to GeneXpert testing.
Intervention or response: USAID Eliminate TB Project collaborated with the Tigray Regional Health Bureau to facilitate specimen referral through sensitization workshop for the postal office, district TB focal persons, and clinicians on demand creation for TB diagnostics.
Interventions such as, preparation of schedule for specimen transporters; assigning non-health professionals for specimen transportation; the postal office service outsourced to district youth, provided on job training, and project-covered alternative specimen transport costs were designed.
The project also provided testing delivery standard operating procedures, test algorithm, lab request form, and referral tracking sheet. Data collected and analyzed from March to November 2023.

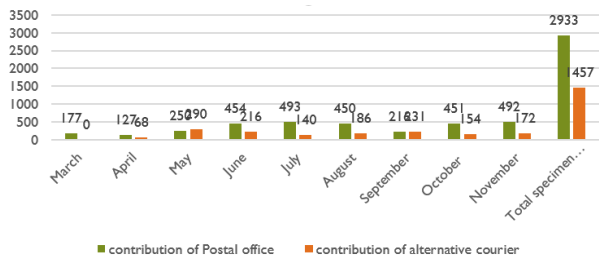

Figure 1. Contribution of different modalities of specimen referral to revitalize GeneXpert testing uptake in Tigray Region, March-November 2023.

Results/Impact: From March to June 2023, GeneXpert service was provided only in the regional capital of Mekele town where only 117 specimens were referred. After the project facilitated the sensitization workshop, the specimen referral increased to 4,390, which represented 29.2% of the total 15,024 GeneXpert tests in the region. The contribution from the postal courier was 19.5% and 9.6% from alternative couriers. Comparing one round-trip cost with that of the postal office, the alternative courier showed a reduction of 29.3%. In November 2023, the alternative specimen transportation was handed over to the government to sustain e of the service.

Conclusions: Coordination and implementation of different modalities of specimen referral service revitalized the specimen referral and diagnostics in Tigray. The adoption and implementation of an alternative modality of local courier could further improve accessibility, courier cost, efficiency, and sustainability of the service and could be scaled up to other regions.

EP07-662-14 Improving GeneXpert machines uptime in Ethiopia: Overcoming maintenance hurdles

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Background and challenges to implementation: Despite the advantages of GeneXpert for rapid and accurate tuberculosis (TB) diagnosis, maintaining optimal uptime can be challenging in resource-limited settings.
This study explores the maintenance challenges associated with the GeneXpert machine scale-up in Ethiopia and identifies strategies for improvement.
Intervention or response: A retrospective study investigated the hurdles of GeneXpert maintenance and unsuccessful Xpert® MTB/RIF (Ultra) tests in Ethiopia. The study analyzed test performance and maintenance data from 226 GeneXpert machines between October and December 2023. Data was entered into an electronic spreadsheet, imported, and analyzed using SPSS version 20.0.
Results/Impact: A total of 105,116 tests were conducted using 226 GeneXpert machines. However, 8,151 (7.8%) tests were unsuccessful.
Looking closer at these unsuccessful tests, 3.1% were due to power outages („no result"), 5% were caused by errors related to the machine, cartridge, or user („errors"), and the remaining 7% were deemed „invalid" due to user error. 93,936 USD was spent on procuring wasted cartridges.
Of 904 GeneXpert modules, 225 (24.8%) failed and were not maintained due to a lack of spare parts, limited technical expertise, unreliable power supply, and long turnaround time contributed to GeneXpert's downtime in Ethiopia.
As a result, the module uptime is only 75.2%. Effective strategies for overcoming these challenges include implementing preventive maintenance schedules, improving access to spare parts, establishing partnerships for backup power solutions, and strengthening the implementation of maintenance service level agreements.

Conclusions: In Ethiopia, GeneXpert maintenance issues significantly hindered TB diagnosis (7.8% unsuccessful tests, $93,000 is wasted for cartridges). A lack of spare parts, limited expertise, and unreliable power caused high downtime (24.8% unmaintained modules) and led to 75.2% module uptime. Implementing SLA (Service Level Agreement), preventive maintenance, improving spare part access, and partnering for backup power are crucial to optimizing GeneXpert and improving TB control.

EP07-663-14 Performance of TB diagnostic network in its ability to meet the needs of the Country's National Strategic Plan: Kenya's experience

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Background and challenges to implementation: Tuberculosis (TB) is a major public health issue that causes significant morbidity and mortality worldwide. Kenya is among 30 high-burden countries for TB and contributes to about 80% of the global TB burden. Through its network of laboratories, Kenya strives to ensure equitable access to TB diagnostic services. An assessment was performed to review the diagnostic network performance.

Intervention or response: The assessment comprehensively examined current diagnostic practices and algorithms while identifying impediments that hinder the network's efficiency and effectiveness. Consultations were done with the National Tuberculosis, Leprosy and Lung Disease Program (NTLDP), National Tuberculosis Reference Laboratory (NTRL) and other stakeholders at the national level. A total of 175 TB facilities in 13 counties were assessed. An assessment tool (TB-Net Tool) which uses semi-quantitative scoring to identify the stage of various aspects of the diagnostic network was used.

Results/Impact: The assessment revealed a mixed picture of performance across different components of the diagnostic network. While certain aspects, like the diagnostic algorithm and TB-HIV coordination, exhibited commendable performance, deficiencies were apparent elsewhere. Notably, Equipment & Supplies (40%), Biosafety (32%), and Workforce (38%) scored below average, necessitating immediate attention. Other scores included Political, legal, regulatory, and financial framework (60%), Structure and organization of the diagnostic network (60%), Coverage (59%), Diagnostic data management (68%), Quality of the diagnostic network (68%), and TB-HIV (73%).

Following the assessment, concerted initiatives have been launched by the NTP/NTRL, encompassing the formulation and rollout of a National Operational Plan and a Quality Management Framework.

Additionally, work is underway to craft a TB-specific Biosafety manual aligned with WHO guidelines.

Conclusions: The findings underscore the imperative of enhancing each core capacity of the diagnostic network to align with the objectives of the National Strategic Plan (NSP). A target of 80% performance is indispensable in realizing Kenya's commitment to combatting TB effectively.

EP07-664-14 A novel 3-gene host response blood-based test for treatment monitoring in rifampicin-resistant TB: Interim results

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Background: A non-sputum-based, rapid triage test is urgently needed for tuberculosis treatment monitoring. We therefore conducted a prospective cohort to evaluate the implication of a novel 3-gene blood-based test (the Xpert MTB-HR prototype) in monitoring treatment response in rifampicin-resistant tuberculosis (RR-TB).

Design/Methods: Patients aged over 16 with pulmonary RR-TB were prospectively enrolled and received a 9-month oral regimen including a five-drug combination of the following: bedaquiline, linezolid, cycloserine, clofazimine, pyrazinamide, and a fluoroquinolone. Sputum was obtained for smear and culture monthly, and venous blood was obtained at baseline, month 2, month 6, month 9 and a year after end of treatment for the Xpert MTB-HR cartridges. The procedures for the Xpert-MTB-HR tests were performed following the manufacturers' instructions.

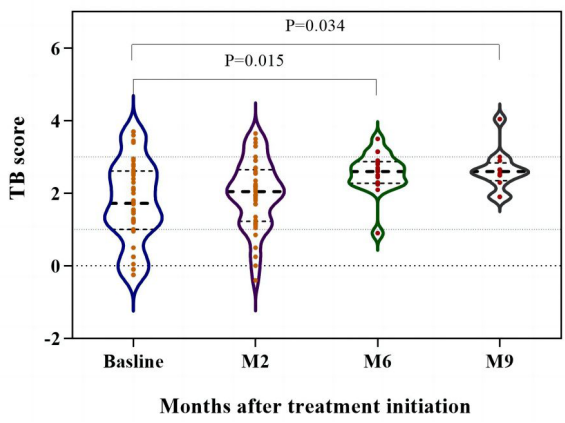
Cycle threshold for three genes (DUSP, GBP5 and KLF2) was obtained and TB score was determined by: $(Ct_{GBP5} + Ct_{DUSP3})/2 - Ct_{KLF2}$. Data in these interim results was updated in April 2024.

Results: From May 11, 2023 to March 12, 2024, 46 patients were recruited. Two patients were lost to follow-up after month 2 and one death occurred after month 6. Twelve patients have completed treatment and no bacteriological failure was reported so far.

The average TB score was 1.74 (IQR 1.00–2.61) before treatment initiation and then gradually increased during treatment period.

The most remarkable increase was seen at month 6 (2.55 (IQR 2.28–2.88) vs. 1.74 (IQR 1.00–2.61), P = 0.015) and month 9 (2.63 (IQR 2.35–2.84) vs. 1.74 (IQR 1.00–2.61), P = 0.034) compared with baseline.

The average TB score at month 2 (1.97 (IQR 1.23–2.65)) was not statistically different compared with baseline.



Conclusions: This interim analysis indicated the 3-gene TB score could be a potential tool for treatment monitoring in RR-TB patients, yet more data are needed to further validate its future implementation.

EP07-665-14 Olink proteomic analysis of immune proteins from the serum of people with non-tuberculous mycobacteria and M. tuberculosis

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Background: Non-tuberculous mycobacterial (NTM) and *Mycobacterium tuberculosis* (*Mtb*) infections are difficult to diagnose and treat, creating a significant burden on global health. The host immune status is generally believed to be associated with the onset and progression of NTM and MTB infections, but its specific impact remains unclear.
Design/Methods: In the present study, the expression levels of 92 immune-related proteins in the serum from and normal controls (n = 26) and patients with *Mtb* (n = 26), rapidly growing NTM (RGM, n = 15), and slowly growing NTM (SGM, n = 21) were determined using the Olink panel based on the highly sensitive and specific proximity extension assay technology.
Results: Compared with normal controls, IFN-γ, IL12, chemokines CXCL9, CXCL10, CXCL11 and CXCL13, CD83, galectin 9 (Gal-9), matrix metallopeptidase 12 (MMP12), mucin 6 (MUC-16), and programmed cell death ligand 1 (PD-L1) were simultaneously upregulated in patients with *Mtb*, RGM and SGM, while chemokine CCL3 were simultaneously downregulated. Compared with *Mtb* infected patients, IL8, chemokines CCL3, CXCL5 and MCP-2, Gal-1, CD40, and adenosine deaminase (ADA) were simultaneously upregulated in patients with RGM and SGM. Compared with RGM infected patients, IL7, CD27, and chemokines CCL17 and CXCL12 were downregulated in patients with SGM. In addition, Olink proteomic analysis of these immune-related proteins described above demonstrated diagnostic and differential diagnostic potential.
Conclusions: Using Olink proteomic analysis, differences in immune-related proteins between normal controls, patients with *Mtb*, patients with RGM and patients with SGM were revealed, and potential diagnostic and differential diagnostic markers were explored.

EP08 Community participation: Treasure for TB

EP08-666-14 Treatment adherence of people with drug-resistant TB in taking medication based on peer educator characteristic

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Background: The burden of DR-TB in Indonesia is one of the highest in the world. In 2022, it is estimated that there will be 24,666 cases of DR-TB in Indonesia. Treatment success rates are still a major challenge. One of the challenges in the treatment of DR-TB is the lack of patient compliance in taking medication which is influenced by many factors that are the main obstacles to the success of treatment. To support and ensure adherence to taking patient medication, regular assistance by health cadres known as patient companions or peer educators is needed. This study wants to find out what characteristics of patient support are most appropriate for patients so that they can support medication adherence that has an impact on optimal treatment success.
Design/Methods: This study used an analytical descriptive observation method involving 146 DR-TB patients in terms of medication adherence rates associated with the characteristic features of 26 peer educators divided into 4 categories: age, gender, educational background, and experience as DR-TB survivors. Research data collection was carried out in 3 Muhammadiyah Hospitals in Central Java and Yogyakarta Provinces.
Results: Out of the 146 DR-TB patients observed, 85% exhibited medication adherence, while the remaining 15% were non-adherent. The patient's medication adherence rate is influenced by factors such as 55% having the same age as the patient, 62% sharing the same sex, and only 5% being influenced by peer educators who have experience as DR-TB survivors, with educational background affecting only 2%.
Conclusions: Age and gender of peer educators contributed to medication adherence to patients, while experience as an DR-TB survivor and educational background did not have a significant influence on medication adherence.

EP08-667-14 Empowerment of local self-governing bodies to accelerate TB elimination efforts in Himachal Pradesh, India

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Background and challenges to implementation: Panchayati Raj Institutions (PRI) are rural local elected bodies in India which promote community-led participatory governance for decision-making in rural areas. In the PRI system, the Gram Panchayats (GP) are governing bodies for every village that looks after health and development. State of Himachal Pradesh undertook the 'Healthy Villages' initiative in 2019, to help each GP accelerate achieving sustainable development goals and thus attain their tuberculosis (TB) free status.
This study aims to describe the impact of this initiative on TB program outcomes.
Intervention or response: Since 2019, 'TB-Free' Panchayat Forum Meetings were initiated in every GP on a biannual basis that constituted TB survivors, representatives of the health and PRI members.
Gram Panchayat Development Plan (GPDP), a community-informed action plan was formulated to monitor the activities in every GP. TB program outcomes were defined through six criteria:
i. Presumptive TB testing,
ii. Annual TB notifications,
iii. Drug susceptibility testing
iv. Uptake of social welfare schemes,
v. Community-led nutritional support, and;
vi. Treatment outcome.
State mobile application 'TB Mukt Himachal' was leveraged to track all the indicators in the year 2023 against every GP. Data was analyzed on SPSS ver22.
Results/Impact: A total of 5527 PRI representatives from 3615 GPs were sensitized under this initiative. Over 27% of GPs prioritized the inclusion of persons with TB in welfare schemes and TB-free activities.
Presumptive TB testing rate in 2023 for the state was 4312/100,000 population which was above the national average (1281/100,000 population) and state trends (161% increase vis-à-vis 2018).
The initiative resulted in 723 GPs attaining TB-free status based on the predefined criteria.

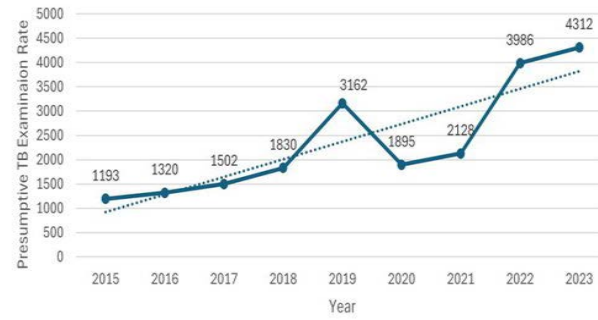

Figure. Annual trend of presumptive TB examination rate in Himachal Pradesh, India.
$y = 363.15x + 554.05$ $R^2 = 0.7309$

Conclusions: Engagement with local self-governing bodies accelerates TB elimination efforts by empowering decision making, participation and sense of ownership at decentralized level, as evidenced in this initiative and should find adequate weightage in national policy frameworks for such hard-to-reach geographies.

EP08-668-14 The value of community engagement prioritising a multi-sectoral holistic approach when conducting TB clinical trials in the Matlosana sub-district of South Africa

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Background and challenges to implementation: Communities affected by TB are facing multi-dimensional challenges and are most often hardly reached which requires multi-stakeholder engagement. The trial was aimed at persons with tuberculosis (TB) and communities with high incidence of TB. Participants for the TB trial was enrolled within the final month of the 6-month TB treatment. 28 of 145 participants found not eligible due to loss to follow up (non-completion of treatment), which was attributed to social determinants. We learned that poverty, inequity, food insecurity and under nutrition drives TB and non-completion of treatment.
Intervention or response: Community engagement activities included collecting significant change stories to understand the social aspects of TB, asset-based community mapping exercises, to determine which stakeholders are critical for addressing TB holistically. Diverse stakeholders that include all relevant sectors that address social determinants of TB were prioritized. Facilitating this meant placing people first and at the core of interventions. This translated in authentic collaborations with community-based organizations which enabled multi stakeholder engagement. Connections were formed based on mutual interest. Connections were sustained by creating

opportunities for ongoing collaborations. Collaborations included organizations, who provide nutritional and psycho-social support to person's profiled to be food insecure because of poverty.

Results/Impact:

- Multisectoral collaborations enhanced trust between the clinical research site (CRS), stakeholders, exchange of knowledge and expertise, promoting mutually beneficial relationships.
- Social determinants do impact trial participation.
- Understanding social determinants enables CRS to co-create plans that integrate services through multi stakeholder collaborations.
- Interventions that address the whole person and not only the disease are impactful.
- Integrated solutions to social determinants are critical.

Conclusions: TB is not only a medical challenge but is highly influenced by social determinants these challenges have a ripple effect on trials and a TB response. Clinical trials/TB response exist within an ecosystem and strategic collaborations that address all aspects of human development cannot be underscored.

EP08-669-14 Survivor-led networks as a catalyst to end TB in high-burden countries: A case study of Indian networks

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Background and challenges to implementation: India being a high burden and high populated country, program alone is not sufficient to address challenges to end TB as per the political commitment to end TB by 2025. In this situation along with other key stakeholders, engagement of survivor led networks plays an interface role between affected community and program to solve challenges and provide quality care to the affected community for desired treatment outcome.

Intervention or response: Touched by TB established districts and state level networks and grown to 15 state level networks with several thousands of members. These networks work with the program at all levels and interface affected community and program. This lead to awareness on TB symptoms, diagnostics, treatment literacy and quality of care. The champions were providing peer to peer counselling and facilitating several patient care needs. This initiatives of networks reduced the delay in diagnosis and treatment completion. On average 3000 persons were benefited by this intervention in every quarter and reached out to nearly 40,000 persons in a period of three years.

Results/Impact: The intervention led to formation of 10 district level networks, 15 State level networks and 1 National level TB Survivors' led network. Currently there are 924 TB Survivors associated with the network working in close coordination with the affected community and the NTEP to provide the support to people with TB. It is expected that within one year, the membership will be increased to 1500 members

Conclusions: It may be concluded from the intervention that, survivor led networks and its members are critical in ending TB in a mission mode especially in high burden countries. The network members act as an interface between affected community and program for the smooth sailing of program intervention especially in a less resource ecosystem

EP08-670-14 Fostering women's health and community bonding: Designing health camps for integrated testing and social interactions

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Background and challenges to implementation: William J. Clinton Foundation, under the aegis of Central TB Division, is conducting Active Case Finding integrated health camps in India. In collaboration with public health staff, camps employ integrated Chest X-Ray for TB screening with basic health tests like height-weight, blood pressure, random blood sugar (RBS). A gender intentional approach in such a health program implementation is often overlooked making it disadvantageous for women to seek equal access to care, especially in rural areas.

Intervention or response: A five-person field team makes every camp come to life by driving community engagement through door-to-door outreach, interactions, and distribution of Information, Education and Communication (IEC) materials. Women's participation and decision-making process in seeking healthcare is often positively correlated with their socio-economic, cultural, and educational levels. The health camps at their doorstep empower them access to public healthcare through accurate information, affordable services, and strong persuasion.

Results/Impact: Between January-March 2024, 55.7% of camp footfall comprises women which has contributed to 53 individuals confirmed for TB. The camps mobilise women in communities - usually homemakers - to participate and become champions advocating for the cause. By bringing health awareness information and access to health resources at their doorstep; the program addresses inequities in rural and peri urban healthcare facilities/ services and facilitates health records of a set of population that may have otherwise been missed out.

Conclusions: Women's health impacts the economic system. When they are empowered, their families and communities benefit, leading to improved overall health.

By catering to needs of the community, sustainability of tuberculosis prevention and care initiatives to Key & Vulnerable Populations (KVPs) can be ensured, aligning with the ‚Build' pillar of National Strategic Plan (NSP) for TB Elimination in India, emphasising the importance of providing affordable, quality TB diagnosis and treatment services through public health system.

EP08-672-14 Empowering local leaders: A catalyst for social mobilisation for TPT education in West Java

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Background and challenges to implementation: Tuberculosis (TB) is a significant health issue in Indonesia, particularly in West Java, which has the highest TB prevalence. Local leaders play a crucial role in bridging the gap in reaching communities with Tuberculosis Preventive Treatment (TPT) services, aligning with the Indonesian Ministry of Health's strategy[1] and the National Strategy TB Care and Prevention in Indonesia 2020-2024[2].
[1] Indonesia commitment to eliminate TB by 2030 supported by the highest-level government. (who.int)
[2] Indonesia Tuberculosis Roadmap Overview, Fiscal Year 2021 (usaid.gov)
Intervention or response: In response to this challenge, In October 2023, USAID Prevent TB initiated TPT education for village leaders in Bogor, Bandung, Depok, Bekasi. This information was further disseminated to household contacts identified by their respective village Public Health Centers (Puskesmas).
The program continued with area mapping to identify districts with a significant number of TB cases, TB screening for village officials and cadres, and TB information dissemination through various channels such as Integrated Health Post (Posyandu), religious groups, village meetings, Friday prayers.
Other initiatives included poster installations at village offices, multi-sector coordination, local community cadre training, planning budgeting process meetings at the village level (Musrembang), and communication materials distribution to public places.
Results/Impact: The program's efforts yielded promising results. By December 2023, a total of 663 individuals had received TPT information and education across 20 meetings. The program's efforts led to increased awareness and understanding of TB and TPT among the local community, contributing to fight against TB.
Conclusions: The engagement of local leaders in TPT communication proved effective, promoting health empowerment and sustainability. It enhanced community ownership and strengthened efforts to combat TB stigma and discrimination.
This program underscores the importance of partnerships among local communities, healthcare providers, government, and grassroots organizations. The findings can inform future TB prevention and control strategies, in West Java and nationwide in Indonesia.

EP08-673-14 Finding the missing people with TB in Nigeria: Has community active case finding helped in childhood TB diagnosis? Insights from Kano State

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Background and challenges to implementation: Community-based active case-finding (ACF) interventions identify and treat more people with tuberculosis disease than standard conventional case detection. Early warning outbreak recognition system (EWORS) is an early-warning system for infectious diseases to detect outbreaks and guide control practice, it can also predict TB hot spots at the community level by identifying TB patients' residences in clusters. inform community mass TB screening interventions in hot spot areas with clusters of TB patients. This paper aims to present the results from community ACF on Childhood TB notification in Kano state, Nigeria.
Intervention or response: KNCV Nigeria with funding from USAID through TB LON regions 1 and 2 project, in collaboration with kano state TBL control program from January to December 2023 deployed EWORS to high TB burden communities of kano state. EWORS served as a geospatial tool for real-time identification of hot spot areas, identified TB patients' residences in clusters at the ward level for targeted community based ACF interventions.
TB screening outreach was conducted using the World Health Organization 4-symptom screening method in hot spot wards selected from the same communities and screening household contacts of infectious TB patients. Specimen of presumptive cases identified were evaluated for TB using the GeneXpert instrument or chest X-ray. Confirmed TB cases including children were linked to treatment. In additional a targeted childhood TB case-finding testing week in the same communities was conducted in June 2023.
Results/Impact: During the implementation period Jan to Dec 2023, 364,378 persons were screened, 38,172 presumptive TB identified, and 1,155 persons diagnosed with TB of which 90 (8%) were children.

Conclusions: Community-based active case-finding for TB is effective in improving Childhood TB notification if targeted and delivered with high intensity and more coverage.
National tuberculosis programs should promote and incorporate a well-designed, robust systems for identification, screening, and diagnosis of children in targeted populations.

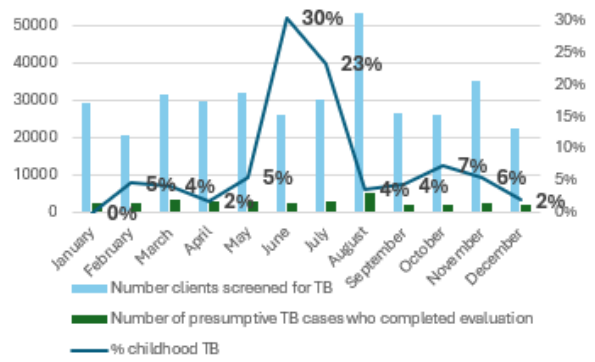

Figure. Trend of childhood TB notification from community active case finding in Kano state, January to December 2023.

EP08-674-14 *Jeelo Dobara*: Community-led, co-created social media campaigns to boost COVID-19 vaccine confidence and uptake in Karachi, Pakistan

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Background and challenges to implementation: In Pakistan, vaccine hesitancy is fueled by misinformation, conspiracy theories, disbelief in health consequences, and limited equitable access. Many COVID-19 campaigns focused on knowledge dissemination, targeting literate, self-motivated groups in urban areas, neglecting low-literacy marginalised populations.
Social media messages perpetuated the spread of information, and misinformation alike, while mass media campaigns focused on medical knowledge, overlooking social barriers.
Intervention or response: IRD's *Jeelo Dobara* (Live Life Again), a community-driven online movement, utilised user-informed social media to boost COVID-19 vaccine confidence in three of Karachi's low-uptake districts. It established bespoke online communities on WhatsApp and Facebook, fostering safe spaces comprising trusted local networks.
The project employed local micro-digital influencers rather than celebrities (unlike other COVID-19 drives in Pakistan) across campaign themes addressing social, economic, and health aspects. To bolster digital efforts, maintain engagement, combat COVID-19 fatigue, and accelerate group membership, on-ground activities were executed involving community activists, socio-cultural events, and gamified social experiences.
Results/Impact: Post-project six online communities, three women-only on WhatsApp and three mixed-gender on Facebook, hosted 1,425 members (M=58%, W=42%). They discussed the pandemic's relational, social, and economic impacts on personal lives (loss of social connection and economic opportunities being primary concerns). Themes emerging from the groups and on-ground activities guided five digital campaigns spanning six platforms: Facebook, WhatsApp, Twitter(X), Instagram, TikTok, and Snack Video. 30 digital influencers engaged communities via humour and social commentary, mobilising 1,039 individuals (M=54%, W=46%) towards vaccination through 21 mobile health camps.
Conclusions: *Jeelo Dobara* showcases that user-led content generation based on personal narratives highlights communities' concerns, making it more relatable. Online group discussions revealed the pandemic's multi-layered impact and identified local solutions.
Framing messages around social realities, not just medical implications, garnered better engagement online and offline. Thus, contextualised public health campaigns depicting community concerns and opinions are recommended to boost service uptake.

EP09 Managing TB

EP09-675-14 Avoidable hospitalisations from TB meningitis in Karachi, Pakistan

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Background: Tuberculosis is an Ambulatory Care Sensitive Condition (ACSC) where effective primary health care (PHC) can prevent hospitalizations. Tuberculous meningitis (TBM) almost always requires hospitalization. Current International Standards of Tuberculosis Care and WHO Compendium (2014, 2018) describe ambulatory-level interventions which prevent tuberculosis and potentially avert hospitalizations. In Pakistan, PHC interventions are implemented through the vertical tuberculosis control program; their coverage and impact on averted hospitalizations is unknown. We previously reported a high annual hospitalization rate due to TBM in Karachi (2017-2020).
The aim of this study was to determine the burden of TBM hospitalizations potentially preventable by PHC interventions.
Design/Methods: A TBM hospitalization was defined as avoidable when evidence of any of the following were present, without prior active or latent tuberculosis treatment: i) close contact with a pulmonary tuberculosis patient; ii) latent infection 1 month before hospitalization; iii) pulmonary tuberculosis on admission; iv) age <10 years without a history of BCG vaccination; v) malnutrition; vi) HIV or other immune compromise; vii) diabetes. Records were examined for 72 TBM cases admitted at a tertiary hospital from 2017-2020 for variables indicating avoidability, cost of hospitalization, and disability (Rankin) scores. Data were analyzed using Cox proportional hazard regression and Mann-Whitney-U test in Prism version-10.2.1.
Results: Of 72 hospitalized TBM cases, 55.6% (95%CI 44.1-66.5) were avoidable. Diabetes and pulmonary tuberculosis were associated with higher risk of TBM hospitalizations (Hazard ratio HR of 3.1, 95%CI 1.5-6.3, p 0.002; and 3, 95%CI1.5-6.2, p 0.002, respectively). Average costs of hospitalization or disability scores were not significantly different for avoidable episodes (Mann-Whitney-U p 0.5 and 0.4 respectively).
Conclusions: A high proportion of TBM hospitalizations are avoidable through adequate coverage of PHC interventions in southern Pakistan. These data call for strategies to increase uptake of PHC interventions for early detection of pulmonary tuberculosis and latent infection treatment in high-risk groups, especially diabetics.

EP09-676-14 Clinical significance of hyponatremia in TB meningitis: A prospective cohort in Indonesia

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Background: Tuberculous meningitis (TBM) frequently presents with hyponatremia, but its relation with disease severity and patient outcomes remains poorly understood.
Design/Methods: In a prospective cohort study of adult tuberculous meningitis patients in Indonesia, we analyzed hyponatremia prevalence and prognostic significance. Patients were categorized by baseline sodium levels: severe (<120 mEq/L), moderate (120-130 mEq/L), and mild/normal (130-145 mEq/L).
We evaluated the likelihood of SIADH or CSWS by analyzing sodium levels in 24-hour urine samples, and adjusting treatment as needed. Sodium depletion was managed using the Adrogué and Madias formula (<12 meq/day). All patients received anti-tuberculous therapy and corticosteroids, with one-year outcomes tracked via phone calls or home visits up.
Results: Among 864 adult TBM patients (median age 30 years, 60.5% male, 14.9% HIV-infected), 750 (87%) had hyponatremia, including 26% with severe hyponatremia (<120 mEq/L). Patients with severe hyponatremia more often had concomitant pulmonary tuberculosis infection, culture-confirmed TBM, a lower Glasgow Coma Scale (GCS), lower cerebrospinal fluid (CSF) glucose levels, higher blood neutrophils, and lower blood lymphocytes (p <0.05). One-year mortality was 46.5% (95%CI, 43.2%-49.8%) and strongly associated with older age, HIV infection, higher TBM grade, decreased consciousness, motor deficits, fever, more CSF and blood inflammatory markers, and severe hyponatremia (all p-values <0.05).
Moderate and severe hyponatremia was associated with higher mortality in univariate Cox regression (hazard ratio 1.34, 95%CI 1.02-1.77, p=0.03 and 1.64, 95%CI 1.21-2.24, p=0.001) but only in HIV-negative patients and not in multivariate analysis.
Conclusions: Hyponatremia is common in patients with TBM and is associated with clinical severity, CSF and blood inflammation, and death. However, in our setting, hyponatremia does not seem to independently contribute to increased mortality, and aggressive correction of hyponatremia is therefore unlikely to significantly improve prognosis.

EP09-677-14 An evaluation of the TB infection treatment care cascade among pregnant women in a low-burden setting

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Background: In the United States, tuberculosis (TB) screening is recommended for all pregnant persons who are at risk for TB as part of routine antenatal care. Gaps in TB evaluation and treatment after a positive test can leave pregnant persons at high risk for progression to TB disease.
Design/Methods: We conducted a retrospective cohort study of pregnant persons with a positive TB infection test in a tertiary US health system between January 1, 2018–December 31, 2019. We excluded patients previously treated for TB infection or disease, and patients with <1 year of clinical follow-up. We reviewed medical records to determine completion of TB infection care cascade steps at any time after the initial positive test.
Results: We identified 165 pregnant persons with positive TB infection tests. 144 (87%) were born outside of the US, of whom 57 (40%) had arrived in the US in the preceding 2 years.
The **figure** shows completion of each care cascade step after the positive test. No patients started treatment outside of a TB clinic. At time of TB clinic attendance (n=61), treatment was deferred for 27 (44%) patients due to breastfeeding (n=20), ongoing pregnancy (n=4), or attempting to conceive (n=3). Of these 27 patients, only 6 (22%) subsequently initiated TB infection treatment. One patient (0.7%) was diagnosed with extrapulmonary TB disease 4.3 years after a positive TB infection test in pregnancy; this patient had not been treated for TB infection.

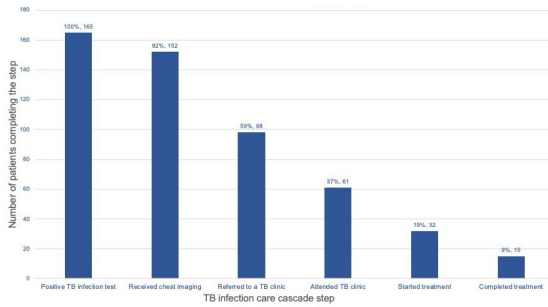

Figure. TB infection care cascade in pregnancy.

Conclusions: In this low-burden setting, we found that only 9% of pregnant women with TB infection completed the care cascade. Significant losses occurred prior to referral and clinic attendance. Breastfeeding, pregnancy, and trying to conceive were common reasons for treatment deferral, but subsequent re-engagement in TB infection care was rare.
Further research is needed to improve retention in TB infection care for pregnant individuals.

EP09-678-14 Experience working with private laboratories for QuantiFERON®-TB Gold testing to scale up LTBI diagnosis in Ukraine

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Background and challenges to implementation: Until 2021, the main diagnostic method for latent TB infection (LTBI) in Ukraine was the tuberculin skin test, and the use of QuantiFERON®-TB Gold (QFT-Gold) testing was infrequent. Use of both testing methods was not systematic. The main challenges in the systematic application of QFT-Gold testing were the absence of equipment for testing in TB facilities' laboratories and access to collection points.
Intervention or response: The USAID-funded, PATH-led Support TB Control Efforts in Ukraine (STBCEU) project engaged private laboratories to provide QFT-Gold testing for LTBI in project-supported regions. Project established access to 120 collection points in various cities, and two models to QFT-Gold testing were implemented: private laboratories collected samples, transported biomaterials, and assured testing; in three regions medical care providers collected samples and private laboratories transported biomaterials and assured testing.
Results/Impact: From September 2021 to December 2023, STBCEU supported 6,533 QFT-Gold tests free of charge across 17 regions for people at high risk of TB infection. The turnaround time to receive results was 72 hours for both models. Private laboratories collected biomaterial for 5,723 tests and rejected 74 samples (1.3%) due to low quality. Medical care providers from local health care facilities collected 810 samples with a rejection rate of 3%. In one region, specimen collection in TB facilities resulted in a higher rate of rejected specimens (12% vs. 1.5% in all regions).
Conclusions: Benefits of private laboratory engagement included: wide network of collection points, no maintenance, established platform for real-time lab results for doctors and people received on email, well-trained staff, high-quality specimen collection and transportation, no multiple visits required for people. Higher sample rejection rates were observed in the regions where specimen collection occurred in TB facilities, highlighting a need for further exploration of potential factors contributing to this discrepancy.

EP09-679-14 Limited availability of TBI diagnostic testing in 24 USAID high TB burden countries

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Background: TB infection (TBI) is estimated to affect 1.8 billion people, nearly a quarter of the world population. The UNHLM in September 2023 set a target to provide TB preventive treatment (TPT) to 30 million contacts to clinical infectious TB and WHO has recommended testing of contacts for TBI with the newer TB antigen-based skin tests (TBST) or interferon-gamma release assays (IGRAs) when possible.
A meta-analysis of TB contact investigations conducted between 2006-2019 in low-and middle-income countries found a TBI prevalence of 43.8% (95% CI 38.1,49.5) and a new case yield of 2.9% (95% CI 2.6,3.1).
Considering that half or more of all contacts are not infected, testing for TBI is needed to avoid unnecessary treatment and to reduce the risk of adverse events.
Design/Methods: We analyzed routinely collected WHO data reported in 2022 on availability of TBI diagnostic testing (TST, TBST or IGRA) in 24 high TB burden countries receiving USAID bilateral assistance with Ministries of Health.
Results: In 2022, 11 of 24 countries (46%) reported availability of TBI diagnostic testing in the public or private sector before starting TPT: 11 TST, 10 IGRA, 8 TST and IGRA, 1 TBST, and 1 Unknown. All 4 of WHO EUR countries reported TBI testing while available in only 3 of 11 countries in the AFR region.
Conclusions: TBI diagnostic testing is not universally available in USAID-supported countries. There is a need to expand availability of WHO recommended TBST and IGRAs and evaluate through operational research the use case, cost, and impact of TBI testing.
Until TBI diagnostic testing is more widely available at lower cost, establishing TBI prevalence among contacts can inform TPT policy options to offer TPT to all contacts, to test and provide TPT if positive, or to provide TPT based on an individual assessment of risk of progression to active disease.

EP09-680-14 Resistance to 1st-line treatment in people with pulmonary tuberculosis enrolled the IeDEA TB-SRN cohort in Abidjan, Côte d'Ivoire

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Background: Drug-resistant tuberculosis remains globally underdiagnosed, posing a threat to public health. Increasing access to Xpert MTB/RIF Ultra test (Xpert) enables rifampicin resistance detection, but not resistance to other 1st-line antituberculosis drugs.
We sought to assess the prevalence of resistances to first-line anti-tuberculosis drugs and to describe their management in patients with pulmonary tuberculosis in Abidjan, Côte d'Ivoire.
Design/Methods: From October 2022 to August 2023, we enrolled patients aged ≥18 years with pulmonary tuberculosis at 1 HIV and 4 tuberculosis clinics, as part of the NIH-funded TB-SRN of IeDEA cohort. Patients had Xpert and culture and drug susceptibility testing (DST) at inclusion, month (M)1, M2, and M6. In case of resistance, TB treatment was adapted with the national TB program.
Results: Of 155 participants enrolled, including 94 (61%) men, 27 (17%) with HIV, 37 (24%) aged <25 years, all had ≥1 Xpert and ≥4 MTB cultures. Overall 130 (83.9%) had positive Xpert and 117 (75,5%) positive MTB culture. Overall 29 (18.7%) patients ≥1 resistance to first-line antituberculosis drugs at different periods of protocol follow-up, including 4 (2.5%) MDR, 1 (0.6%) resistance to rifampicin, 22 (14.2%) resistance to isoniazid (14) or isoniazid and ethambutol (8), and 2 (1.3%) resistance to ethambutol.
There was no difference in prevalence of 1st line drug resistance by sex, HIV status, age <25 or above, and history of TB disease. Adapted treatment was proposed in 4/5 MDR TB with 9-month all oral MDR-TB regimen and all isoniazid resistant TB with introduction of ofloxacin and prolonged 4-drug regimen over 6 months.
Conclusions: Resistance to isoniazid, alone or in association with ethambutol, was frequent in patients with pulmonary tuberculosis in Abidjan, Cote d'Ivoire. Isoniazid resistance remains undetected in routine practice and could have a negative impact on the treatment outcomes in the national TB program.

EP09-681-14 Diagnosis of TB infection among household contacts using tuberculin skin test and QuantiFERON®-TB Gold Plus in 9 high TB burden provinces in Vietnam, 2023

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Background and challenges to implementation: Disease modeling indicates that Vietnam cannot end tuberculosis (TB) without implementing TB preventive treatment (TPT). In 2020, Vietnam's National TB Program initiated TPT among household contacts (HHCs) of people with TB aged ≥5 years following testing to confirm tuberculosis infection (TBI). The TST positivity threshold was changed from ≥10mm to ≥5mm in 2021 after analysis of TST and interferon-gamma release assay (IGRA) results. Ongoing challenges to reach TB prevention targets include tuberculin shortages and limited technical skills to administer and read TST.

Intervention or response: In 2023 the USAID support to End TB project collaborated with NTP to integrate TB and TBI detection for HHCs in 11 active case finding (ACF) community campaigns and 45 District TB Units (DTUs) in 9 high burden provinces. HHCs were listed and invited to have combined TB/TBI evaluation. The standard of care is TST, but QuantiFERON®-TB Gold Plus Interferon Gamma Release Assay (IGRA) was used when TST was not available.

Results/Impact: Between January—December 2023, 12,757 HHCs were evaluated for TBI. Due to a shortage of tuberculin, IGRA was used at 7 ACF campaigns representing 32.1% of TBI tests. Among HHC tested for TBI, 3,969 people had IGRA and 1,419 (35.8%) were TBI positive. For TST, DTUs tested 7,853 HHCs with 19.1% positivity and ACF campaigns tested 558 HHCs with 20.7% positivity. From ACF, 70.3% of TBI confirmed individuals initiated TPT compared with 93.9% of those tested at health facilities.

Setting and TBI test	HHC participants	# (%) TSTIGRA	# (%) with TST/ IGRA results	# (%) TST/ IGRA (+)	# (%) initiated TPT
ACF-IGRA	4,302	3,969 (92.3%)	3,969 (100%)	1,419 (35.8%)	974 (68.6%)
ACF-TST	602	558 (92.7%)	556 (99.6%)	115 (20.7%)	104 (90.4%)
Health facilities-TST	7,853	7,853 (100%)	7,848 (99.9%)	1,502 (19.1%)	1,410 (93.9%)
	12,757	12,380 (97%)	12,373 (99.9%)	3,036(24.5%)	2,488 (81.9%)

Conclusions: Lower TST positivity compared with IGRA is consistent with previous findings and suggests that using TST will result in finding fewer people eligible for TPT. An adequate supply of tuberculin and ongoing training in TST injection and reading is essential for this test and treat approach for TBI. Person-centered TPT treatment consultation and education is an area of ongoing support to increase TPT uptake.

EP09-682-14 The prevalence and determinants of TB infection among households and close contacts of persons with TB in Cambodia

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Background: In Cambodia, routine Tuberculosis (TB) infection testing prior to administering TB preventive treatment (TPT) is not customary for HIV-negative individuals aged >5 years.

This study aims to:

1. Determine the prevalence of TB infection, and;
2. Identify the factors associated with TB infection among households and close contacts of people with TB.

Design/Methods: We evaluated household and close contacts of people with bacteriologically-confirmed pulmonary TB and clinically diagnosed pulmonary TB for TB disease using a symptom screening questionnaire, chest x-rays (regardless of symptoms), and rapid molecular diagnostics between August 2023 and March 2024 in Phnom Penh, Cambodia. Blood samples were collected from TB and HIV-negative individuals aged ≥5 for interferon-gamma release assay (IGRA) tests (QuantiFERON-TB Gold Plus). We used multivariable logistic regression models to identify risk factors associated with IGRA positivity.

Results: Among 249 eligible individuals included in phase 1 of the study, 62 (24.9%) were IGRA positive. Of these, 56 (90.3%) were contacts of bacteriologically-confirmed TB, and 6 (9.7%) were contacts of clinically-diagnosed TB. IGRA-positive individuals were mostly females (69.4%) and had spent significantly longer time with their positive contacts per week (median 49 hours; interquartile range: 35 – 70). IGRA positivity was independently associated with increasing age (adjusted odds ratio [aOR] 1.02; 95%CI 1.0 – 1.03), being a household contact (aOR 3.40; 95%CI 1.06 – 10.90), and being a contact of bacteriologically confirmed TB (aOR 4.30; 95%CI 1.65 – 11.24). Phase 2 of the project involving participants from a rural district is currently ongoing.

Conclusions: The rate of IGRA-diagnosed TB infection was notably higher among contacts of bacteriologically confirmed TB than the contacts of clinically diagnosed

TB. In the absence of a TB infection test, the majority of individuals currently deemed eligible for TPT may not necessitate the intervention. Therefore, implementing a TB infection test could prove valuable in guiding TPT administration.

EP09-683-14 Differentiated care for TB: What works, how it works and for whom does it work? An experience from three Indian States

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Background and challenges to implementation: High TB burden countries witness early deaths due to severe illness and late presentation. Existing evidence supports effectiveness of differentiated TB Care models in HIV, much remains to be understood about how well and for whom differentiated TB care models work and whether these models can be scaled, are sustainable, and can reach high-risk populations.
Intervention or response: Jhpiego used a grant from the U.S. Agency for International Development under Tuberculosis Implementation Framework Agreement to pilot Differentiated TB Care model(DFCM) in three Indian districts from July 2022 to September 2023. The model included 16 parameter assessments of person with TB every-month using mobile application to identify associated co-morbidities, which included clinical, vital, and nutritional assessments, blood tests, and chest X-rays(CXR). Subsequently, risk-scores (low, moderate, high) were assigned which informed further action on patient management. Teleconsultations were used at primary healthcare level to manage mild and moderate risk individuals and high-risk individuals with TB were managed at IPD. Mobile application was developed for recording patient-wise DFCM care-related data.

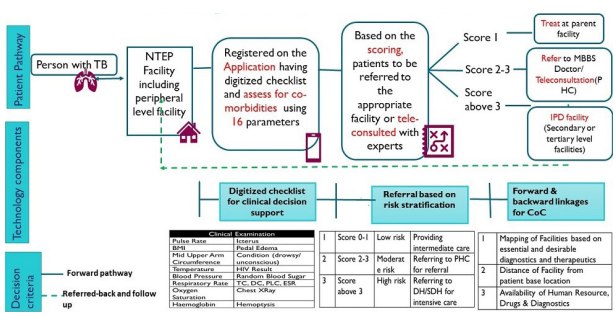

Figure. Pathway for differentiated TB care.

Results/Impact: Among notified 51% underwent differentiated TB care, of which 95% were catered by primary level healthcare facilities. On average 13 parameters (SD±2) were assessed at SHC-AAM and 15 parameters (SD±1) at PHC-AAM, with CXR and WBC being the least commonly assessed parameters. Teleconsultations were used in 25% of consultations, for managing hypertension and diabetes. 60% of eligible patients had at-least one follow-up, 24% had at-least three and 8% had five follow-ups.
Challenges highlighted the need for better diagnostic supply-chains and addressing decline in follow-up assessments (60% to 8%). The model expanded to 20,000 facilities by introducing triage tool (8 parameters) followed by comprehensive-assessments and leveraging community health officers for follow-up.
Conclusions: The model is scalable at primary healthcare level by including easy triage tool, teleconsultations and sustainable inclusion of Community Health Officers for follow-up.

EP10 Gender and TB

EP10-684-14 Healthcare seeking behavior and gender differences among people with presumptive TB: Preliminary results from the 3rd national TB prevalence survey in Cambodia

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Background: Healthcare seeking behavior is crucial for early diagnosis and treatment of any diseases. This study aims to describe sex differences of seeking care behavior among participants with presumptive tuberculosis (TB).
Design/Methods: A nationally representative preliminary data of the 3rd national TB prevalence survey in Cambodia was analyzed. Presumptive TB was defined as those with cough two weeks or more. Descriptive analysis was performed to determine gender disparities of TB seeking behavior among those with presumptive TB. Chi-square test or Fisher exact test, as necessary, for categorical variables and student t-test for continuous variables were computed using STATA version 17.
Results: Among 20,254 participants, 476 were presumptive tuberculosis (TB) and only 51.2% sought medical consultation. A statistically significant gender disparity of care-seeking emerged, with a proportion of 56.4% in females compared to only 45.7% in males, (p=0.020). First-line healthcare utilization includes public health facilities (45.3%), private health facilities (24.5%) and pharmacies (23.6%).
Interestingly, no significant gender difference was observed in the choice of facility. The primary reason cited for selecting a particular facility by both genders was proximity to their residence.
However, a noteworthy difference emerged regarding trust in the provider as a factor influencing facility choice, with a significantly higher proportion of males (13.2%) compared to females (5.8%) (p=0.047).
Among those who did not seek care (48.8%), the majority (82.7%) attributed their decision to the belief that their condition was not serious.
Notably, cost emerged as a more prominent barrier for females (7.6%) compared to males (0.8%) (p=0.009).
Conclusions: These findings suggest that the national TB program and stakeholders should design interventions to address the low care-seeking rate, particularly among men. Educational campaigns about TB and the importance of seeking care could be helpful. Additionally, making care more accessible and affordable, especially for women, could improve overall TB screening and case detection.

EP10-685-14 Gendered barriers in TB care in Indonesia: Insights and recommendations for equity

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Background: Gender-responsive health services are crucial to achieve global targets to end TB by 2030 because they enable people-centred prevention, diagnosis, treatment, and care of people affected by TB. In 2022, 49 percent of notified new TB cases in Indonesia were male, yet women were more likely to complete treatment. This indicates that men faced varying barriers and challenges throughout the patient pathway.
This qualitative study aimed to explore the experiences of people affected by TB in Indonesia using a gender lens to identify strategies addressing intersecting norms and power relations that influence access to TB services.
Design/Methods: We analysed 20 in-depth interviews (8 males, 12 females) and 1 focus group discussion (2 males, 8 females) in February 2024 from the MOH, civil society, and "TB survivor" organization. Audio-recorded data was transcribed and open-coded using a gender lens to identify challenges spanning from the onset of TB symptoms, the process of seeking care, diagnosing the disease, initiating treatment, and managing it during the treatment phase and post-treatment period.
Results: We found that patriarchal norms and power relations caused gender-specific challenges for adult men and women in accessing TB services. Women delayed access to health care facilities due to societal norms of prioritizing the household's needs and needing permission from men at home to access diagnosis and treatment, whereas men did not access health care services when symptoms showed because of shame when feeling physically weak and out of fear of losing their jobs during treatment. Informants also noted the need for more male community health volunteers who provide psychosocial support for male TB patients.
Background and challenges to implementation: Gender-responsive health services are crucial to achieve global targets to end TB by 2030 because they enable people-centred prevention, diagnosis, treatment, and care of people affected by TB. In 2022, 49 percent of notified new TB cases in Indonesia were male, yet women were more

likely to complete treatment. This indicates that men faced varying barriers and challenges throughout the patient pathway. This qualitative study aimed to explore the experiences of people affected by TB in Indonesia using a gender lens to identify strategies addressing intersecting norms and power relations that influence access to TB services.

Intervention or response: We analysed 20 in-depth interviews (8 males, 12 females) and 1 focus group discussion (2 males, 8 females) in February 2024 from the MOH, civil society, and "TB survivor" organization. Audio-recorded data was transcribed and open-coded using a gender lens to identify challenges spanning from the onset of TB symptoms, the process of seeking care, diagnosing the disease, initiating treatment, and managing it during the treatment phase and post-treatment period.

Results/Impact: We found that patriarchal norms and power relations caused gender-specific challenges for adult men and women in accessing TB services. Women delayed access to health care facilities due to societal norms of prioritizing the household's needs and needing permission from men at home to access diagnosis and treatment, whereas men did not access health care services when symptoms showed because of shame when feeling physically weak and out of fear of losing their jobs during treatment. Informants also noted the need for more male community health volunteers who provide psychosocial support for male TB patients.

Conclusions: The National TB Program needs to promote gender-responsive initiatives such as providing more male health volunteers in community-based TB services and ensuring the availability of social protections to address specific barriers faced by adult men and women.

EP10-686-14 Providing gender balanced TB services in the Philippines: What does it take?

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Background and challenges to implementation: Globally, men account for over 66% of TB cases and experience higher unfavorable outcomes than women. Despite gender disparities in TB infection risk, access to diagnosis and treatment services, stigma and discrimination, and the socioeconomic consequences of TB disease, few TB programs are designed to address these.

Intervention or response: A Gender gap analysis was conducted using the 2016 National TB Prevalence Survey, the 2019 Quality of TB Services Assessment and data from the Integrated TB information system from 12 provinces and 19 highly urbanized cities in the Philippines, to identify gender related barriers to participation in TB services. Parameters related to access to TB services, individual beliefs, perceptions, and participation in decision-making, TB laws, policies and institutional procedures were used to analyze differences between men and women. Data was analyzed using MS Excel and Tableau.

Results/Impact: Both men and women have access to TB services. Men tend to use the services less due to work commitments and prefer private providers. Health services are fixed and offered during traditional working hours, limiting participation, and are compounded by existing stigma and norms propagating machoism. Men are the primary earners and decision makers in the home and may control which health services women, the family caretakers, can seek. As the family caretaker, women are more likely to participate in health-related activities; however, their pretreatment loss to follow up is higher (30% vs 15%, $p<0.001$) while on treatment loss to follow up is higher among men (26% vs 15%, $p<0.01$). Despite availability of pro-women policies at the local government level, the TB guidelines, informational materials, and service delivery standards are gender blind.

Conclusions: To provide sustainable quality patient-centered care across the TB care continuum for both men and women, policies promoting gender-balanced interventions should be implemented at all levels.

EP10-687-14 Exploring gender-nuanced TB risk factors to design person-centred TB services

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Background and challenges to implementation: TB risk factors include gender disparities, smoking, alcohol use, malnutrition and comorbidities like diabetes and hypertension. While the TB risk factors are clearly documented, they are not routinely sex disaggregated. Designing TB services informed by gendered risk factors increases patient-centric care delivery and active client participation.

This study explored prevalent risk factors among clients participating in community-based TB screening in a city in Metro Manila.

Intervention or response: Data from 11,919 (5,432 male; 6,487 female) participants of TB screening activities was reviewed for risk factors such as age older than 60 years, smoking, alcohol use, previous TB history, a history of contact and presence of diabetes and hypertension. Data was analyzed using MS Excel and Tableau.

Results/Impact: More men reported a history of TB (10.6% vs 7.1%, $P<0.001$), previous TB treatment (9.7% vs 6.9%, $P<0.001$), smoking (29.2% vs 5.6%, $P<0.001$) and alcohol use (27.8% vs 6.7%, $P<0.001$). More women reported being a household TB contact (6.0% vs 3.5%, $P<0.001$), having Diabetes (9.8% vs 7.8%, $P<0.001$) and Hypertension (23.7% vs 19.4%, $P<0.001$).

Despite similar chest x-ray screening coverage, presumptive TB was approximately 30% higher among men than women (12.5% vs 8.1%) and twice as many men were bacteriologically confirmed with TB (68 vs 23); however, treatment enrollment was higher among women (82.6% vs 75%).

Conclusions: Recognizing gender disparities in TB risk factors and client participation in TB diagnosis and treatment activities allows TB programs to tailor social and behavior change and service delivery interventions for each gender. The targeted interventions optimize resource utilization, promote patient engagement, and bridge the gaps in access and health outcomes.

EP10-688-14 Gender differences of TB risk factors: Preliminary results from 52 clusters of the 3rd national TB prevalence survey in Cambodia

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Background: Globally, the rate of tuberculosis (TB) is significantly higher in male than in female, with male/female ratio of 1.7. However, reason for this gender disparity is not well defined in Cambodia. This study aims to describe gender differences of TB risk factors among Cambodian aged ≥ 15 years old.

Design/Methods: A nationally representative data of the 3rd national TB prevalence survey in Cambodia was analyzed. Descriptive analysis was performed to determine gender disparities of TB risk factors such as sociodemographic characteristics and behavioral risk factors. Chi-square test or Fisher exact test, as necessary, for categorical variables and student t-test for continuous variables were computed using STATA version 17.

Results: Among a total of 20,254 participants, 8,506 (42.0%) and 11,748 (58.0%) were males and females respectively. Mean age of male participants was significantly lower (43.4 (±17.7)) than female participants (45.3 (±17.7), $p < 0.001$. Compared to female, significant higher proportions of male participants smoked daily or someday (31.7% vs. 5.1%) and drank alcohol either socially, moderately or heavily (65.2% vs. 30.3%), $p < 0.001$. However, higher proportion contact person (7.2%) and having diabetes (9.6%) were reported by female compared to only 6.0% and 6.9% of male respondents respectively, $p < 0.001$.

Conclusions: The national TB program (NTP) and relevant stakeholders should design gender-specific interventions to minimize TB risk factors. To reduce smoking and alcohol consumption among males, education campaigns, support groups, and access to smoking cessation and addiction treatment programs should be intensified. For females, development programs to educate females about tuberculosis (TB) transmission and prevention strategies is crucial. This could include promoting early diagnosis and treatment for TB among contact person.

In addition, improving diabetes management supports, including educational workshops, nutritional counseling, and access to diabetes medications and supplies should be prioritized.

EP10-689-14 Engaging LGBTQAI+ TB champions in India's TB elimination efforts

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Background and challenges to implementation: In India, empowering the LGBTQAI+ community is crucial due to their vulnerability to stigma and limited healthcare access. The Unite to Act project addresses this by training and engaging LGBTQAI+-TBCs to offer psychosocial support to LGBTQAI+ People with TB (LGBTQAI+-PwTB) and organising community meetings with LGBTQAI+ and non-LGBTQAI+ participants. This initiative resulted in development of the first cohort of LGBTQAI+-TBCs in India, involving trained individuals from LGBTQAI+ community in TB elimination activities. By empowering LGBTQAI+ individuals, the project aims to strengthen the community and establish a TB free community.

Intervention or response: Capacity building of 44 LGBTQAI+-TBCs was done under 2 batches of national level training workshops with a training module developed in consultation with LGBTQAI+ public health professionals who had experience in LGBTQAI+ health / advocacy.

Results/Impact: Based on their willingness 29 LGBTQAI+-TBCs were engaged in 6 states and UTs of India (Chhattisgarh, Madhya Pradesh, Maharashtra, New Delhi, Uttarakhand, and Uttar Pradesh). LGBTQAI+-TBCs conducted community meetings for LGBTQAI+s and non-LGBTQAI+s, anti-stigma campaigns, advocacy meetings with stakeholders, provided person-centred care services to LGBTQAI+-PwTB, sensitised members of the Dera (abode) and their Guru (Head) about TB, participated in World TB Day activities and linked with local Targeted Intervention NGOs working with TG population under NACO.

The written consent was taken from the LGBTQAI+ community for the photograph and for sharing their stories for public awareness activities. Based on the learnings from implementation, NTEP revised the National Framework for a Gender-Responsive Approach to TB to align with the needs of LGBTQAI+ community.

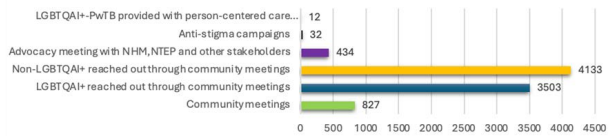

Figure. Activities conducted by LGBTQAI+ TBCs (March 2023-March 2024)

Conclusions: This initiative, represents significant stride towards empowering LGBTQAI+ TB survivors, advancing gender-inclusive healthcare, for achieving TB Elimination goal of 2025. The project yielded impressive results, including numerous community meetings, advocacy sessions with stakeholders, and anti-stigma campaigns led by LGBTQAI+-TBCs. These efforts aim to cultivate a TB-free community while enhancing inclusivity and empowerment among LGBTQAI+ populations.

EP10-690-14 Exploring health needs and TB services access of LGBTQIA+ individuals in two cities in the Philippines

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Background and challenges to implementation: LGBTQIA+ populations face unique barriers to accessing health services, including stigma, discrimination, and economic constraints. They often report fair or poor health, particularly mental health issues. The TB information system (ITIS) lacks data on sexual orientation and gender identification and expression (SOGIE), hindering targeted interventions. This study explored LGBTQIA+ health perceptions and needs.
Intervention or response: We surveyed 627 randomly sampled LGBTQIA+ individuals in 2 cities outside of Metro Manila using a semi-structured digital questionnaire. The survey explored their experience of discrimination, healthcare seeking, their knowledge of TB, and ability to pay for healthcare. Data was analyzed using MS Excel and Tableau.
Results/Impact: Healthcare seeking was affected by fear of negative reactions due to gender identification reported by 40% of respondents; affordability concerns affected 62%, while 44% had previously experienced negative communication from healthcare providers. Lack of family support (31%) and transportation (41%) were additional barriers. Seventy percent had adequate income to meet their priority needs, however, health was not a priority for most. Of 57% reporting health insurance coverage, 56% had national health insurance, 31% had private insurance (through employment or self-financed), and 13% had insurance through family members. Respondents identified Mental Health and TB services as health needs. Mental health challenges were reported by 51% with 38% reporting thoughts of self-harm and suicide.
While more than 80% were aware of TB and where to seek services, 61% had never been screened. Among those screened, 23% were diagnosed with TB; 6% initiated treatment but did not complete treatment while 3% did not initiate treatment.
Conclusions: LGBTQIA+ individuals continue to face barriers to healthcare access and require multifaceted multisectoral interventions to ensure equitable and inclusive healthcare. Policies promoting gender-nuanced interventions and prevent discrimination must be institutionalized to systematically address these challenges and expand access to integrated TB services.

EP10-691-14 Community, rights, and gender issues at the heart of the TB response in Zimbabwe

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Background: Zimbabwe remains burdened with Tuberculosis and ending TB by 2035 requires the country to understand and overcome the barriers people face when they access TB services. Before this study, there have been limited studies that focused on TB health service access barriers in Zimbabwe.
We conducted a community rights and gender assessment (CRG) to better understand communities, legal environments, and gender dynamics at the heart of the TB epidemic in Zimbabwe.
Design/Methods: This was a cross-sectional descriptive study, that focused on all the provinces of Zimbabwe. A mixed methods approach was utilized with an interviewer-administered structured questionnaire for quantitative data, Key informant interviews, and focus group discussions collecting qualitative data. Qualitative data was analysed using themes and descriptive statistics used for quantitative data.
Results: We recruited 806 participants,394(48.9%) males, females 406(50.4%), 6(0.7%) identified as gender non-conforming. The mean age was 40.2 (14.1) years, and the modal age range was 45-54. A third (31.6%) of respondents reported experiencing TB-associated stigma and discrimination from family members, communities, co-workers, and healthcare workers with women affected by TB likely to experience more intense stigma than men. Unfair dismissal at formal and informal workplaces, failure to get compensation after contracting TB. The study

revealed the gendered nature of TB with patriarchal social and cultural norms limiting women's health decision-making and access to TB health services. Men experience increased TB risk and reduced access to TB health services. (32.6%) of participants were aware of the client charter showing Low awareness levels of rights. Long distances coupled with transport costs, and long waiting times are barriers that affect the uptake of TB services in Zimbabwe.

Conclusions: Barriers and facilitators to access services are key drivers to person-centric quality TB services. Removal of any human rights, legal, structural, and systematic barriers is key to ending TB.

EP10-692-14 Reciprocal dynamics: Gender-based violence and TB care in Bangladesh

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Background: Gender-based violence (GBV) refers to a spectrum of violent behaviors and harmful practices rooted in societal norms, particularly those related to gender; it includes acts that result in or have the potential to result in physical, sexual, or psychological harm or suffering, primarily targeting individuals due to their gender roles and societal expectations. They may occur within the family or community or even be perpetrated or tolerated by the state(Russo & Pirlott, 2006), adding another layer of complexity to TB management, particularly in low- and middle-income countries (LMICs), where the TB burden is high, and GBV prevalence is significant. However, the intersectionality of TB and GBV remains underexplored, necessitating comprehensive research to understand their intricate dynamics.

This study, conducted in Bangladesh, employed a qualitative approach to investigate the reciprocal relationship between GBV and TB care in Bangladesh.

Design/Methods: Our research approach utilized the Feminist Standpoint theory to examine the delicate issues surrounding TB and GBV thoughtfully. We conducted in-depth interviews with PWTB, caregivers, community members, and healthcare providers to gather qualitative data, which we analyzed using thematic analysis techniques.

Results: Key findings revealed the occurrence of intimate partner violence (IPV) among PWTB in Bangladesh. While verbal abuse was more common, there were also reports of physical abuse, financial hardships, and even dissolution of marriage. Women faced numerous challenges, including social isolation and abandonment by partners and family members. The GBV also interrupts their accessibility to TB care and adherence to the treatment. Healthcare providers reported difficulties in diagnosing TB due to fear of GBV. Our analysis is ongoing, and we expect more information on the nature of violence and its impact on patient care pathways.

Conclusions: Interventions are urgently needed to address gender-based violence against TB survivors in Bangladesh. This requires awareness-raising, support services, and integrating GBV screening into TB care.

EP11 Improving treatment adherence

EP11-693-14 Treatment adherence and cost-effectiveness of 6H and 3HP regimens for TB infection in Himachal Pradesh, India: A comparative study

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Background and challenges to implementation: Tuberculosis (TB) is a major public health problem in Himachal Pradesh with a prevalence of 344 TB cases per 100,000 population. Preventive therapy is an important strategy for controlling TB transmission and two commonly used regimens for this are the 6H and 3HP. There is a need to compare the treatment adherence and cost-effectiveness of these two regimens.

Intervention or response: This study reviewed data from PMTPT implementation in Himachal Pradesh between October 2021 and March Marc 2024. The study included all 7217 individuals who were household contacts of pulmonary TB patients, tested positive on the TBI test, and consented to preventive TB treatment in the state during the period. Of these, 5790 were treated with the 6H regimen and 1427 were treated with 3HP regimen. Treatment adherence was assessed by calculating the percentage of patients who completed the full course of treatment, and cost-effectiveness was measured by incremental cost-effectiveness ratio (ICER). The cost of the 6H regimen is INR 250 (USD 3) whereas the cost of the 3HP regimen is Rs 2000 (USD 24) including import duty, taxes, and transportation charges per course.

Results/Impact: The study found high treatment adherence rates for both regimens, with 90% for the 6H regimen and 92% for 3HP regimen. But the ICER of the 3HP

regimen compared to 6H regimen was INR 87,500 (USD 1050) per additional patient who completed preventive treatment, indicating that the 6H regimen was more cost-effective for most of the optimum and maximum value of Willingness-to-Pay applicable for TB treatment in India.

Type of regimen of preventive TB treatment	No. of contact person initiated on preventive treatment of TB	No. of the contact persons who completed preventive treatment for TB	No. of contact persons who lost to follow-up	No. of contacts who discontinued preventive TB treatment due to toxicity	No. of contacts with treatment failure	No. of contacts who died during the course of the study
6H	5790	5207 (90%)	407 (7%)	32 (1%)	13 (0%)	5 (0%)
3HP	1427	1311 (92%)	91 (6%)	13 (1%)	1 (0%)	3 (0%)

Conclusions: Both 6H and 3HP regimens are highly effective in treating TB infection in Himachal Pradesh. However, the 6H regimen was found to be more cost-effective than the 3HP regimen.
These findings can help inform TB programs in determining the cost-effectiveness of different regimens across different thresholds of willingness to pay.

EP11-694-14 Increasing TPT uptake through continued healthcare worker sensitisation: The Kano State experience

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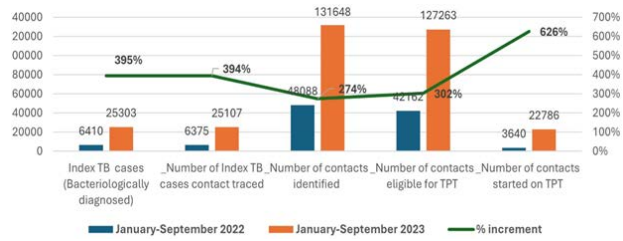
Background and challenges to implementation: TPT uptake has been a major challenge across health facilities in Kano state due to frequent staff attritions (transfer). Trained health workers – employed by government barely remain in a particular health station for a considerable period of time before they will be transferred to other health facilities by the relevant authorities (health management board).
The objective is to compare TPT uptake before and after adopting the strategies (January-March 2023 against the improve uptake in April-June 2023).
Intervention or response: KNCV Nigeria through the USAID TB LON 1&2 Project is leveraging on the cordial relationship with the State Ministry of Health to obtain periodic transfer calendar of the ministry of health – thereby facilitating continuous health care workers sensitization and on the job training to newly posted health staff in 6 selected health facilities over the period of 6 months in Kano state.
Results/Impact:



Conclusions: This study proved that sustaining on the job sensitization/training of healthcare workers is key in addressing low-intake of TPT treatment across many health facilities in Nigeria.

EP11-695-14 Optimising TPT uptake as a component of contact investigation strategy to mitigate spread of the TB scourge: The KNCV Nigeria TIFA experience

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Background and challenges to implementation: Tuberculosis (TB) is a preventable and curable disease, with about a quarter of the world's population estimated to be infected with TB (WHO, 2022). The World Health Organization has recommended various TB preventive therapy regimens; these include the conventional 6INH, 3HR and 1HP currently in use in Nigeria. We present results from a contact investigation model approach using social franchising in Kano state, Nigeria.
Intervention or response: KNCV Nigeria with funding from John Snow Incorporation (JSI) implemented the TB implementation framework agreement (TIFA) grant in Kano state between January and September 2023. Through a social franchising model, community-based organizations were identified, trained, and deployed to communities in the state to conduct contact tracing for bacteriologically diagnosed index TB patients. Screening tools and logistic support were provided by KNCV Nigeria. We reviewed the contact investigation cascade data from this novel intervention for the 9-month period.
Results/Impact:

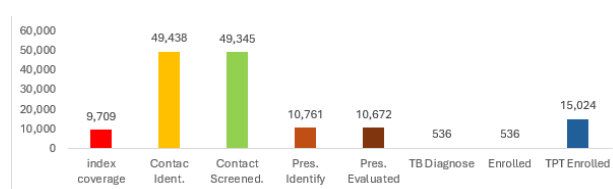

Figure. TIFA SOFT - CI cascade results.

Across the 9 months period, we had a 100% index coverage. 9709 index patients were reached representing a 70% increase from baseline figures in the state, we had a presumptive TB yield of 22% and a TB yield of 5% translating to 536 new TB cases diagnosed, all were enrolled on treatment and notified. With a progressively increasing number of eligible contacts placed on TPT, we had a cumulative TPT enrolment of 15,024 persons within the period increasing the uptake by 16% from the baseline of 4% in the state.

Conclusions: This novel approach has showed promising results increasing the contact investigation coverage in Kano state from a baseline of 25% to 95% within the nine months period, it also improved the TPT uptake from 4% at baseline to 25% highlighting the significant role played by the intervention in optimizing TPT uptake in the state. We recommend use of similar strategies to sustain these gains.

EP11-696-14 Assessing India's TPT scale-up in the global context: Achievements, challenges, and insights for global strategies

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Background: India's commitment to UNHLM targets included providing TPT to 6.8 million individuals between 2018-22, focusing on contacts and people living with HIV/AIDS. India expanded TPT eligibility to include all household contacts and people at-risk, issuing guidelines for Programmatic Management of TPT aligned to WHO guidelines.

Advocacy led to unprecedented politico-administrative commitment, alongside district-wise scale-up plans. We assessed India's progress in TPT scale-up compared to the global context.

Design/Methods: Data on TPT in household contacts (HHC) reported to WHO's Global TB Report-2023, India's annual TB report-2024, UNHLM targets, and WHO and national policy guidelines for TPT were analysed. Ranking and percentages were utilized to compare India's performance with other countries globally.

Results: In 2022, India enumerated 93% (3.3 million) HHC of pulmonary bacteriologically confirmed TB. TPT care cascade showed a significantly smaller gap in enumeration (6%) and TB screening (7%) in India compared to the global total (29% and 16%, respectively).India provided TPT to 2.7 million individuals between 2018-22, achieving 30% of it's UNHLM target.

TPT initiation increased nine-fold from 2018, surpassing the global four-fold increase. 6H is a predominant regimen, while 3HP and 3RH introduced in limited geographies and operational research.

The challenges remain, including suboptimal TB detection post-screening (0.45% detected TB among screened compared to 3% globally) and lower TPT completion rates (77% in India compared to 88% globally).

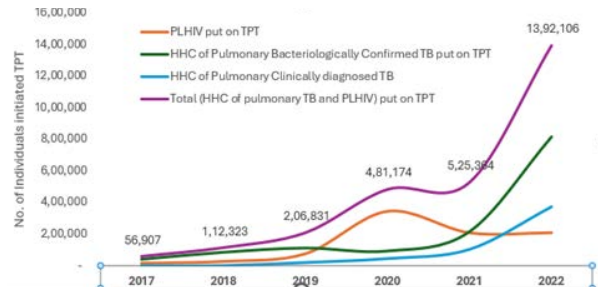

Figure 1. TPT coverage in India between 2018-2022

Variable	Global	India
Estimated - number of household contacts	1,25,34,574	36,00,000
Enumerated - number of household contacts (% among estimated)	89,53,459 (71%)	33,56,272 (93%)
Screened – number of household contacts (% among enumerated)	75,25,451 (84%)	31,61,022 (94%)
New TB diagnosed from the screened number of household contacts (% among screened)	1,98,646 (3%)	14,175 (0.45%)
Number of household contacts provided TPT (% among estimated contacts)	19,49,054 (16%)	8,12,311 (22%)
Increment in % of household contacts provided TPT in 2022 compared to 2018	~4 times	~9 times

Table 1. TPT care cascade of global average and India (2022)

Conclusions: India demonstrates a robust contact tracing mechanism; rates of enumeration of HHC and TB screening. TPT initiation exceeded global averages. To address the challenges, India has introduced innovations such as ultraportable handheld X-ray devices to improve access and quality of screening, treatment supporter incentives upon TPT completion, and complete transition to shorter TPT (3HP/1HP) to improve adherence and treatment completion, particularly as UNHLM sets new targets for TPT coverage.

EP11-697-14 Implementing TB preventive therapy within differentiated HIV service delivery models: Experiences from a pilot study in North East Nigeria

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Background and challenges to implementation: Complementary Differentiated Service Delivery (DSD) models are utilized to enhance access to antiretroviral therapy (ART) for people living with HIV (PLHIV). DSD models help ensure that PLHIV receive the best care possible. Tuberculosis (TB) preventive therapy (TPT) has been part of Nigeria's HIV programs, however, uptake has remained low.

This study measured how engaging DSD groups could improve TPT uptake and treatment completion in Gombe State, Nigeria.

Intervention or response: From July, 2023 to March, 2024, the leadership of PLHIV at the State and local levels were engaged, existing community DSD groups were mapped in 4 local government areas (LGAs) and baseline data on TPT was collected. Peer educators were identified and trained on TB care and prevention from each DSD group. Monthly TB screening among PLHIVs was conducted by peer educators, persons eligible for TPT were identified and actively linked to treatment.

PLHIV with presumptive TB were evaluated and managed according to guidelines. PLHIV on TPT were provided with adherence counselling and 3-monthly medication refills for 6 months.

Results/Impact: 68 active DSD groups were mapped in 4 LGAs of Gombe State; 22 consisted of both males and females, 12 were females only while the remaining groups were males. The overall number of PLHIV (15 years and above) across all categories was 2,774, with each group having a range of 8 to 32 members. At baseline (2022), only 12% (332) PLHIV were initiated on TPT across the 4 LGAs, with a completion rate of 67%. This project improved TPT initiation from 12% to 38% giving a total of 1,080 PLHIV initiated on TPT (a 52% increase compared to baseline). TPT completion rate also increased from 67% to 84%.

Conclusions: Scaling up the DSD approach for PLHIVs provides an opportunity to improve TPT uptake and completion rates in Nigeria.

EP11-698-14 Acceptability of the 28-day TB preventive therapy regimen: Health workers perspective in Nigeria

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Background: Tuberculosis Preventive Therapy TPT is a crucial intervention for individuals at a high-risk of developing Tuberculosis TB, including those with latent TB infection. In Nigeria, the introduction of a 28-day Isoniazid-Rifapentine (1HP) TB preventive therapy regimen marks a significant leap in managing latent TB infections. This new regimen challenges the traditional 6-month Isoniazid (6H) and 3-month Rifapentine-Isoniazid (3HP) regimens. However, the acceptability of this new regimen among health workers in Nigeria is yet to be studied.

The crux lies in evaluating the acceptability of 1HP regimen among frontline health workers, whose support is instrumental for its seamless integration into the TB control program.

Design/Methods: The research employed a qualitative study design, conducting in-depth interviews with 105 health workers across 35 sites in one of the five 1HP pilot states in Nigeria. The study seeks to understand health workers' experiences and perceptions of administering 1HP against the traditional 6-month (6H) and 3-month (3HP) regimens, focusing on ease of administration, adherence challenges, and patient compliance risks.

Results: Analysis showed a strong preference for 1HP among health workers, with 90% (n=95) endorsing its administration ease and patient compliance over 6H and 3HP regimens.

Notably, 60% (n=63) identified adherence challenges with 6H, and 70% (n=74) noted dose forgetfulness with the once-weekly 3HP. The shorter duration of 1HP was highlighted as key to reducing therapeutic burden, default risks and enhancing treatment completion.

Background and challenges to implementation: Tuberculosis Preventive Therapy TPT is a crucial intervention for individuals at a high-risk of developing Tuberculosis TB, including those with latent TB infection. In Nigeria, the introduction of a 28-day Isoniazid-Rifapentine (1HP) TB preventive therapy marks a significant leap in managing latent TB infections, particularly for high-risk groups. This initiative challenges the traditional 6-month Isoniazid (6H) and 3-month Rifapentine-Isoniazid (3HP) regimens. However, the acceptability of this new regimen among health workers in Nigeria is yet to be studied.

The crux lies in evaluating the acceptability of 1HP among frontline health workers, whose support is instrumental for its seamless integration into the TB control program.

Intervention or response: An evaluative study was conducted involving in-depth qualitative interviews with 105 health workers across 35 study sites, within one of the six pilot states in Nigeria. This study seeks to understand health workers' experiences and perceptions of administering the three regimens, 6H, 3HP and 1HP, focusing on administration ease, adherence challenges, and patient compliance risks.
Results/Impact: The findings revealed a compelling preference for 1HP, with 90% (n=95) of health workers advocating for its ease and efficacy over 6H and 3HP. Concerns were highlighted regarding the longer regimens, with a notable 60% (n=63) citing adherence challenges with 6H due to its duration, and 70% (n=74) indicating dose forgetfulness with weekly 3HP. The preference for 1HP was attributed to its shorter duration, significantly reducing patient default risks and improving completion rates.
Conclusions: The significant support for 1HP among health workers highlights its potential to transform TB preventive therapy in Nigeria. Recommendations include accelerating the nationwide adoption of 1HP by the National TB Program (NTP), coupled with strategic adherence support for existing regimens. This approach promises a paradigm shift in TB prevention, aligning with global efforts to curb the disease's spread.

EP11-699-14 Optimising TB preventive treatment eligibility using QuantiFERON-Plus (QFT-Plus) TB infection test amongst household contacts in Lesotho, 2022

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Background and challenges to implementation: Despite high TB incidence rates in Lesotho (661/100,000), TB case detection rate is very low, 37% . Addressing latent TB infection (LTBI) through TB preventive treatment (TPT) is crucial in achieving global TB elimination goals by 2030. The Community and Universal Testing for TB among Contacts (CUT-TB) study, conducted across Lesotho, Tanzania, and South Africa, aims to enhance TB case detection and increase TPT uptake in high/medium TB burden settings. Phase I of the CUT-TB study in Lesotho, led by Jhpiego, utilized the QuantiFERON-Plus (QFT-Plus) test to identify TPT eligible individuals among household contacts (HHC).
Intervention or response: A cross-sectional study was conducted from February to October 2022. We identified 100 individuals with TB confirmed by GeneXpert from TB registers; we enrolled 321 HHC.
We assessed HHC (7years and older, regardless of TB symptoms) for LTBI using blood for QFT-Plus and sputum specimens for GeneXpert test for TB disease . TPT eligibility was based on ability to produce both sputum and blood specimens. Statistical analyses will assess LTBI prevalence and predictors. Total recruitment numbers were included.
Results/Impact: A total of 321 HHC contacts (211 females and 110 males) were enrolled. 220 sputum and 223 blood samples were collected. 84% (208/220) of sputum specimens tested, 2.4% (5/208) were positive, 16% not analyzed. Of 223 blood samples, **54%** (121/223) tested positive - 17% (**21/121)** children aged 7-14 years, 17% (**20/121)** PLHIV and 66% (**80/121)** adult HHC. Of the 250 HHC eligible for TPT, 64% (161) initiated on TPT (36% [58/161] adult HHC, 12% [20/161] PLHIV and 64% [103/161] children 7-14 years[SK1]). 34% did not go to the facility.
Conclusions: High LTBI prevalence was observed among adult HHC. Targeted LTBI and TB disease testing among close contacts have the potential to increase access to TPT initiation across different close contacts populations

EP11-700-14 Low enrolment of TB preventive treatment among childhood contacts and limited availability of the drugs at public health centers in North Sumatera, Indonesia

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Background and challenges to implementation: The END TB strategy outlines ambitious targets to reduce TB incidence by 90% and TB deaths by 95% by 2035. This will require substantial scale-up of tuberculosis preventive treatment (TPT) to break transmission. Despite endorsement by WHO and revised national guidelines, implementation of this intervention remains suboptimal. Nationally, in Indonesia, fewer than 3% of high-risk populations were enrolled on TPT in 2023.
Intervention or response: We assessed the coverage of TPT and the availability of the drugs in all 160 public health centers (PHCs) across five districts in North Sumatra Province. An instrument to review the performance of each health facility in implementing the TB program, called „Standard of Care" was used to guide the assessment.
Results/Impact: In 2023, TPT enrolment among eligible childhood household contacts was only 1% (13/1,301), while only 8% (13/160) of PHCs enrolled more than 80%

of eligible children on TPT. Qualitatively, reasons for the low coverage, given by health workers, include absence of educational materials and refusal by caretakers. The assessment also found that 141 (88%) PHCs experienced TPT stockouts in the last quarter of 2023, with 120 (75%) having insufficient stock for the following month. However, despite TPT stockouts, 10 out of 13 PHCs (77%) did enrol more than 80% of eligible children. Stockouts were found to be a result of suboptimal logistical planning at the facility level, in turn contributing to inadequate supplies by district and provincial levels. Staff's awareness and lack of knowledge on logistics management were found to contribute to this.

Conclusions: Low enrolment of TPT for children is caused by several factors, mainly a lack of educational materials, refusal by caretakers, and suboptimal logistical planning. Each of these factors will need to be mitigated to increase improvement of TPT enrolment among childhood contacts.

EP11-701-14 Enhancing TB preventive therapy uptake through active contact investigation: Insights from Nigeria's private health sector

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Background: The END TB strategy aims to reduce TB transmission by 90%, necessitating prompt identification and treatment of latent TB infection among contacts of pulmonary TB cases. Contact investigation is vital for scaling up TB control efforts by identifying, evaluating, and promoting the uptake of TB preventive therapy (TPT) among close contacts. The Global Fund Public-Private Mix (GF PPM) initiative, implemented in Nigeria from 2019 to 2023 by the Institute of Human Virology Nigeria and NTBLCP, offers an opportunity to assess the impact of active contact investigation on TPT uptake in private health facilities. This report presents the outcomes of the approach in enhancing TPT uptake.

Design/Methods: This is a retrospective cohort analysis of identified contacts of TB patients using the hub and spoke approach across the 21 states of GF PPM implementation over the period Jan – Dec 2022. The year 2022 was selected through a simple random sampling technique. Aggregated data was thereafter stratified, and proportions were compared.

Results: A total of 46,075 patients were on TB treatment in 2022. Of these, 14,413 (31.3%) TB cases had their contacts traced, with 53,725 contacts identified and 53,692 (99.9%) actively investigated. All 13,740 presumptive cases identified were evaluated, with 1562 diagnosed TB cases, a yield of 11.4%, and 1559 (99.8%) commenced TB treatment. Also, among the contacts investigated, 45262 (< 5 years=4979; > 5 years=40283) were eligible for TB preventive therapy (TPT). TPT uptake was higher among the under 5s compared to the above 5s, 3843 (77%) and 16156 (40.1%) respectively, p-value <0.01.

Conclusions: The study highlights the effectiveness of the hub and spoke approach in achieving high TPT uptake among TB contacts in the private sector. Leveraging this during scale to shorter TPT regimens would potentially further increase the uptake, successful completion, and coverage among under-5s and the older population group.

EP11-702-14 Implementation and effectiveness of a person-centered model of household contact investigation for TB preventive therapy in Uganda: A before and after study

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Background: The implementation of contact tracing and provision of tuberculosis preventive therapy (TPT) in Uganda has traditionally been through health facility-centred approaches, resulting in suboptimal implementation of contact tracing, and low TPT uptake and completion rates. We evaluated whether a person-centred strategy of contact investigation and TPT provision could enhance the uptake and completion of TPT.

Design/Methods: From March to December 2023, we conducted a before-and-after study comparing the routine and person-centred strategies at 26 health facilities in Uganda. The person-centred strategy included: 1) an educational booklet to teach index patients how to iden-

tify household/close contacts and teach contacts about TPT; 2) task-shifting of contact investigation from facility healthcare workers (HCWs) to community health workers (CHWs); 3) community health rider services to transport CHWs, contacts, sputum samples and TPT refills between health facilities and homes; 4) monthly community of practice meetings involving CHWs and HCWs to share experiences and improve practice. Using data from health facility TB registers, we compared the proportion of index patients with bacteriologically confirmed TB visited, the proportion of eligible contacts started on TPT and the proportion of contacts completing TPT before and after the intervention using mixed effects regression models.
Results: We analyzed data from 1929 index patients (833 before, 1096 after the intervention) and 7091 close contacts (1862 before, 5229 after the intervention). Participant characteristics were similar in both periods. Compared to routine care, more index patients received a contact tracing visit (adjusted odds ratio [aOR] 5.2, 95% CI 2.9-9.3, p<0.001), more contacts were started on TPT (aOR 3.0, 95% CI 2.1-4.4, p<0.001), and more contacts completed TPT (aOR 5.8, 95% CI 3.3-10.3, p<0.001) during the intervention period.

Outcome	Routine care, n (%)	Person-centred strategy, n (%)	adjusted OR** (95% CI)	p-value
Implementation (Contact tracing &screening)	Index patients=833	Index patients=1096		
Index patients visited	315 (38)	863 (79)	5.2 (2.9-9.3)	<0.001
Contacts screened	1862 (98)	5229 (99)		
Effectiveness (TPT uptake and completion)				
Contacts initiating TPT	1004 (53)	4773 (91)	3.0 (2.1-4.4)	<0.001
Contacts completing TPT	207 (21)	4077 (85)	5.8 (3.3-10.3)	<0.001

Conclusions: The person-centred strategy significantly improved uptake and completion of TPT and could be a key component in the global effort to end TB, especially in high-burden countries.

EP12 Education and training for optimal TB care and prevention

EP12-703-14 Impact of TB-centred training on baseline knowledge in nurses offering HAST services in KwaZulu-Natal province, South Africa

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Background and challenges to implementation: Management of HIV and AIDS, Sexually Transmitted Infections (STIs) and Tuberculosis (TB) [HAST] remain public health concerns in South Africa. Nurses are the frontline workers tasked with identification and diagnosis of these conditions. Capacitation of the health workforce was identified as a key activity within the USAID TB LONSAFT programme as it is linked to improved patient outcomes. The programme offered training to various cadres in five districts of KwaZulu-Natal between 2019-2023.
Intervention or response: One district identified the need for TB- focused training for HAST nurses. Face-to-face training on clinical and data-centred modules was offered over three consecutive days to different facility teams with the aim of strengthening patient clinical and data management. Clinical modules focused on TB disease and infection, diagnostics and treatment. Pre- and post- training quizzes were administered to assess change from baseline knowledge. De-identified data extracts of pre-and-post training scores were analysed using descriptive statistics.
Results/Impact: In total, 125 HAST nurses were trained; 80% (97/121) female, mean age 42 (24 - 59), median number of months in current workplace 44 (IQR: 12-84) and 31% (37/119) received prior TB- training. Pre- and post-training scores were analysed in two groups; the graph below represents a comparison of these scores in one group of 66 nurses.
Baseline knowledge for TB symptoms and diagnostics was above 90%. Significant improvement from baseline knowledge was observed in latent TB (40%), TB-HIV co-infection (25%) and TB treatment (19%) modules.

Conclusions: Two-thirds of nurses had not received prior TB-centred training highlighting the need for initial and continuous training aligned with updated TB guidelines.

Poor knowledge of key aspects of the TB care cascade could correlate to performance on key indicators, for example, scores for TPT use and latent TB could correlate with poor implementation of TPT services. Identified areas of weaknesses can thus be targeted for additional training.

EP12-704-14 Health education and training about TB in children and adolescents: Assessing skills and knowledge among healthcare workers in Lesotho

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Background: Lesotho remains in the 30 high burden countries in TB incidence. Currently TB incidence is at 661/100, 000 population, treatment coverage is 37% and percentage of new and relapse TB among 0-14 is 6%. (WHO Global TB report, 2022) The percentage of TB among age group 0-14 has been below the WHO estimated 5-10 % over the years. The country team used tools that were provided by the Union to conduct assessment as well as desk review of documents and field visits to the facilities.
Design/Methods: The tools were used at different levels namely national, district, and facility levels. Nationally the national strategic plan and national guidelines were reviewed, while on district and facility levels the actual knowledge of TB cascade, contact tracing, prevention and service integration were reviewed.
Results: Findings from National TB strategic plan 2018-2022: Target for child notification was clearly stated at (10% of all TB cases), TB treatment success set at 95%, Targets for TPT among CLHIV was not defined, Targets for TPT among child contacts and adolescents was not clearly defined, Indicators to monitor the cascade and reporting and recording tools was available however the reporting did not segregate according to age. At the health centre level, TB focal nurses were experts in the facilities on child and adolescent TB however, the other nurses in the facilities had gaps which should be addressed by frequent onsite trainings using the desk guide on diagnosis and management of children and adolescent TB. The desk guide has been printed with the support of one of our implementing partners.
Conclusions: It is vital to have at least one HCW who is knowledgeable about childhood and adolescent TB within a facility. Countries can make use of the desk guide developed by the Union to address knowledge of TB in children and adolescents.

EP12-705-14 TB portals assist in training the next generation of doctors by integrating artificial intelligence into person-centric clinical resource

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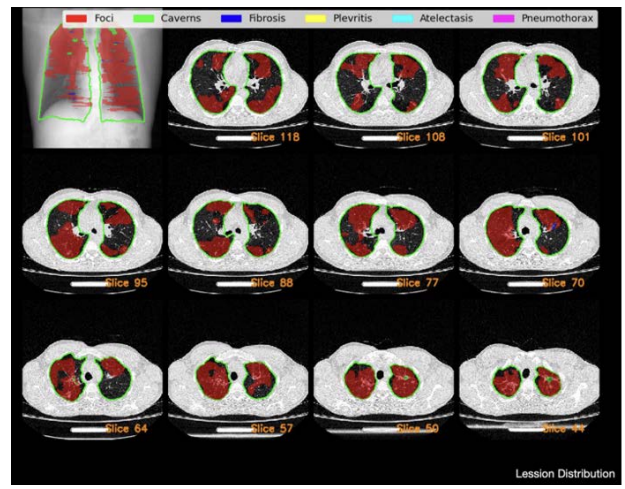
Background and challenges to implementation: The TB Portals program represents a unique educational resource for the new generation of doctors, maturing professionally in an era where artificial intelligence (AI) solutions are becoming integral to the practice of medicine. The program's innovative database and Web resources offer a comprehensive and interactive platform that amalgamates a wealth of clinical, radiological, genomic, and therapeutic data.
Our goal is to facilitate a deeper understanding of TB's complexities, enhance diagnostic accuracy, and foster the adoption of effective treatments.
Intervention or response: TB Portals information is patient-centric, i.e. every feature, clinical or computed, is linked to particular patient (anonymized), with time stamps available for every sample and image.In the context of education and training, the TB Portals resources serve as a bridge between traditional medical knowledge and cutting-edge Machine Learning and AI technologies.
Users can create virtual cohorts, compare and contrast, and examine factors important for survival. TB Portals integration of AI annotations together with expert annotations for thousands of clinical images exemplifies the potential of AI to transform disease diagnosis and management.



Results/Impact: By exposing the new generation of medical professionals to clinical histories, with treatments, tests, images and outcomes, we enrich the process of education. Adding AI and personalized medicine to clinical practices would increase operational efficiencies. AI and

machine learning could process and summarize a lot of information, but in some cases, human and AI would disagree, and it is important to learn and better understand limitations and challenges.
Conclusions: The collaborative nature of the TB Portals project highlights the value of cooperation across borders and disciplines, an essential skill in an increasingly interconnected world. TB Portals is an example of user-friendly, dynamic, feature-rich educational resource, that equips the new generation of medical professionals with knowledge, skills, and innovative mindset necessary to harness the power of AI in the fight against TB.

EP12-706-14 Enhancing TB training for private healthcare providers through e-learning in Indonesia

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Background and challenges to implementation: A significant barrier to engaging private healthcare providers in Indonesia's tuberculosis (TB) control efforts is their varying capacity to deliver standardized, quality TB services. Traditional accredited TB training in Indonesia has been classroom-based, primarily targeting public sector health workers and excluding most private sector health professionals due to logistical constraints and the volume of practitioners requiring training.
Intervention or response: In response, the USAID Tuberculosis Private Sector (TBPS) Activity collaborated with the Ministry of Health (MoH) and professional organizations to develop an accredited TB e-learning curriculum and associated online courses.
Aligned with the classroom-based training curriculum, the online courses were launched in March 2023 on the MoH owned and managed Plataran Sehat platform - a learning management system.
Participants completing the course receive Continuing Medical Education (CME) credits from professional organizations and certification from the MoH which counts toward health facility accreditation score.
This innovative approach offers tailored courses for doctors, nurses, lab technicians, and pharmacy professionals, enabling on-demand, equitable access to TB training across the private sector.
Results/Impact: Since this e-learning platform is hosted by MoH and connected to the National Information System for Human Resource in Health (SISDMK), there has been rapid uptake of the TB e-learning courses. By March 2024, 43,546 participants had benefited from the TB e-learning courses, 18,855 (43%) from private health facilities. This represents nearly 49% of targeted private sector health workers in Indonesia, demonstrating its significant potential to engage and build capacity of private healthcare sector staff.
Conclusions: The transition to TB e-learning is a pivotal shift in Indonesia's strategy to enhance private healthcare providers' involvement in TB management. This intervention demonstrates the potential of digital learning platforms to ensure equitable access to essential TB training for the private sector in Indonesia and support the national objective to eliminate TB by 2030.

EP12-707-14 Building sustainable competency-based training systems for community health workers: Insights from the TIFA-STOM project

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Background and challenges to implementation: A critical issue in the planning of better health care delivery for Low- and Middle-Income Countries like Nigeria is the training and education of health personnel. Competency-based training (CBT) focuses on outcomes and ensures participants have the necessary knowledge, skills, and attitudes on the subject matter. Efficient human resources development is vital for facilitating tuberculosis control in developing countries, and appropriate training of front-line staff is an important component of this process. This study shares insights from implementing a CBT program for community health workers by KNCV Nigeria.
Intervention or response: With funding from the United States Agency for International Development (USAID) through the John Snow Incorporated (JSI) TIFA project, KNCV Nigeria adapted course modules from the USAID TB Contact Investigation (TBCI) framework and developed a tailored TBCI competency-based training curriculum. This curriculum was onboarded on a compact self-paced TBCI online training course.
Results/Impact: Seventy (70) CHWs were successfully onboarded, received hands-on training on navigating the course modules and the platform. The platform afforded real-time monitoring and tracking of course progress for individual CHWs, to enable supportive guidance by the KNCV Nigeria team towards course completion. All 70 CHWs who completed the course received a certificate of course completion and a post-training evaluation reveals an impressive 29% increase in knowledge among participants, highlighting the tangible gains achieved through the CBT learning program.
Conclusions: The development of an effective interactive learning Competency Based Training (CBT) platform for CHWs in the STOM project provided a qualitative and easily accessible continuous learning resource on TB contact investigation.

This innovative approach not only enhanced the competency of our community healthcare workforce but also established a framework for continuous learning and adaptation in the ever-evolving landscape of TB program implementation.

EP12-708-14 Empowering mid-level healthcare providers: Strengthening community-level outreach of TB services through training and sustained skill building in Telangana, India

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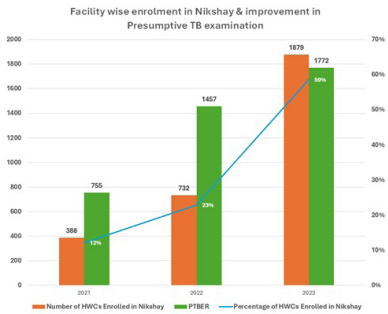
Background and challenges to implementation: The Ayushman Bharat Program in India aims to deliver comprehensive healthcare services through Mid-Level Healthcare Providers (MLHPs) known as Community Health Officers (CHOs) stationed at Health and Wellness Centers (HWCs). These CHOs provide diverse healthcare services directly to communities. Integrating TB services into the general health system through tailored capacity-building for CHOs can decentralize TB services, improving accessibility at grassroots levels.
This quasi-experimental case study examines the impact of such interventions on TB screening and diagnosis in Telangana, India
Intervention or response: To improve TB screening and diagnosis, structured training modules were developed for 4000 CHOs (serving 20 million population), adaptable for both in-person and virtual delivery with shorter re-orientation capsules for sustained knowledge retention. Capacity-building begins with induction training on the National Tuberculosis Elimination Program (NTEP), followed by regular virtual interactions. Rural CHOs are divided into three groups, while urban CHOs form a separate group for effective training. Sessions cover program guidelines, diagnosis, treatment, follow-up procedures, public health actions, Nikshay (National digital surveillance system for TB) platform and specially developed skill-building exercises. Each group receives monthly sessions, supplemented by prescheduled virtual refresher sessions throughout the year.
Results/Impact: Initially, participation was modest; however, additional sessions enhanced CHOs' engagement. Nikshay entries from HWCs saw an increase from 732 to 1879 between 2022 and 2023. Concurrently, the Presumptive TB Examination Rates (PTBER) rose from 1457 to 1722 per 100,000 population during the same period.



Proportion of Health wellness centres enrolling in Nikshay & Presumptive TB Examination rate

Year	Number of HWCs Enrolled in Nikshay	Percentage of HWCs Enrolled in Nikshay	PTBER
2021	388	12%	755
2022	732	23%	1457
2023	1879	59%	1772

Conclusions: This structured training approach is a sustainable, zero-cost intervention enhancing CHOs' TB management skills and benefiting community healthcare delivery. The intervention positively impacts program parameters and service delivery closer to communities. The research has potential for wider adoption and replication in other Indian states.

EP12-709-14 Strengthening TB response at the grassroots: Capacity building of local self-government structures through Grama Arogya Initiative in Karnataka, India

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Background and challenges to implementation: Gram Panchayats (GPs) are the Local Self-Government, require bottom-up comprehensive planning. The top-down approach has led to disconnects between planning and implementation, necessitating micro-planning at the GP level. The Grama Arogya initiative aimed to empower GP Task Force (GPTF) members to address the health challenges including Tuberculosis in the grassroots communities.

Intervention or response: Towards promoting local governance and local-level planning and implementation, a comprehensive capacity-building program was designed, focusing on training GPTF members. The training at the state, district, and GP levels, covered topics such as Tuberculosis, NCDs, Anaemia, Undernutrition and social determinants of health. GPTF members were capacitated to do the micro planning involving the local resources to address the various health related challenges in the villages.
Results/Impact: The intervention trained 180,048 GPTF members and 4,221 GPs started preparing micro plans monthly to conduct health camps to reach out to the communities with screening and referral services.
Over 24 months, 5.7 million people were verbally screened for TB and identified 51,697 presumptive cases and linked for diagnosis and treatment. 4,456 GPs integrated health activities into their development plans, with 642 GPs using health cess (tax) for TB care including nutritional support for Persons with TB.
Conclusions: By empowering GPs with the tools necessary for awareness building, micro-planning and local resource utilization, the intervention effectively bridged the gap between planning and implementation at the village level.
The significant uptake of training, active participation of GPs in micro-planning, and integration of health priorities into local development plans highlight the possibility of fostering bottom-up governance and local ownership of health interventions.

EP12-710-14 Building nursing capacity in the Pacific through the pathway to the elimination of antibiotic-resistant and latent TB (and leprosy) in the Pacific *(*PEARL) project

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Background and challenges to implementation: The Australian Government is supporting research around the diagnosis, prevention and treatment of tuberculosis (TB) in Pacific Island Countries. The research project proposes to enhance knowledge and develop tools to combat threats to health security posed by the regional and global challenges of DR TB. The project is a collaboration with the Kiribati Ministry of Health and Medical Services and team of Australian translation-oriented researchers and capacity building experts.
Intervention or response: The PEARL Project aims to contribute to TB prevention and TB elimination in the Pacific by:
a. Implementing a TB and leprosy elimination intervention in Kiribati,
b. Building workforce capability for TB and leprosy elimination in Kiribati, and more broadly within the Pacific, through a program of training and mentoring, and
c. Defining the most effective and cost-effective strategies to control TB/DR-TB in the Pacific.
To address the specialised training needs of the Pacific nursing workforce a training package to support TB nurses and related workers for the six countries with incidence rates of TB (> 40 per 100,000 population) within the south pacific (Fiji, Kiribati, Nauru, Solomon Islands, Tuvalu and Vanuatu) is being developed.
Results/Impact: Participants' knowledge and skills acquisition, as well as role extension, competence, and perceived confidence to safely manage people with TB will be evaluated. The training materials and resources developed will be made available online to benefit nurses, and National TB Programs (NTPS) more broadly across the pacific.
Conclusions: Capacity building through education and training in the clinical and public health management of TB will enhance current regional National TB Program efforts. There is currently no specialized education or training programs available for TB nurses within the pacific, TB nurses learn predominantly through on-the-job training. It is proposed that strengthening training in the clinical and public health management of TB will enhance current efforts of the pacific NTPs.

EP12-711-14 Innovative cost-effective approaches to TB programme capacity building among healthcare workers in Katsina

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health concern in low- and middle-income countries. Building healthcare worker (HCW) capacity in TB diagnosis, treatment, and management is crucial for effective TB control programs. However, traditional training methods can be resource-intensive and impractical in settings with limited budgets. KNCV Nigeria under the USAID funded TB LON Project in Katsina state in line with its strategic monitoring and evaluation (M&E) plan for the TB LON Project incorporates innovative and cost-effective approaches for collaborative and adaptive learning to strengthen TB program implementation and improve program quality in the state.

Intervention or response: The implementation of these innovative and cost-effective approaches to TB program capacity building among HCWs in Katsina involves a multifaceted approach, including the utilization of digital training platforms, centrally coordinated e-learning modules and certifications, continuous on-site mentorship and supportive supervision ,peer-to-peer learning among adhoc staff, and task-shifting and upskilling and use of infographics and IEC materials.

Results/Impact: A total of 137 HCWs were trained between Jan to Dec 2023 in the USAID LON Region 1 & 2 Project. The initiatives resulted in notable improvements in HCWs' capacity in TB program delivery leading to quality improvement and an increase in overall active case finding cascade in Katsina.

The digital training platforms provided flexible learning for healthcare workers (HCWs), on-site mentorship and peer learning, enhanced collaboration while task-shifting and upskilling initiatives boosted workforce efficiency.

Implementation Period	Target population	Clients screened for TB	Presumtive TB Cases Identified	Presumptive TB cases evaluated for TB	TB Cases Diagnosed	TB Cases Started on Tx
Jan - Dec 2022	1160201.	1152471.	93526.	88250.	6897.	6822.
Jan - Dec 2023	1457134.	1469920.	148796.	146366.	11088.	11066.
Percentage Improvement	11%	12%	23%	25%	23%	24%

Table 1: Program Quality Improvement in Katsina due to Capacity Building of HCWs.

Conclusions: The innovative and multifaceted methods of capacity building for HCWs in Katsina have proven to be both effective and cost-efficient. Its resultant impact on HCW knowledge, program implementation, active case finding, and overall cost-effectiveness, serves as a basis for scaling up and replication in similar resource-limited settings.

EP12-712-14 Standardising evaluation tools for innovative LTBI education: Insights from two LTBI ECHO programs in the US

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Background and challenges to implementation: To achieve the Sustainable Development Goal of ending the global TB epidemic by 2030, treatment of LTBI is a critical strategy. Educating and engaging community clinicians is often incorporated into National TB programmatic efforts. One-time educational initiatives are not sufficient in developing confidence in LTBI management. In the US, to overcome this challenge and support PCPs, we developed a LTBI Extension for Community Healthcare Outcomes(ECHO) program. This initiative was expanded across 16 states. An Advanced LTBI ECHO was developed to support PCPs in addressing people requiring more complex TB infection management in MA. One major challenge remains evaluating educational efforts to demonstrate competence.

Intervention or response:

The development of a standardized, structured questionnaire assessed participants' change in self-reported confidence in key areas of the LTBI care cascade. This tool was developed using the Moore's framework - a practical guide to more effectively assess learners' competence(level 4). We were able to implement this tool in a traditional pre/post approach(Regional) and a retrospective pre/post approach(MA).

Results/Impact: Our tool incorporated 10 questions regarding LTBI management(Table 1). The Regional LTBI ECHO demonstrated a significant increase in confidence for all steps of the LTBI care cascade. The Advanced MA LTBI ECHO program demonstrated a significant increase in confidence for questions related to treatment and monitoring. This was expected given that an Advanced course was intended to focus on later LTBI care cascade steps. These survey results illustrated that both ECHO programs achieved our educational objectives.

Please rate your confidence in performing each of the areas of Latent TB infection practice below...

Not at all confident ① — Not very confident ② — Moderately confident ③ — Very confident ④ — Extremely confident ⑤

LTBI Management practice areas		Regional (n=32) Mean(SD)	Regional (n=32) P-value[a]	MA Advanced (n=7) Mean(SD)	MA Advanced (n=7) P-value[a]
Assessing a patient's risk for TB infection	*Before the ECHO course*	3.3(0.9)	0.0007*	3.4(1.2)	0.47
	After the ECHO course	3.9(0.7)		3.7(1.2)	
Selecting a test to screen for TB infection	*Before the ECHO course*	3.6(1.0)	0.0007*	3.1(1.0)	0.04*
	After the ECHO course	4.3(0.7)		3.9(1.3)	
Interpreting TB infection test results	*Before the ECHO course*	3.3(0.8)	0.0008*	2.8(0.7)	0.16
	After the ECHO course	3.8(0.6)		3.6(1.2)	
Providing education to a patient about TB infection testing	*Before the ECHO course*	3.4(0.9)	<0.000*	2.6(0.9)	0.08
	After the ECHO course	4.1(0.7)		3.5(1.2)	
Providing education to a patient about TB infection treatment	*Before the ECHO course*	3.1(0.9)	0.0003*	2.2(1.1)	0.03*
	After the ECHO course	3.9(0.7)		3.5(1.2)	
Helping patients with TB infection to navigate the system, which includes getting to medical appointments and completing TB infection treatment	*Before the ECHO course*	2.6(1.0)	<0.000*	2.0(0.9)	0.06
	After the ECHO course	3.6(0.8)		3.1(1.3)	
Conducting an evaluation to rule out TB disease	*Before the ECHO course*	3.0(0.9)	<0.000*	2.8(1.0)	0.14
	After the ECHO course	4.0(0.8)		3.3(1.2)	
Selecting an appropriate TB infection treatment regimen	*Before the ECHO course*	2.5(1.0)	<0.000*	2.0(0.9)	0.06
	After the ECHO course	3.7(0.9)		3.1(1.3)	
Monitoring a patient on TB infection treatment for safety and adherence	*Before the ECHO course*	2.5(1.0)	<0.000*	2.1(0.8)	0.03*
	After the ECHO course	3.7(0.9)		3.3(1.4)	
Reporting TB infection to the Department of Health	*Before the ECHO course*	3.4(1.4)	0.0021*	3.1(1.6)	0.29
	After the ECHO course	4.3(1.0)		3.3(1.6)	

ECHO=Expansion for Community Healthcare Outcomes;TB=Tuberculosis;LTBI=Latent Tuberculosis Infection;MA=Massachusetts
*Statistically significant result($p<0.05$);[a]Calculated with non-parametric Wilcoxon signed rank test for paired data

Table 1. Participants' self-reported confidence regarding LTBI management before and after two LTBI ECHO courses.

Conclusions: The development and utilization of a tool based on a well-known educational evaluation framework allowed for assessment of different LTBI ECHO programs. We will share this tool during the presentation so that others can consider using it across a range of settings and a wide variety of LTBI educational initiatives globally.

ABSTRACT PRESENTATIONS FRIDAY 15 NOVEMBER 2024

ORAL ABSTRACT SESSION (OA)

OA32 Approaches for identifying TB in children

OA32-354-15 Treatment-decision algorithms for children evaluated for pulmonary TB: Evaluation of the WHO algorithm and development of the algorithm in Indonesia

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Background: The diagnosis of tuberculosis (TB) in children is often made clinically, which can be challenging. Clinical algorithm is valuable to guide healthcare workers in deciding treatment initiation. We evaluated the 2022 WHO treatment decision algorithm and the 2016 Indonesia algorithm.

Design/Methods: We conducted a retrospective cross-sectional study in five provinces in Indonesia, involving children (aged 0-10 years), who were evaluated for TB diagnosis in 2022. Children with comorbidities other than HIV or malnutrition were excluded. A panel child TB expert applied the collected data to make a diagnosis using the WHO algorithm and the Indonesia algorithm. Analysis was made to compare the diagnosis agreement between the attending doctor and the expert panel (using the WHO and the Indonesia algorithm).

Based on the findings, a new Indonesia guideline was developed and reviewed by representatives from the Indonesia Pediatric Society, the national TB program, doctors from primary health centers, pediatricians from district hospitals, province and district TB officers, and non-government organizations.

Results: Of 523 eligible children, 371 (70.9%) were diagnosed with TB by the attending doctors, while 295 (56.4%) were diagnosed by the expert panel using the WHO algorithm and 246 (47%) using the Indonesia algorithm. The Cohen's Kappa of TB diagnosis: attending doctor vs the expert panel using the WHO algorithm (0.27), attending doctor vs the expert panel using the Indonesia algorithm (0.45), and the WHO algorithm vs the Indonesia algorithm (0.42). A detailed review of both algorithms revealed some limitations in the implementation. The new Indonesia algorithm is presented in Figure 1.

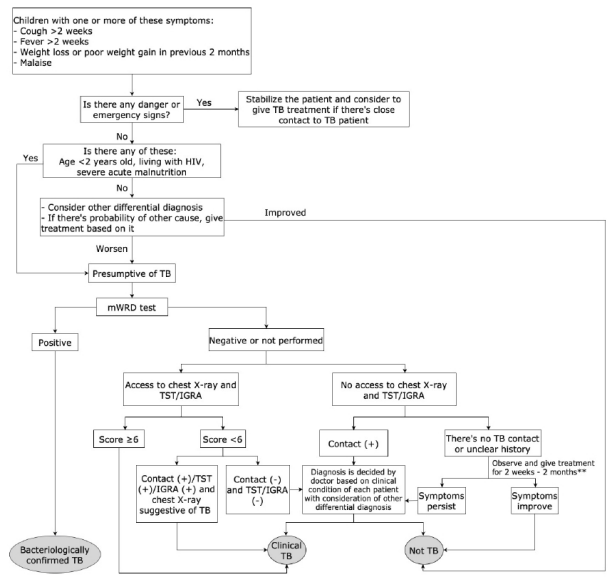

Figure 1.The revised Indonesia algorithm for diagnosis of TB in children.

Conclusions: The current practice of doctors in the hospital setting in Indonesia shows a tendency to overdiagnose TB in children. The varied characteristics and risks of individual patients as well as access to diagnostic tools should be considered by clinicians to make treatment decisions.

OA32-355-15 Diagnostic accuracy of Computer-Aided Detection for Tuberculosis® and Xpert Ultra stool testing for pulmonary TB in West African children

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Background: Diagnosis of tuberculosis (TB) in children is challenging because of difficulty in obtaining sputum and paucibacillary nature of childhood TB. However, non-sputum-based TB diagnostic approaches hold promise in children.

We investigated the diagnostic accuracy of the Computer-aided detection (CAD) for TB version 7 (CAD4TBv7®; Delft Imaging, the Netherlands) and Xpert Ultra stool testing ('stool Xpert') for diagnosing childhood TB in three West African countries.

Design/Methods: This is an ongoing multicountry study in which children aged less than 15 years with presumptive pulmonary TB are consecutively recruited at study sites in Benin, Gambia, and Ghana. Participants undergo standardized conventional investigations for TB. In addition, early morning stool samples are simultaneously collected for testing with Xpert Ultra and CAD4TBv7®abnormality scores are derived for their digital chest radiographs.

The diagnostic accuracy of stool Xpert and CAD4TBv7® were verified against a microbiological reference standard (MRS) of culture-confirmed TB, using area under the receiver operating characteristic (AUROC) curve, and point estimates of sensitivity and specificity were determined.

Results: Of the 186 participants included in the analysis, median age was 3.7 (IQR 1.4-8.7) years and 28/164 (17.1%) were HIV positive. Twenty-five (14.8%) had confirmed TB, 17 (10.1%) had unconfirmed TB and 127 (75.1%) unlikely TB. Using the MRS, the AUROC, sensitivity, and specificity of CAD4TBv7® were 0.65 (95%CI 0.53-0.76), 33.3% (95% CI 13.3-59.0), and 96.3% (95% CI 90.8-99.0%), respectively.

The AUROC, sensitivity, and specificity of 'stool Xpert' were 0.82 (95% CI 0.72-0.92), 63.6% (95% CI 40.7-82.8), and 100% (95% CI 97.2-100%), respectively. There was no significant difference between the AUROC of CAD4TBv7® compared to a human reader using the MRS (0.65 [95% CI 0.53-0.76]) *versus* 0.68 [(95% CI 0.56-0.80]), DeLong p-value= 0.558).

Test	AUROC	Sensitivity % (95%CI)	Specificity % (95%CI)	PPV % (95%CI)	NPV % (95%CI)
Stool Xpert	0.82 (0.72-0.92)	63.6 (40.7-82.8)	100 (97.2- 100)	100 (76.8-100)	94.2 (89.0-97.5)
CAD Abnormality Score	0.65 (0.53-0.76)	33.3 (13.3-59)	96.3 (90.8-99.0)	60.0 (26.2-87.8)	89.7 (82.6-94.5)
Human Reader	0.69 (0.60-0.79)	78.3 (56.3-92.5)	60.0 (51.2-68.3)	25.0 (15.5-36.6)	94.2 (87.0-98.1)

PPV=Positive Predictive Value; NPV = Negative Predictive Value
Value (95% CI) AUROC= area under receiver operating characteristics curve

Table: Diagnostic Performance of Stool, CAD4TB, and Human Reader against MRS.

Conclusions: The CAD4TBv7® and stool Xpert are non-sputum-based approaches that could potentially add value to the diagnosis of TB in children.

OA32-356-15 TB detection in children using the simple one-step stool processing method in three remote zones in Ethiopia

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Background: Children constitute about one-tenth of the global TB burden, but over half of these are often go undetected. Difficulties with collecting sputum samples collection and the paucibacillary nature of TB in children pose diagnostic challenges. A Stool-based diagnostic known as the Simple-One-Step method has emerged as a more feasible alternative. Our objective was to assess improvements in TB diagnosis in children following the implementation of the SOS method.

Design/Methods: Employing a before-after study design, we conducted this study in forty-five health facilities in three remote zones of Ethiopia between July 2023 and February 2024. Baseline data were extracted from the national digital TB register from July 2021 to June 2022 and adjusted to an 8-month figure for comparison. Healthcare workers were trained in the application of the SOS method. Children under 15 with presumptive TB upon clinical evaluation were tested using the SOS processing method if unable to produce sputum. Data was collected in structured paper-based forms at each health facility, then transferred to an Excel sheet for centralized management and analyzed using STATA. We compared percentage improvements in TB case diagnosis relative to baseline.

Results: Out of 2294 presumptive TB cases (1266 males, 1028 females), 222 were confirmed with all forms of TB, including 130 bacteriologically confirmed cases, compared to 100 and 39 at baseline respectively. This indicates a 122% increase in all forms of TB and a 231% increase in bacteriologically confirmed TB cases (see Table). The SOS processing method, detected 79 bacteriologically confirmed TB cases, accounting for 60.7% of all bacteriologically confirmed TB cases. Furthermore, TB preventive treatment initiation rose by 131%, from 198 to 457 children post-intervention.

Indicators	Before	After	% Improvement
Total presumptive TB (<15 yr)	299	2294	668%
Number (%) <5 yr	129 (43.1%)	1152 (50.2%)	791%
All forms of TB (<15 yr)	100	222	122%
Number (%) <5 yr	36 (36%)	98 (44.1%)	172%
Bacteriologically confirmed by all form	39	130	231%
Number (%) <5 yr	14 (35.9%)	64 (49.23%)	357%

Table. Improvements in TB case detection after the intervention.

Conclusions: TB case detection and TPT uptake improved among children in remote districts in Ethiopia following the implementation of the SOS method. The result proved this intervention should be scaled up.

OA32-357-15 Exploring opportunities for TB diagnosis in children aged 5-14 years in Nigeria using ultra-portable digital X-ray with computer-aided detection

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Background and challenges to implementation: Children make up an estimated 15% of Nigeria's TB incidence, and underdiagnosis of TB in this age group remains a major challenge. In 2021, Nigeria received and deployed ten ultra-Portable Digital Xray (uPDX) machines with Computer-Aided Detection (CAD) for TB detection, under the USAID-funded/STOP TB Partnership introducing New Tools Project.
The aim of the project was to improve access to high quality, innovative screening, and diagnostic tools for TB. This abstract describes results from the use of the uPDX with CAD, by USAID TB LON projects, on TB screening among children 5-14 years.
Intervention or response: The ten uPDX with CAD were deployed to eight project states for active TB case finding during community outreaches. At-risk children, five years and above, were targeted for TB screening using the uPDX with CAD, during community outreaches and special active TB case finding campaigns like the childhood TB testing week, national testing weeks and world TB day activities. A parallel screening algorithm using the WHO four-symptom screen and a CAD threshold score of 50 were used to identify presumptive TB cases. Children presumptive for TB were evaluated bacteriologically using stool or sputum samples. Those diagnosed with TB were linked to treatment.
Results/Impact: Between 2021 and 2022, 34,053 children, aged 5-14 years, were screened using the uPDX with CAD, 2,883 (8%) were presumptive for TB, while 194 (8%) were diagnosed with TB with 60% bacteriologically diagnosed (Figure 1).
To diagnose one childhood TB case, the Number-needed-to-screen (NNS) was 176, while the Number-needed-to-test (NNT) was 12.

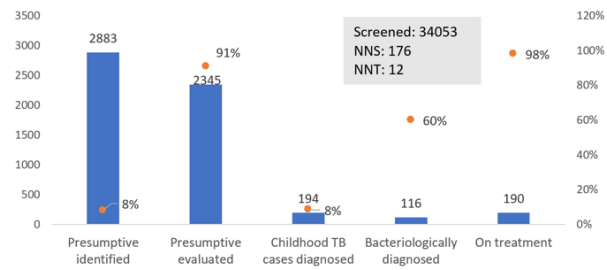

Figure 1. Childhood TB case finding cascade using the ultra-portable digital X-ray in Nigeria (Jan 2022 - Dec 2023)

Conclusions: The low NNS and NNT demonstrate the opportunities and potential for finding TB among at-risk children aged 5-14 years using the uPDX with CAD. There is an urgent need to validate the performance of CAD systems in children to leverage its use in childhood TB detection.

OA32-358-15 Finding the missing children: Results from a multi-country study of the diagnostic cascade using WHO treatment decision algorithms for pulmonary TB

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Background: The World Health Organisation (WHO) recommends two new treatment decision algorithms for pulmonary TB in children that incorporate clinical and laboratory features, and where available, imaging. We describe the TB diagnostic cascade using these new treatment decision algorithms in diverse populations, including ambulatory and hospitalized children, children living with HIV (CLWHIV) and malnourished children.
Design/Methods: Prospective observational diagnostic study conducted in Guinea, Niger, Nigeria, South Sudan, and Uganda. Study sites included primary and higher health care facilities, nutritional centres, and HIV clinics. Children under 10 years with signs and symptoms of TB were included. Algorithm A was used when chest X-ray was available, and algorithm B when not.
Results: Among 311 participants enrolled, the median age was 1.8 years (IQR: 0.8-3.8), 141 (45.3%) were female, 212 (68.2%) hospitalized, 224 (72.0 %) malnourished, and 15 (4.8 %) CLWHIV. After the first medical assessment, 253 patients were scheduled for a second assessment, which 176 (69.6%) attended. In total, 76 (24.4%) children were diagnosed with TB, 58 (76.3%) of them at the first visit. Principal reasons for starting TB treatment were: 28 (36.8%) clinical-radiological score using algorithm A, 27 (35.5%) clinical score using algorithm B, 11 (14.5%) contact with TB case, 6 (7.9%) positive Xpert MTB/RIF, 3 (3.9%) positive TB-LAM CLWHIV. Xpert MTB/RIF was positive in 10/272 (3.7%) children with at least one specimen, 6/184 (3.3%) in gastric aspirate, 7/259 (2.7%) in stool, 1/41 (2.4%) in nasopharyngeal aspirate, 0/20 (0.0%) in sputum.
Conclusions: The scores of algorithms A and B, based on clinical and radiological observations, triggered most of the decisions to initiate TB treatment, and enabled prompt initiation of TB treatment at first contact with patients. These results suggest the continued importance of a multifaceted approach to diagnosing TB in children, and not relying on imaging or laboratory tests alone.

OA32-359-15 Ultra on induced sputum for diagnosis of pulmonary TB in children in a setting with a high burden of HIV or malnutrition

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Background: Molecular testing of respiratory specimens for TB evaluation in children can be challenging, due to their inability to spontaneously expectorate. Induced sputum (IS) is safe and feasible, but there are limited data on its accuracy in high-risk groups (children living with HIV (CLHIV), with malnutrition, or <2 years).
Design/Methods: Children (<15 years) investigated for PTB, attending Dora Nginza Hospital, South Africa, were prospectively enrolled between January 2018-December 2023. Where possible, 2 IS were performed at least 4 hours apart for liquid culture and Xpert Ultra (Ultra). Children were categorised as ‚confirmed' (including Ultra trace positive), ‚unconfirmed,' or ‚unlikely TB' according to NIH consensus definitions. Diagnostic accuracy for Ultra was calculated against a culture-based reference standard.
Results: 791 children were enrolled; 177 (22.4%) ‚confirmed' on IS (161/177 [91.0%] Ultra positive), 486 (61.4%) ‚unconfirmed,' and 119 (15.0%) ‚unlikely TB'. Median age was 27.3 (IQR 12.1–59.8) months, 351 (44.4%) were <2 years, and 196/788 (24.9%) were CLHIV (with 96 [49.0%] on ART). Stunting (height-for-age Z-score <-2) occurred in 38.8%, and weight-for-age Z-score (WAZ) <-2, in 36.4%. CLHIV had lower WAZ (-2.2 vs. -1.2, p<0.001) and more stunting (55.3% vs. 33.4%, p<0.001), vs. HIV-uninfected children.
Overall, IS Ultra sensitivity was 86.1% (95%CI 78.4-91.8) and specificity, 90.8% (95%CI 88.4-92.9). Sensitivity was similar across risk-groups, excepting lower sensitivity (76.1%) in children <2 years (Table). For 62 children with negative cultures, IS Ultra was positive (56.5% trace positive); all improved-on TB treatment. Children with WAZ<-2 had higher yields (compared to WAZ>-2). 427 children had two valid Ultra and culture results; a second IS increased detection by 32.1% (81 to 107 cases) for Ultra, and by 25.9% (54 to 68 cases) for culture.

Xpert Ultra vs TB Culture on any IS sample, n = 791	Yield	Sensitivity	Specificity
Ultra	161/791 (20.4)	86.1 (78.4-91.8)	90.8 (88.4-92.9)
CLHIV[1,2]	36/196 (18.4)	90.6 (75.0-98.0)	95.7 (91.4-98.3)
HIV uninfected	125/592 (21.1)	84.3 (74.7-91.4)	89.2 (86.2-91.8)
WAZ[3] <-2	63/264 (23.9)	86.1 (72.1-94.7)	88.2 (83.2-92.2)
WAZ[3] >-2	76/461 (16.5)	84.3 (71.4-93.0)	84.3 (71.4-94.5)
<2 years	67/351 (19.1)	76.1 (61.2-87.4)	89.5 (85.5-92.7)
>2 years	94/440 (21.4)	92.8 (83.9-97.6)	91.9 (88.7-93.2)
Ambulatory	52/261 (19.9)	82.9 (66.4-93.4)	89.8 (85.1-93.4)
Hospitalised	109/530 (20.6)	87.5 (78.2-93.8)	91.3 (88.3-93.8)

Table 1. Yield and Accuracy of Xpert Ultra compared to culture from induced sputum (IS)
Data are reported as frequency (95% Confidence Intervals).
[1]CLHIV = Children Living with HIV
[2]HIV status unknown for 3 children
[3]WAZ = weight-for-age Z-score

Conclusions: Xpert Ultra on IS offered a high yield and diagnostic accuracy, including in CLHIV and malnourished children, with a significant incremental yield on a second sample.

OA32-360-15 Blinded point-of-care ultrasound to support TB diagnosis in children: A Médecins Sans Frontières cross-sectional study in Malakal, South Sudan

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Background: Evidence on the use of tuberculosis-focused point-of-care ultrasound (POCUS) in children is limited. Our study describes the utility of POCUS for diagnosis of tuberculosis (TB) in children with presumptive TB in South Sudan (SSD)- a high-burden setting for TB, HIV, and malnutrition.
Design/Methods: This cross-sectional study took place at Malakal hospital (SSD), from July 2021 to December 2023. Children between 6months and 15years with presumptive TB underwent clinical, laboratory and blinded clinician-performed POCUS assessments, to assess subpleural nodules (SUNs), lung consolidation, pleural and pericardial effusion, abdominal lymphadenopathy, focal splenic and hepatic lesions and ascites. Presence of any sign prompted a POCUS positive result. Ultrasound images and clips were evaluated by expert reviewers. Children were categorised as confirmed TB (microbiological diagnosis), unconfirmed TB (clinical diagnosis) or unlikely TB.
Results: A total of 359 children were enrolled, with 188(52%) females and 210(58.5%) <5 years; 236(66%) and 28(7.8%) were severely acute malnourished (SAM) and HIV-infected, respectively. TB confirmation occurred in 58(16%); 158(44%) had unconfirmed TB and 143(39.8%) had unlikely TB. Children with TB were more likely to have POCUS-positive results (111/216;51.4%) compared with children with unlikely TB (32/143;22%). Common POCUS signs in patients with TB were: focal splenic lesions (61;28%), lung consolidation (43;20%), abdominal lymph nodes (14; 6.5%) and pericardial effusion (13;6%). In children with confirmed TB, POCUS sensitivity was 64.3% (95%CI:51.2%-75.5%). In those with unlikely TB, specificity was 77.6% (95%CI:70.1%-83.7%). Unlike SAM status (Risk Ratio (RR) (1.2;95%CI:0.9,1.6; p=0.291) and age<5 years (RR 1.2;95%CI:0.9-1.6; p=0.228), HIV-infection (RR 1.6;95%CI:1.2-2.1; p=0.001) was associated with higher POCUS-positive results in TB patients.
Conclusions: We found a high prevalence of POCUS signs in children with TB compared with children with unlikely TB. Children living with HIV were more likely to have POCUS-positive. TB-focused POCUS can play a supportive role in the diagnosis of TB in children.

OA32-361-15 The performance of WHO-recommended child TB treatment decision algorithms in an individual participant dataset from multi-centre diagnostic accuracy studies in lower-middle-income countries

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Background: In 2022, the World Health Organization (WHO) conditionally recommended the use of treatment decision algorithms (TDAs) for treatment decision-making in children <10 years with presumptive TB, aiming to decrease the case detection gap and improve treatment access in high TB-incidence settings. WHO called for external validation of these TDAs.
Design/Methods: Within the Decide-TB project, we generated an individual-participant dataset (IPD) from prospective TB diagnostic accuracy cohorts (RaPaed-TB, UMOYA) established in five countries (South Africa, Mozambique, Malawi, Tanzania, India).
We assessed diagnostic accuracy of TDAs-A (incl.chest radiography [CXR]) and -B (without CXR) outlined in the WHO operational handbook using the NIH-consensus case definitions as the reference standard (confirmed and unconfirmed versus unlikely TB). Subgroup analyses included high-risk groups (<2 years, severe acute malnutrition [SAM], children with HIV [CHIV]).
Results: Of 1,041 children included under 10 years, median age was 2.8 years (IQR:1.3-5.5), 8.7% (91/1,041) SAM, and 13.1% (136/1,041) were CLHIV, 19.6% (204/1,041) had confirmed, 49.5% (515/1,041) unconfirmed, and 30.9% (322/1,041) unlikely TB.
Of all children, 81.3% (846/1,041) were recommended to start treatment, based on TDA-A, resulting in a sensitivity of 90.3% (95%CI:87.9-92.6) and a specificity of 38.8% (95%CI:23.8-35.2). For TDA-B, estimated sensitivity was 87.8% (95%CI:85.2-93.8) and specificity 34.8% (95%CI:29.8-40.1).
Sensitivity was similar for children at high and low-risk (TDA-A:91.2% [95%CI:87.6-93.8] vs 89.5% [95%CI:86.0-92.1]; TDA-B:83.6% [95%CI:79.1-87.2] vs. 91.3% [95%CI:88.1-93.7]) while specificity was pronouncedly higher for the former (TDA-A:51.2% [95%CI:42.6-59.7] and 30.8% [95%CI:24.7-37.6]; TDA-B:46.5% [95%CI:38.0-55.1] vs. 27.2% [95%CI:21.4-33.8]).
Conclusions: External validation of WHO-TDAs on previously collected data using a large IPD shows a high sensitivity for both TDAs in line with the meta-analyses that generated the WHO-TDAs. Specificity was higher in children at high-risk of dying from TB, including CHIV and those <2 years, while maintaining a high sensitivity, highlighting the potential of TDAs to address diagnostic challenges in the most vulnerable groups.

OA33 Cost associated with TB

OA33-362-15 Cost of TB care and equity in distribution of catastrophic TB care costs across income quintiles in India

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Background: An objective of India's National Strategic Plan to End-TB is to achieve zero catastrophic costs for TB affected households. Despite free TB diagnosis and treatment offered under the National TB Elimination Programme (NTEP), persons with TB (PwTB) incur substantial financial burden for TB care. ICMR-National Institute of Epidemiology estimated the costs incurred by PwTB during TB care and the factors associated with incurring the costs.
Design/Methods: We conducted this cross-sectional study among PwTB whose treatment outcome was declared between May 2022 and February 2023 under NTEP. Total patient costs were measured through direct medical, non-medical and indirect costs. Catastrophic costs were defined as expenditure on TB care >20% of the annual household income. Factors influencing the total cost of TB care were measured using median regression. A cluster-adjusted, generalized linear regression model with Poisson family and log link was used to determine the factors associated with catastrophic costs. This study was carried out with funding from the U.S Agency for International Development Tuberculosis Implementation Framework Agreement project implemented by JSI Research & Training, Inc.
Results: The mean age of 1407 PwTB interviewed was 40.8(SD 16.8) years, of whom 865(61.5%) were male,786(55.9%) were economically active, and

258(18.3%) were hospitalized. The median(IQR) total costs of TB care were US$386.1(130.8,876.9). Direct costs(34% of total cost) were US$78.4(43.3,153.6) and indirect costs were US$279.8(18.9,699.4). PwTB <60 years of age (US$446.1;370.4,521.8), with no health insurance (US$464.2;386.7,541.6), and hospitalized (US$900.4;700.2,1100.6) incurred higher costs. Catastrophic costs, experienced by 45% of PwTB, followed a pro-poor distribution. Hospitalized PwTB (adjusted prevalence ratio(aPR)=19;1.6,2.2) and those notified from private sector(aPR=1.4;1.1,1.8) were more likely to incur catastrophic costs.

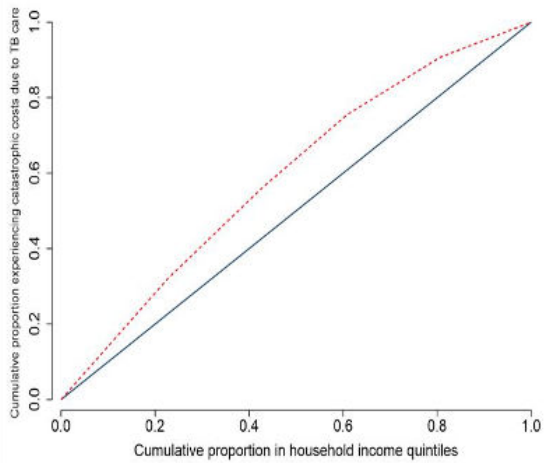

Figure 1. Concentration curve showing distribution of catastrophic TB costs experienced by the PwTB, India, 2022 (N=1407).
DC: Direct cost, TC: Total cost, AHI: Annual household income

Conclusions: PwTB in India incur high costs for TB care especially due to lost productivity. Nearly half of PwTB incur catastrophic costs, especially those from poorer income quintiles, who are hospitalized and treated through the private sector.

OA33-363-15 Improving AHD care through cost-effective capacity building approaches

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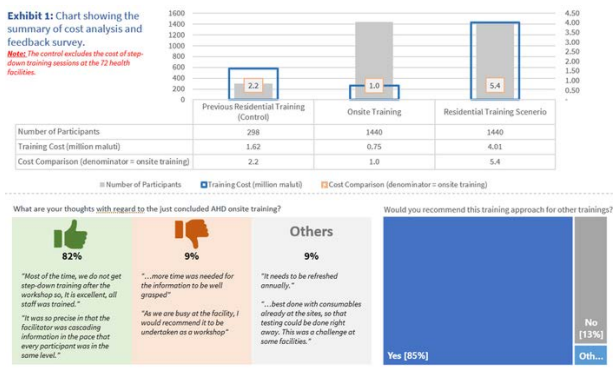
Background and challenges to implementation: In Lesotho, the Advanced HIV Disease (AHD) landscape has experienced significant shifts since the roll-out of the AHD program in 2019.
Furthermore, findings from an AHD supportive supervision conducted in 2023 highlighted gaps in health-worker ability to diagnose and manage AHD-related illnesses. To address these needs, the Ministry of Health (MoH) employed an on-site training model.
Intervention or response: We ascertained and analyzed the cost of a prior residential AHD training (excluding step-down training sessions) in 2022 and compared it to the on-site training approach conducted in 2023. The two training approaches were targeted at the 18 hospitals and 54 health centres providing AHD care across all ten districts in the country.
The cost analysis also included a hypothetical scenario where the same number of participants trained using the onsite approach were trained using the residential approach.
Lastly, we conducted a post-training survey to gain insights into this approach.
Results/Impact: 1,440 participants, including clinicians, pharmacists, laboratorians, counsellors, supply chain officers, and M&E officers, were trained using the onsite training approach.
Our cost analysis revealed that onsite training was 5.4 times more cost-effective than the residential training scenario.
Cost comparison between a previously conducted residential AHD training (control) for the same number of facilities also showed that the cost of the residential training was 2.2 times higher compared to the onsite training despite training a smaller cohort (21%).
Furthermore, participant feedback indicated increased confidence in offering AHD services after onsite training, with 85% of respondents recommending this approach for other trainings.



Conclusions: In our experience, on-site training was found to be more cost-effective than residential training approaches, and other AHD programs may want to explore this approach, especially in the context of declining donor funding.

OA33-364-15 Identifying barriers to social protection for food insecure people living with HIV and TB in Zimbabwe: Results from a multi-method study

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Background: Tuberculosis (TB) disproportionately affects the most vulnerable. TB perpetuates unmet social needs such as food insecurity, a determinant that increases the risk of poor TB outcomes such as treatment failure, recurrence, and death. Nutritional support and other social protections (SP) have been shown to improve TB outcomes by addressing underlying social determinants of health. We sought to assess the burden of poverty and food insecurity among TB/HIV co-infected individuals in Zimbabwe.
Design/Methods: In this multi-method study, we surveyed people living with HIV (PLHIV) at risk of TB regarding experience of poverty, food insecurity, and access to SP between January-July 2023 at 321 health facilities across 15 districts in Zimbabwe. Additionally, between August and September 2023, we conducted semi-structured interviews among 13 purposefully selected TB-affected participants using an equity-focused implementation science framework to describe the impacts of food insecurity on TB care and barriers to accessing SP.
Results: Among 589 PLHIV surveyed who reported having active TB disease, 123(21%) were categorized as vulnerable to poverty, and 373(63%) were multidimensionally poor. Despite half of TB-HIV co-infected individuals (n=320,54%) reporting food insecurity, only 152(26%) of the total population and less than half (48%) of those with food insecurity reported ever receiving SP (Figure 1). Participants noted that poverty and living 'hand-to-mouth' limits access to nutritious foods during TB treatment while TB itself exacerbates food insecurity from inability to work and reduced income. While SP programs exist in Zimbabwe, barriers to access include limited program eligibility, lack of community awareness about programs, unreliable program sustainability, and benefits which did not match needs.

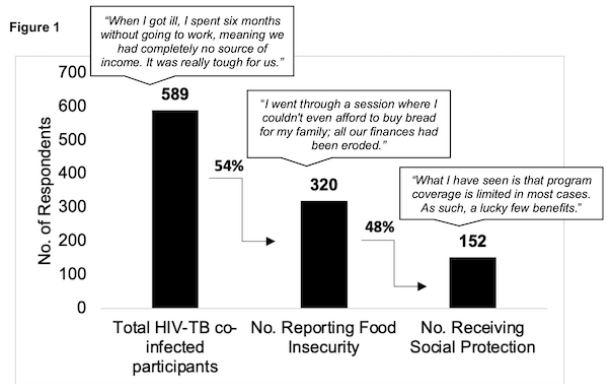

Figure 1. Cascade of food insecurity and social protection receipt among HIV-TB co-infected individuals receiving care at HIV clinics in Zimbabwe.

Conclusions: While food insecurity and poverty are widespread among this population of TB/HIV coinfected individuals in Zimbabwe, social protection coverage remains low. Interventions are needed to overcome structural barriers that impede access to these programs that address unmet social needs.

OA33-365-15 Baseline assessment of social assistance programs for people affected by TB and their households in Uganda: A situation analysis

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Background and challenges to implementation: Robust social protection systems are crucial for supporting people with TB and align with global TB control targets and commitments from the 2023 UN High-Level meeting. We conducted a participatory action mixed-methods study to understand the social protection landscape for people with TB in Uganda.
Intervention or response: Between October-November 2023 we conducted document reviews and completed surveys and semi-structured interviews with key informants using a WHO-recommended protocol adapted for Uganda. We collected data on social protection program characteristics, coverage, and accessibility, and categorized programs as TB-specific or TB-sensitive, and responsive or inclusive.
We summarized qualitative barriers to program access/implementation from the supply and demand-side perspective.
Results/Impact: Surveys (n=26) among TB and social protection program representatives, governmental and non-governmental organization employees, community members, and TB survivors revealed a multitude of programs (n=19) managed by diverse entities, including governmental, non-governmental, and community-led initiatives.
Among these, the Enablers Program (funder: Global Fund) emerged as the sole TB-specific initiative both inclusive and responsive to the needs of people with multidrug resistant TB. Key informant interview data (n=18) revealed administrative challenges and limited resource allocation as significant implementation barriers.
Prominent demand-side barriers included lack of program awareness among intended beneficiaries and bureaucratic complexities. These results demonstrated insufficient awareness and differing perspectives on program inclusiveness, key population coverage, and ability to address socioeconomic shocks among intended beneficiaries.
Conclusions: TB-specific programs responsive to the needs of people with drug-sensitive TB are lacking in Uganda. TB-sensitive programs fail to benefit people with/at-risk of TB due to supply, policy, and programmatic barriers that hinder access. Lack of unified understanding of program characteristics including their ability to meet the needs of people with TB underscores the need for a more coherent approach to program implementation. Addressing these barriers is imperative to ensure equitable access to social protection for TB-affected households.

OA33-366-15 Dissaving is common among people undergoing TB diagnostic evaluation across four high-burden countries for TB

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Background: Tuberculosis (TB)-affected households often face dire socioeconomic consequences of disease which are associated with poor TB outcomes. Examples include catastrophic costs, which can be difficult to enumerate, and negative financial coping strategies, such as dissaving, which are simpler to identify. We assessed the prevalence of dissaving among people accessing TB diagnostic services in 4 high-TB burden countries, as well as demographic and clinical factors associated with dissaving.
Design/Methods: From December 2022-March 2024, surveys were conducted among adults with no prior history of TB undergoing diagnostic evaluation at health facilities in the Philippines, Vietnam, Uganda, and India. Surveys collected self-reported health and sociodemographic data, including questions about dissaving and unmet social needs. Dissaving was defined as having: taken out a loan, sold a household asset, reduced household food consumption, withdrawn from long-term savings, or taken a child out of school to cover the costs of TB care. We used multivariate logistic regression to assess for characteristics associated with dissaving.
Results: Among 571 participants (median age 45 years, 50.6% (n=289) female, 2.6% (n=15) HIV-positive, 16.5% (n=92) diabetic), 317 (56.6%) engaged in any type of dis-

saving, with withdrawal from savings being most common (Table). Multivariate logistic regression revealed that lower education was associated with a greater odds of dissaving (No education: odds ratio [OR]=3.11, 95% confidence interval (CI): 1.20-8.05; Primary/some primary: OR=2.68, 95% CI: 1.25-5.77; Secondary/some secondary: OR=2.02, 95% CI: 1.35-3.01). Additionally, those with HIV (OR=3.58, 95% CI: 2.74-4.69), multidimensionally poor people (OR=1.75, 95% CI: 1.40-2.20), and those with diabetes (OR=1.44, 95% CI: 1.04-1.99) were at greater risk of dissaving.

No education	31 (5.4%)
Primary/some primary education	127 (22.2%)
Secondary/some secondary education	287 (50.3%)
Post-secondary education	126 (22.1%)
Dissaving: Used savings	246 (43.1%)
Dissaving: Took out a loan	109 (19.1%)
Dissaving: Reduced household food consumption	64 (11.2%)
Dissaving: Sold a household asset	49 (8.6%)
Dissaving: Took a child out of school	21 (3.7%)

Table. Self-reported characteristics of 571 survey participants undergoing tuberculosis diagnostic evaluation in the Philippines (n=134), Viet Nam (n=157), Uganda (n=131), and India (n=149).

Conclusions: Dissaving is prevalent even among people undergoing testing for TB. Poverty, less education, and coexistent diagnoses made these individuals significantly more vulnerable to dissaving. Targeting socioeconomic interventions for those with existing health conditions and/or heightened socioeconomic risk should be considered to improve TB outcomes.

OA33-367-15 Costs, including catastrophic costs, of people with TB with unhealthy alcohol use in Pune, India

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Background: Although tuberculosis (TB) services are free in India, patients face large hidden costs impacting their long-term socioeconomic status. TB patients with unhealthy alcohol use may face greater risks for unfavorable TB treatment outcomes and socioeconomic burden; yet there lacks empiric evidence for this population. In this study, we assessed factors influencing catastrophic costs in TB patients with unhealthy alcohol use in India.
Design/Methods: As part of the Hybrid Trial for Alcohol Reduction Among People with TB and HIV in India (HATHI), we administered a modified WHO TB patient cost survey at enrolment, 8 weeks, and 6 months of follow-up to participants with unhealthy alcohol use in Pune, India initiating on TB treatment. For this analysis, we selected a sub-set who have completed the 6-month follow-up (n=96). We calculated direct and indirect costs for each follow-up period and cumulative total costs per patient. Patient-level risk factors for catastrophic costs were identified using logistic regression analysis.
Results: Up to 6 months' follow-up, patients incurred mean cumulative costs of 39,533Rs (95% CI [29,477-49,589]). Direct costs accounted for 18% while indirect costs accounted for 82% of total per-patient costs. 84% of the direct medical costs were incurred before TB treatment initiation. Monthly average costs were higher during the first 8 weeks of treatment (intensive phase) than during the continuation phase (8 weeks to 6 months). 27% of patients included in our analysis experienced catastrophic costs. Socioeconomic factors, total visits, and care-seeking patterns were associated with catastrophic costs (Figure 1).

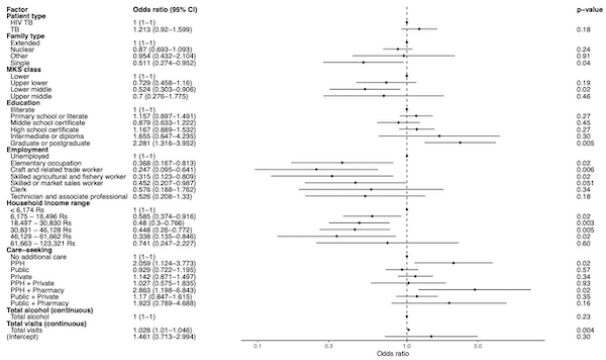

Figure 1. Factors associated with catastrophic costs.

Conclusions: Our study provides initial insights to financial burdens faced by TB patients with unhealthy alcohol use who may face greater risk for catastrophic costs compare to general TB patients. Interventions that address alcohol use behaviors and special attention prior and during TB treatment could be critical in improving treatment outcome and alleviating financial burdens.

OA33-368-15 Financial impact of illness in a cohort of people with TB in Kisumu County, Kenya, during the COVID-19 pandemic, March 2022- January 2023

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Background: Tuberculosis (TB) disproportionately affects the world's poorest populations. In Kenya, the COVID-19 pandemic disrupted economic activity and health services delivery significantly. This investigation aimed at describing the financial impact of illness on TB patients in Kisumu County in the context of COVID-19 pandemic.
Design/Methods: After consent, 200 TB patients aged 18+ years diagnosed in March-July 2022 in Kisumu County were enrolled. They received SARS-CoV-2 antigen and antibody testing at enrollment, month 2 (M2) and month 6 (M6). At enrollment and M6, they were surveyed about household economic status, out-of-pocket health expenses and coping strategies using a standardized questionnaire. We used descriptive statistics and Chi-square tests for association (5% significance level).
Results: Two hundred participants completed the baseline survey; 190 completed the M6 survey. Seven of 10 participants not surveyed at M6 had died. Median age was 38.4 years (IQR: 30.2-48.0); 128 (64.0%) participants were male. At baseline, 32 (16%) reported no income-generating occupation. Sixty-four (32.0%) participants tested antigen- or antibody-positive for SARS-CoV-2 during TB treatment (Table 1).
At baseline, 76/200 (39.8%) participants reported a serious to very serious impact of illness on household finances, compared to 46.3% (88/190) at M6. The proportion of participants with income losses greater than 16 USD increased from 40.5% (81/200) at baseline to 61.1% (116/190) at M6. Participants primarily coped by reducing food intake (51.5%), utilizing savings (47.5%), and borrowing money (46.0%) during treatment.
Compared to TB-only patients, patients with SARS-CoV-2 coinfection reported comparable TB treatment outcomes, out-of-pocket medical costs and income losses, and similar coping strategies (Table 1).

	All TB patients (n=200)	TB patients with SARS-CoV-2 coinfection during TB treatment[a] (n=64)	TB-only patients[b] (n=136)	P value
Patient characteristics				
N (%) Male	128 (64.0%)	45 (70.3%)	83 (61.0%)	0.202[d]
Age (median, IQR)	38.4 (30.2-48.0	38.8 (31.4-44.3	37.6 (29.8-48.8)	0.790[e]
Living with HIV	85 (42.5%)	33 (51.6%)	52 (38.2%)	0.064[d]
TB treatment outcomes				
Cured/Completed treatment	177 (88.5%)	61 (95.3%)	116 (85.3%)	0.148[f]
Died	7 (3.5%)	0 (0.0%)	7 (5.1%)	
Lost to follow-up	4 (2.0%)	2 (3.1%)	2 (1.5%)	
Failed	1 (0.5%)	0 (0.0%)	1 (0.8%)	
Not evaluated	11 (5.5%)	1 (1.6%)	10 (7.4%)	
Total direct out-of-pocket medical costs at M6[c]				
US$ 0-16.00	158 (83.2%)	48 (77.4%)	110 (85.9%)	0.141[d]
Over US$16.00	32 (16.8%)	14 (22.6%)	18 (14.1%)	
Income lost due to not working at M6[c]				
US$ 0-16.00	74 (38.9%)	24 (38.7%)	50 (39.1%)	0.963[d]
Over US$16.00	116 (61.1%)	38 (61.3%)	78 (60.9%)	
Coping strategies ever used during illness				
Decreased food consumption	103 (51.5%)	33 (51.6%)	70 (51.5%)	0.990[g]
Used savings	95 (47.5%)	29 (45.3%)	66 (48.5%)	0.671[g]
Borrowed money	92 (46.0%)	28 (43.8%)	64 (47.1%)	0.661[g]
Sold assets	65 (32.5%)	21 (32.8%)	44 (32.3%)	0.948[g]
Someone interrupted schooling	47 (23.5%)	13 (20.3%)	34 (25.0%)	0.466[g]
Extent to which illness affected the household financially at M6[c]				
No or little impact	46 (24.2%)	18 (29.0%)	28 (21.9%)	0.558[d]
Moderate impact	56 (29.5%)	17 (27.4%)	39 (30.5%)	
Serious or very serious impact	88 (46.3%)	27 (43.5%)	61 (47.7%)	

[a] Patients who were SARS-CoV-2 antigen-positive at baseline (n=12), M2 (n=4) or M6 (n=0), or SARS-CoV-2 antibody-positive for the first time at M2 (n=39) or M6 (n=9)
[b] Patients who were SARS-CoV-2 antibody-positive at baseline (n=97) or never tested antibody- or antigen-positive for SARS-CoV-2 at any point in time during the study (n=39)
[c] The M6 denominator includes 190 patients who completed the M6 interview (62 patients with SARS-CoV-2 coinfection during TB treatment, 128 patients with TB only)
[d] Chi square test
[e] Mood's median-test
[f] Fishers exact test
[g] Proportion difference test

Table 1. Participant characteristics and financial impact of disease on TB patients with and without concurrent SARS-CoV-2 infection, Kisumu County, Kenya, 2022-2023

Conclusions: Our findings show the negative impact of illness on TB patients' economic situation. Coping strategies may result in further adverse health outcomes and worse economic situation. The results may underestimate the health costs and financial impact at M6 due to the inability to survey patients who died.

OA34 Strategies bridging education and communication for transformative outcomes

OA34-369-15 Maximising knowledge retention for TB professionals in Ukraine with retraining

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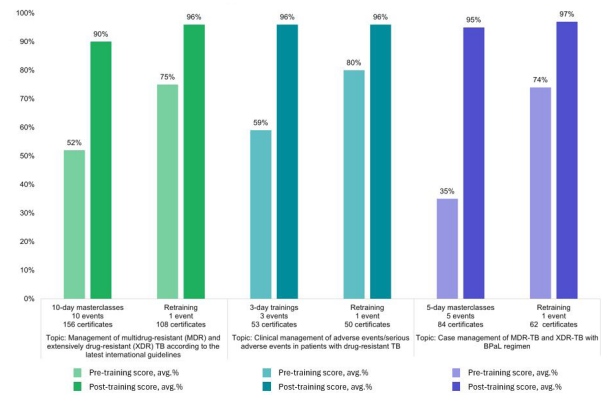
Background: In 2020, the USAID-funded, PATH-led Support TB Control Efforts in Ukraine (STBCEU) project established the National Training Center (NTC) to ensure consistent education for TB medical professionals. However, a structured system for continuous retraining to enhance adult learning has been notably absent. Traditionally, knowledge and skills enhancement occurred during supportive supervisory visits. COVID-19 and the war in Ukraine restricted these field visits, highlighting the critical need for a structured retraining approach to maintain educational engagement after initial training.
Design/Methods: In collaboration with the STBCEU and the USAID-funded, OATH-led Bringing Innovations to Treat TB in Ukraine projects, the NTC conducted 18 trainings from December 2021 to December 2023 for TB professionals across 17 regions, focusing on three topics related to drug-resistant TB management. Pre- and post-training assessments showed initial knowledge levels ranging from 35%-59%, varying with topic novelty. Post-training results indicated a significant knowledge increase, with scores rising to 90%-95%. To ensure continuous supportive supervision, the NTC conducted retrainings on average six months after the initial training sessions.
Results: The NTC conducted three subsequent retrainings for the same cohort of participants—one for each topic—to reinforce knowledge retention. These retrainings combined interactive learning with practical exercises, using clinical cases, discussions, and daily assignments with reviewable materials. Retrainings revealed a decline in knowledge retention, with average pre-test scores of 77%. After the retrainings, post-test scores rebounded to 96%.



Comparative analysis of initial and retraining knowledge levels in TB training.

Conclusions: A noted decline in knowledge retention several months after the training highlights the need for ongoing retrainings to sustain TB expertise among healthcare professionals.
Retraining significantly boosted knowledge, emphasizing the importance of continuous education to maintain high competency levels.

OA34-370-15 Leveraging music to promote TB awareness in Kenya

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health concern in Kenya, particularly among learners in educational institutions. There exists TB knowledge gap among learners and educators alongside factors like overcrowding and poor ventilation in schools, leading to increased spread, delayed diagnosis, and TB-related deaths. Over the years, there's been a rise in TB among school-age children, comprising approximately 20% of the country's TB burden.
To address this challenge, Ministry of Health-National TB Program (NTP) collaborated with Ministry of Education (MoE) to utilize music, specifically the Kenya Music Festivals (KMF), as a platform to raise TB awareness among learners and educators during the annual national event.
Intervention or response: The Global Fund TB project in collaboration with NTP engaged KMF to partner in TB awareness through music festivals. The project supported six categories of choral verses and music in Swahili and English for competitions among primary, secondary, and tertiary learners. These performances took place at zonal, regional, and national levels in 2023. TB messages embedded within the verses and songs were aligned with NTP

guidelines. Winning schools received awards at all levels, with live broadcasts on Edu TV, a MoE channel reaching wide audience across Kenya and beyond. Additionally, findings were utilized in refining school health policy under MoH-NTP.

Results/Impact: The initiative successfully reached a total of 13,974,250 individuals with TB messages, with 4,761,422 (34%) being learners, 7,028 (0.05%) trainers, 800 (0.005%) adjudicators and KMF officials and 9,205,000 (65.9%) from general population. Edu TV channel garnered viewership of 130,000 during National level competitions.

Conclusions: Utilizing platforms like music festivals proves to be effective in promoting health awareness. A multi-sectoral approach involving collaboration between health and education sectors is crucial in addressing health concerns and fostering awareness.

Children and youth serve as influential health ambassadors within their communities, emphasizing the importance of engaging them in health promotion.

OA34-371-15 Teachers as TB advocates: A school-based community-driven approach to TB awareness - the CHIRAATH Initiative

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Background and challenges to implementation: CHIRAATH, the lamp of light, is a visionary concept designed to foster enlightenment among students, facilitated by the guidance of teachers. Control of Tuberculosis (TB) has formidable social and healthcare obstacles, necessitating robust community-based interventions. Persistent stigma and a dearth of awareness persist despite strides in treatment.

Intervention or response: The program commences with comprehensive training sessions for identified teachers of a district in Kerala state, India on fundamentals, prevention of infection, and effective communication. Trainers from the healthcare and education sectors orchestrate interactive sessions, employing multimedia resources to fortify key messages.

Subsequently, equipped teachers spearhead TB awareness initiatives in their schools, utilizing official resources disseminated through educational channels. The effectiveness of the intervention was studied in research mode using a quasi-experimental study design.

Results/Impact: Training was provided to science teachers from 305 schools. The mean age of the teachers was 43.7 (7.6) years, 88 % women. The study demonstrated 20% increase in the average score from the pre-test to the post-test ($p<0.001$) indicating a substantial enhancement in TB knowledge.

Additionally, 75,000 students received awareness sessions as part of the intervention. The students demonstrated the knowledge they acquired through poster presentations, which were showcased during World TB Day.

Operating on a zero-cost budget, CHIRAATH showcases remarkable cost-effectiveness and scalability, potentially impacting approximately 300,000 individuals (considering family size of 4) within the district.

Conclusions: CHIRAATH emerges as a promising public health intervention, capitalizing on educator empowerment and intersectoral collaboration. By nurturing educators as frontline advocates, the program facilitates widespread dissemination of TB knowledge, aligning with national TB elimination objectives. The initiative empowers children to lead TB elimination, fostering a future free from TB through widespread adoption and replication. This intervention aims to demonstrate the pivotal role of teachers as effective advocates for advancing the vision of TB elimination, applicable across all regions worldwide.

OA34-372-15 Risk and behavioral change communication: Sensitising primary and secondary school teachers to improve childhood TB detection in Kano state, Nigeria

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Background and challenges to implementation: Childhood TB case notification in Nigeria was only 7% of the total TB cases notified in 2022 (Global TB Report, 2023). Improving childhood TB entails using multi-pronged strategies to improve awareness, increase diagnostic access and use of program innovations to find the missing cases. Sensitizing school teachers through targeted training programs can improve childhood TB detection. This approach not only aids early detection but contributes to better health outcomes for children.

We present results of a pilot targeted training for school teachers in Kano state, Nigeria towards improving childhood TB case detection.

Intervention or response: KNCV Nigeria collaborated with Break Through Action Nigeria through support of the Kano State TB and Leprosy control program to organize social and behavioral change communication training targeting primary and secondary school teach-

ers to improve childhood TB case detection. The training sessions covered basic knowledge about Tuberculosis, risk factors for transmission and how to identify and refer presumptives, the participants were expected to step down the knowledge to other teachers in their various schools as well as their students and to revive their school health committees and identify TB ambassadors among the students for continuous sensitization and awareness creation.

Results/Impact: 272 teachers drawn from public primary (33%) and secondary schools (67%) in the state were trained during the 10 days training program. Sixty percent (60%) of the training participants were male teachers and 40% were female teachers. Three months post training evaluation of TB case finding in the state showed a significant 12% increase in childhood TB case notification.

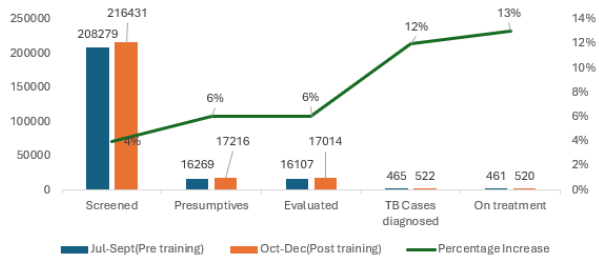

Figure. Pre & post training childhood TB case finding cascade showing percentage increase between the two periods.

Conclusions: The training demonstrated the practicability of achieving substantial behavioral change within a short period moving participants from a stage of limited knowledge/advocacy to one of active engagement and informed action. Periodic review meetings will play a crucial role in ensuring sustainability thereby improving childhood TB case finding in the state.

OA34-373-15 Knowledge, attitude, and practice of TB prevention among female sex workers in the urban area of Aba, South East Nigeria

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Background: In Nigeria, Tuberculosis (TB) continues to pose a significant public health challenge, particularly among high-risk populations such as female sex workers (FSWs). These individuals often face barriers to accessing health information and services, making it crucial to explore the knowledge, attitudes, and practices (KAP) of TB prevention among FSWs to enhance TB prevention efforts within this high-risk group.

Design/Methods: A cross-sectional study was conducted with 103 FSWs in Aba using purposive sampling. Structured questionnaires were administered to collect data on demographics, knowledge of TB, attitudes towards TB, and practices related to TB prevention. The ages of respondents ranged from 18 to 45, with a median age of 31 years. The study utilized descriptive statistics to summarize key demographic variables and inferential statistics (Chi-square tests) to examine the relationship between demographic factors and KAP towards TB.

Results: Preliminary findings indicate that 70% (n=72) of participants possessed a basic understanding of TB transmission. However, gaps in awareness about TB symptoms and prevention strategies were identified, with 52% (n=54) and 45% (n=46) of respondents respectively, lacking comprehensive knowledge. Despite this, a notable 85% (n=88) demonstrated a proactive attitude towards TB prevention, with 75% (n=77) actively engaging in at least one preventive behavior. The consistency of these KAP elements across age groups was confirmed, showing no significant differences related to age ($p>0.05$).

Conclusions: The study highlights critical knowledge gaps in TB prevention among FSWs in Aba but also points to a generally positive attitude towards TB prevention and the adoption of preventive practices. To effectively reduce the TB burden within this vulnerable group, targeted educational programs that address these gaps and leverage the existing positive attitudes are essential. Future strategies should aim to expand such initiatives and integrate them with broader public health measures to combat TB more effectively in Nigeria.

OA34-374-15 TB coaching practice to improve quality of TB care in healthcare facilities: Experience from 28 districts in Indonesia

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Background and challenges to implementation: Indonesia is the second-highest country with tuberculosis (TB) burden in the world with more than 1 million new TB cases reported annually. The ability of health workers in managing TB is essential to ensure equal access to standardized TB care for all. Nonetheless, 46% of health workers were trained in the national TB programs (NTP, 2023). It resulted in a low adherence to standardized TB care. A systematic approach is required to increase the capacity of health workers in the TB program.

Intervention or response: TB Coaching is an activity that helps health workers describe any issues they face when providing standardized TB care in their institutions. This intervention enables health workers to identify solutions to each difficulty encountered in TB care. TB Coaching was started in six piloted districts in 2022, with an expansion to 28 districts in 2023.

Results/Impact: 1.257 health workers were coached at 107 healthcare facilities across 28 districts. The number of presumptive TB cases reported and tested with mWRD test machines at facilities increased by 29% and 38%, respectively, compared to before the intervention. Best practices were identified, including the creation of a forum for TB consultation among health workers, the strengthening of internal and external TB care network, and the improvement of professional organizations' contributions to the TB program.

Conclusions: TB Coaching has been shown to be effective in enhancing TB case notification, health worker capacity in the TB program, and professional organizations' contributions to the TB program.

OA34-375-15 Harnessing potential of youth voices for TB care and prevention: An experience from India

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Background and challenges to implementation: Young people have been relatively unengaged in the TB response in India, with few mechanisms to foster their active participation. 'Gen Z' are considered to have a fairly high social consciousness and an interest in health issues but this has remained untapped for TB. This is despite the fact that in general, at least one-third of all people notified with TB are in the 15-30 age group.

Intervention or response: In 2022-2023, consultations were held with youth groups to understand their perceptions of TB. As the next step, a Youth TB Champions Programme was designed and implemented to train and mentor young TB survivors to become TB Champions and mobilise community participation for TB elimination. The programme culminated with a Youth TB Conclave bringing youths, academics, industry experts and policymakers to share innovative solutions and strategies for a national campaign for TB elimination.

Results/Impact: Consultations with 300 youths highlighted their understanding on TB and identified engagement strategies. 26 young TB survivors from 11 Indian states were selected and trained to become effective communicators under the programme. They developed over 146 communication products including photostories, skits (written and directed by them), posters, videos, reels and blogs, using them to generate large-scale awareness on TB among students, youth club members, TB-affected community, elected representatives and community. They organised local consultations in schools, colleges, youth hostels, youth clubs, village centres, cafés, coaching centres, focusing on awareness generation and assessing youth perception on TB. Over 130 stakeholders came to a consensus at the Youth TB Conclave to look at TB through a lens of intersectionality and undertake a national campaign with audience-specific messages.

Conclusions: India's strength lies in its large youth population, which when mobilised can generate a mass movement required to make TB a conversational, non-taboo topic and achieve India's goal of TB elimination by 2025.

OA34-376-15 Effectiveness, satisfaction, and cost analysis of a blended learning course for TB case managers

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Background and challenges to implementation: Tuberculosis case managers (TCM) training in Taiwan comprises initial training (IT) and refresher training (RT) for experienced nurses. IT focus on foundational knowledge and theory, while RT emphasizes practical skills.The IT training format underwent a transition from traditional in-person lectures to online instruction post-COVID-19 after 2020. In 2023, RT incorporated face-to -face group discussions with each group (about 10 participants) led by an experienced TCM. We investigate the effectiveness and acceptance , and cost analysis of this blended learning approach.

Intervention or response: A retrospective study analyzed participants in the Taiwan TCM training from 2020 to 2023. Pre- and post- test scores (gain scores) for IT participants and RT satisfaction levels (Likert scale) were compared between the two periods. An analysis of training cost was also conducted .
Results/Impact: Compared to the 2020 in-person training (n=476), online IT in 2023 (n=560) demonstrated a significant increase in gain scores (11.4±15.8 vs 17.1±16.2, p<0.001) and IT pass rate (88.7% vs 95.2%, p<0.001). The proportion of individuals initially failing the IT pre-test but subsequently passing the IT post-test increased from 71.8% in 2020 to 86.7% in 2023 (p=0.001). RT participants' satisfaction levels also improved (86.2% vs 93.0%, p=0.037), with 69.2% providing written feedback, emphasizing the benefits of face-to-face discussions. The cost analysis revealed significant savings for the 2023 Blended Learning Course (IT + RT) compared to 2020 in-person training, with a reduction of USD$5,200 from transitioning IT to online format and an increase of USD$520 due to the addition of group leaders in RT, resulting in a net cost savings of USD$4,680.
Conclusions: The blended learning approach proves effective and cost saving for the training of TCM compared to traditional training methods. While online videos are advantageous for theoretical understanding, face-to-face discussion are crucial for practical skills development in case management.

OA35 Tools and technology for TB

OA35-377-15 Impact of electronic return of laboratory results on turnaround time through LIMS in resource-limited settings

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Background and challenges to implementation: Historically, the Zimbabwean laboratory results return system relied on a courier system through the national transport system, with results ferried by riders on a set route schedule. However, long turnaround times (TAT) due to inadequate national capacity for results return from all sites visited daily, and planned route schedules not being completed due to various circumstances have been observed. The existing in-country Laboratory Information Management System (LIMS) was customized in 2022 by utilizing Short Messaging Service (SMS) for return of TB results to the health facilities and clinics. This abstract demonstrates the impact of this innovative approach in accelerating TAT of TB results in resource-limited settings of Zimbabwe.
Intervention or response: A quantitative descriptive analysis of TAT was conducted evaluating the post-analytical TAT between the existing paper-based delivery system of results in comparison to the electronic delivery of results via SMS in two provinces. Data from 262 sites collected between 2022-23 were used. TAT was quantified as the difference between date result received at facility and date result dispatched at the laboratory, using standardized data collection templates. The average of the differences was then calculated and compared with electronic TAT.
Results/Impact: We observed a notable decrease in TAT of TB laboratory results after the SMS functionality was added to LIMS. On average, TAT deceased from four to one day in Masvingo province and from five to one day in Matabeleland South province. SMSs with TB laboratory results were transmitted by LIMS within an hour after the results became available in the laboratories.

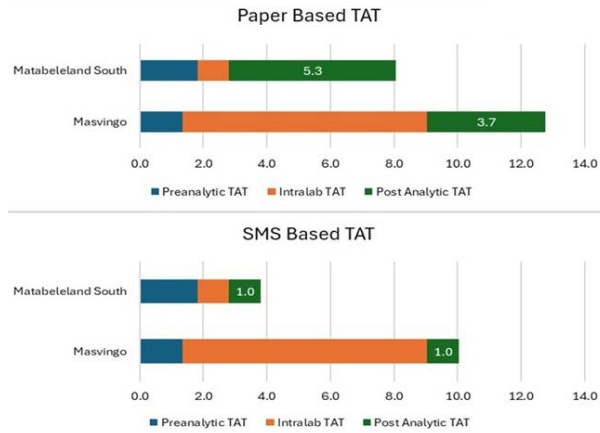

Figure. Impact of electronic results relay on TB turnaround time.

Conclusions: The introduction of electronic results return interventions is pivotal in the timely relay of results in resource-limited settings. This allows near real-time delivery to sites, promoting improved patient care for potentially over one million patients, which is critical for timely and appropriate prevention, care, and treatment.

OA35-378-15 TB Watch: An automated monitoring system for targeted field actions towards TB elimination in India

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Background and challenges to implementation: End TB strategy emphasizes the importance of robust monitoring system in TB elimination efforts. In line with the above, the purpose of this study was to identify the field-level monitoring challenges under programmatic conditions and devise a monitoring system that effectively addresses these challenges.
Intervention or response: Formative research was undertaken between April 2023-June 2023 in Uttar Pradesh which aimed to identify the challenges faced by field staff during programmatic monitoring. It revealed the need for a uniform, user-friendly monitoring system that could generate offline action-lists for pending public health actions and reduce the person-hours spent on data tasks. Thus TB-Watch, an automated monitoring system using R and Excel, was developed between July 2023-December 2023. TB-Watch provided weekly offline updates of TB scores (a composite score measuring TB program performance) at state, district, and sub-district levels. For user-friendliness, TB-Watch automated the action-lists, effectively reducing person-hours spent on data tasks via Ni-kshay (India's online TB surveillance system).
Based on the ten lowest TB score districts, a stratified randomized parallel arm study was conducted between February 2024-March 2024 to field test TB-Watch in Lalitpur and Lucknow districts. Comparator arm were the remaining eight non-intervention districts of the state. Median TB scores were compared using Mann-Whitney U test.
Results/Impact: The median population in intervention and non-intervention districts were comparable (p=0.889). Intervention districts showed a 35.4% significant increase in TB scores compared to 11.2% increase in the non-intervention districts (p=0.044). Person-hours spent in intervention district for various data management tasks and for field-level action lists, decreased by 89.56%. ($p < 0.001$).
Conclusions: TB-Watch provides a user-friendly solution for field-level targeted offline monitoring of TB program's performance. The automated monitoring system utilizes the existing digital TB surveillance to enhance data-driven decision-making for policy interventions. Scaling up and ensuring quality assurance are vital for sustaining and maximizing its impact.

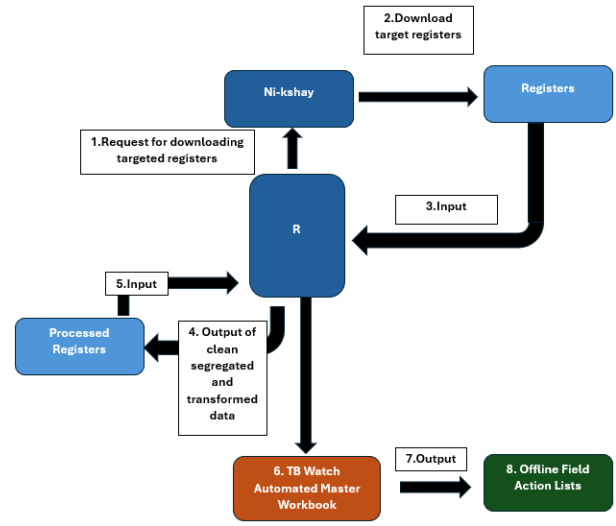

Figure. TB-watch agorithm.

OA35-379-15 PPM hub: A catalyst for digital TB management towards proactive healthcare in the private sector

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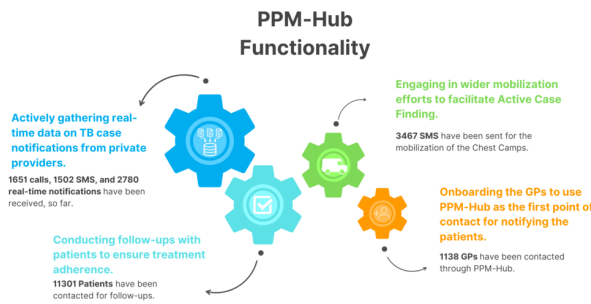
Background and challenges to implementation: Throughout history, Tuberculosis treatment in Pakistan has faced challenges, largely due to the prevalent dependence on the private healthcare sector, which caters to more than 70% of the population seeking medical care as a first point of contact.
The conventional method of recording and reporting TB patient information adopts a reactive approach to patient management, rather than a proactive one.
Intervention or response: To proactively address challenges within the private sector, Mercy Corps Pakistan has introduced the PPM-Hub, a call center and digital platform for TB case management.
The main functions of PPM-Hub are as follows:
- Onboarding the General Practitioners (GPs) to use PPM-Hub as the first point of contact for notifying the patients.
- Actively gathering real-time data on TB case notifications from private providers.
- Conducting follow-ups with patients to ensure treatment adherence.
- Engaging in wider mobilization efforts to facilitate Active Case Finding.

Currently implemented in 34 districts with 1138 GPs onboarded as the first point of contact, the goal is nationwide implementation across all 120 districts of Pakistan.
Results/Impact: As of now, the PPM Hub has been actively engaged, receiving a substantial volume of communication. It has processed 2780 real-time notifications,

comprising 1651 calls and 1502 SMS messages. These notifications facilitated prompt action by field staff, supporting proactive work. Additionally, the hub completed 11,301 patient follow-up interactions, with a remarkable 94% success rate enabling the program to work thoroughly. Furthermore, 3467 SMS messages were dispatched to mobilize individuals for chest camps, aiding the program's active TB patient identification intervention.



Conclusions: The PPM-Hub has played a crucial role in timely patient outreach. Without it, follow-ups would have been delayed by a quarter, risking loss of patients. Its implementation has substantially improved programmatic efficiency, allowing us to provide diligent treatment to patients within critical timeframes.

OA35-380-15 Leveraging connectivity of TB diagnostic instruments with real-time results informing decision-making in Nigeria

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Background and challenges to implementation: Paper-based reporting of tuberculosis (TB) testing is slow and, thus, limits rapid decision-making. Leveraging connectivity of TB diagnostic instruments bridges this gap-routine transmission of data from diagnostic instruments in real-time to the right person at the right time for maximum clinical and economic impact. We provide insights into weekly analysis of real-time results to inform decision-making in Nigeria.
Intervention or response: Key parameters were identified from the GeneXpert database to guide routine monitoring of GeneXpert optimization. Weekly, we download GxAlert data from 501 connected GeneXpert sites across Nigeria. We then analyze these data, weekly, in MS Excel and Tableau. The analysis is then moved, weekly, to a locally created one-stop dashboard to provide insights for focused decision-making. To inform program managers and stakeholders, the dashboard showcases the following: connectivity rate, GeneXpert workload per site, utilization rate of instruments, weekly cartridges consumption, error rate, mapping of MTB/RIF detection by state and top 6 high performing site, and positivity rate of samples tested.
Results/Impact: Nigeria has reduced high weekly wastage of cartridges (error rate) from 4.8% (1056 cartridges) to 2.4% (528 cartridges) (Figure 1) and increased utilization of GeneXpert instruments from 40% (9,600 tests) to as high as 112% (26,880 tests). Over time, connectivity uptime has also increased from a range of 50% to as high as 81%. Furthermore, the detection of drug-resistant TB cases surged by 40%, from 2,384 in 2019 to 3,985 in 2022 as a result of MTB/RIF detected results automatically notified to clinicians, DR-TB focal persons, and program managers through SMS alerts.

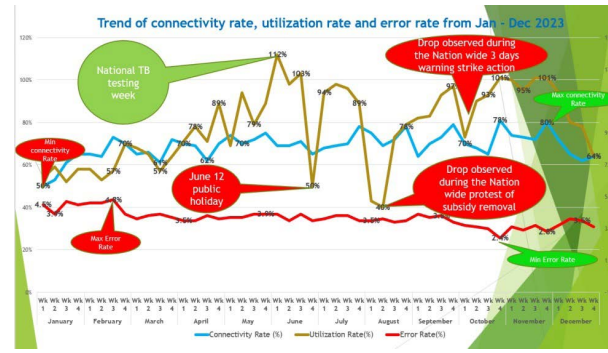

Figure 1.

Conclusions: The weekly routine use of GxAlert real-time results has improved GeneXpert utilization, reduced cartridge wastage, and strengthened GeneXpert connectivity. Further, response times and programmatic decision-making for enrollment of DR-TB patients on treatment have greatly improved with automated SMS alerts.

OA35-381-15 Advancing towards an integrated, comprehensive, case-based TB surveillance system: A case study from Vietnam

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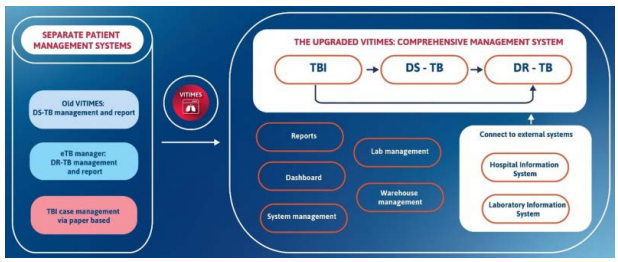
Background and challenges to implementation: Before 2022, Vietnam had separate digital data systems for drug-sensitive tuberculosis (DS-TB) and drug-resistant tuberculosis (DR-TB), and a paper-based tuberculosis infection (TBI) and prevention database. The National TB Program (NTP) and USAID collaborated to create a comprehensive TB data management system to facilitate complete, accurate patient monitoring and program management.

Intervention or response: The USAID Support to End TB project and the NTP evaluated user needs and began upgrading the Vietnam TB Information Management Electronic System (VITIMES) in 2022. The upgraded VITIMES is a complete case-based management system including TBI, DS-TB and DR-TB to facilitate monitoring by TB staff at all levels. The new system was piloted at 11 health facilities at national, provincial and district levels in 2023 and was refined based on feedback from 86 users to optimize functionality.

Results/Impact: The updated VITIMES allows patient records to be linked across TBI, DS-TB, and DR-TB information systems and seamlessly tracks cases across facilities and the care-cascade. One-click data transfer among facilities simplifies TB patient monitoring, minimizing data entry and linkage. Digital and paperless referrals reduce the risk of patient loss-to-follow-up. VITIMES now integrates with Vietnam's hospital and laboratory information systems, providing all available data for TB patient care and management. Advanced functions like report generation, real-time dashboards, and supply and laboratory management tracking provide additional insights. As of March 2024, the upgraded VITIMES has been rolled out nationwide, encompassing 63 provinces and over 900 district health facilities, with nearly 2,000 active accounts.



Conclusions: The upgraded VITIMES streamlines TB patient monitoring, reduces administrative burdens, and contains advanced features for TB program management. Late of March 2024, the Vietnam NTP issued official guidance requiring TB units at all levels to deploy the upgraded VITIMES from April 01, 2024 to manage DS-TB, DR-TB and TBI patients.

OA35-382-15 Enhancing data accuracy in India's TB electronic surveillance system: Insights from a nationwide drug-resistant TB data validation study

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Background and challenges to implementation: India's national tuberculosis elimination program (NTEP) implemented ‚Ni-Kshay,' an electronic surveillance system for the spectrum of TB infection, disease, and drug resistant TB (DR-TB). In 2022, 59,916 MDR-TB patients were reported. Handling numerous data entry points/users across different TB episodes/stages creates complexities, elevates risk of errors, duplications and needs urgent resolution. With the objective of improving data accuracy and quality, we undertook and describe this nationwide MDR-TB data validation study learnings and resolutions.

Intervention or response: A nationwide mixed-methods study was undertaken, comprising a quantitative analysis of MDR-TB records (2022) extracted from Ni-Kshay. These records were validated and cross-checked with laboratory and treatment registers by trained health personnel throughout India. Additionally, qualitative inquiry involved engaging key informants such as data entry operators, DR-TB coordinators, laboratory technicians, doctors, program managers, partners, and WHO TB consultants to identify factors influencing data inconsistencies. Multiple stakeholder consultations, facilitated by the Delphi method, were conducted to synthesize key insights and propose solutions.

Results/Impact: Validation and triangulation of 59,916 MDR-TB records from 2022 revealed a 15.9% error rate, with 46.9% attributed to resolved resistance discordance via rapid molecular technologies (NAAT/LPA). Additional errors arose from regimen reporting discrepancies and duplicate entries. Factors contributing to errors included challenges in resolving discordance, duplicate enrollments, manual input mistakes, misreporting of regimens by private sector entities, low Ni-Kshay literacy, and insufficient training. Resolutions to enhance DR-TB data accuracy and quality involve training Ni-Kshay users to accurately record treatment changes, implementing a triangulation policy for data validation at peripheral centers, and improving Ni-Kshay's internal data validation checks to allow regulated updates from higher-level laboratories.

Conclusions: Our study underscores the need to enhance systems, deploy data triangulation policy with SOPs, train staff for periodic DR-TB data validation, building automated e-validation checks and enable updating umpire results after resistance resolution in Ni-Kshay to improve data accuracy and quality.

OA35-383-15 Ensuring TB data quality in Ethiopia: Role of digitalising mentorship and registers of people with drug-resistant TB

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Background and challenges to implementation: Since 2021, the national TB program has been challenged with data discrepancy between the count on TB unit registers and the data reported to the Ministry of Health due to different understanding of new data elements and indicator definitions. The USAID Eliminate TB Project has been supporting the national TB program through capacity building and supervision activities to alleviate these challenges.
Intervention or response: To improve the data quality, USAID Eliminate TB Project used electronic standard of care (e-SOC), a mentorship and feedback tool, to undertake routine data quality audit (RDQA)-- comparing count versus reported data. The project applied e-SOC, and supported district TB focal persons to carry out RDQA on key indicators. The discrepancy rate was computed as the proportion of the reported minus the recounted divided by reported. The precision level defined between 5 to -5% as an acceptable level of the audit.
Also, the project supported the implementation of case-based surveillance using the drug-resistance (DR) Tracker of DHIS2 for the DR-TB program. The average enrollment rate from the Tracker was calculated as the percentage of DR-TB patients placed on second-line therapy divided by the total number of notified DR-TB cases.
Results/Impact: During October 2019 to September 2023, the discrepancy rate between recount and reported for all forms of TB reduced from 2.4% to 0.8%, from -2% (under reporting) to 1.3% for HIV testing, from 10.5% (over reporting) to 0.9% for contact investigation, from 9.6% (over reporting) to -1.8% for cure rate. Prior to the DR Tracker, the average enrollment rate was 123%. After the Tracker (March 2023-December 2023), the average enrolled rate was 94%-- within acceptable range of precision.
Conclusions: The application of digitalization of SoC and the case-based DR Tracker improved some of the TB indicators. These tools may be scaled up to the remaining health facilities.

OA36 Finding TB in key and vulnerable populations

OA36-384-15 Increasing detection of childhood TB in Bangladesh: Lessons learned through implementation research

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Background and challenges to implementation: Although child tuberculosis (TB) notification has increased from 3% in 2022 to 4% in 2023 and free screening and treatment is available through the National Tuberculosis Control Program (NTP), a significant number of children remain undiagnosed in Bangladesh. The current notification rate is far from the WHO estimated target (10% of adult notifications). There is a critical need for innovative approached to increase child TB detection in Bangladesh.
Intervention or response: Aimed at improving childhood TB detection in Bangladesh, this study implemented an active case-finding program using a digital screening app at outpatient departments (OPDs) of 2 children and 1 tertiary medical college hospitals in Khulna, Bangladesh. This app screened everyone under 15 for TB symptoms using a standardized questionnaire. Individuals with potential TB were referred for evaluation and diagnostics.
Confirmed cases received treatment following Bangladesh's national guidelines. This approach aimed to enhance access to TB services for children and facilitate earlier diagnosis and treatment.
Results/Impact: Between January 2022 and March 2024, we screened 71,401 children for potential TB. The majority of these individuals were either patients who visited the facilities due to other health issues or children accompanying their parents. Out of all the children screened, 2,400 (3.4%) were identified as potential TB cases, with 2,282 (95.1%) undergoing further testing.
Of all evaluated/tested, 115 children (5%) were diagnosed with drug-sensitive tuberculosis (DS-TB), and 3 children (0.1) were diagnosed with drug-resistant tuberculosis (DR-TB). All diagnosed children were subsequently enrolled for treatment.
Conclusions: The yield of the ACF approach that screens and tests individuals regardless of their TB symptoms status was high in our intervention sites. Integrating ACF into existing care delivery platforms of the health facilities has demonstrated the potential for additional TB and DR-TB case detection. The NTP should consider incorporating ACF intervention in high-volume facilities across the country.

OA36-385-15 Enhanced home-based TB contact tracing in rural India, Nagpur, 2021–2022

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Background and challenges to implementation: Household contacts (HHC) of persons with pulmonary tuberculosis (PTB) have higher rates of TB as compared to the general population. Contact tracing is the principal intervention to initiate prevention efforts, but remains ineffective in many programs. We sought to enhance the detection, treatment, and cure of TB infection (TBI) and clinical TB disease among HHCs in rural India.
Intervention or response: From August 2021–May 2022, all HHCs of microbiologically confirmed, drug-susceptible persons with PTB residing in Nagpur, India, were eligible for enrolment. We conducted home visits to screen HHC for TB-related symptoms. HHCs were offered tests for TB infection (QFT; QuantiFERON-TB Gold-Plus), and symptomatic or QFT-positive HHCs were offered chest radiographs and cartridge-based nucleic acid amplification tests (CB-NAAT). HHCs with initial QFT-positive results and no evidence of TB disease were presumed to have TBI and offered three-month, rifampin-based TB preventive treatment (TPT).
From February 2022 to September 2023, we conducted at least two home visits (every 6 months) to screen HHCs for the development of TB symptoms. All HHCs with TB-related symptoms and abnormal chest radiography, or CB-NAAT-positive results were linked to anti-tuberculous treatment.
Results/Impact: We approached 1305 HHCs of 341 persons with PTB. A total of 1038 (80%) HHCs were tested by QFT, 44% (459/1038) had positive QFT results and 82% (374/459) were eligible for TPT.
Among these, 86% (321/374) initiated and 88% (283/321) completed TPT. The median time to QFT result and TPT initiation was three days (range: 1–58 days) and 13 days (range: 1–112 days), respectively.
Seven HHCs were diagnosed with drug-susceptible TB at baseline, and an additional 11 HHCs progressed to disease during the 12-month follow-up.
Conclusions: Home-based contact tracing resulted in high acceptance rates for TBI testing, TPT initiation and completion rates, and the diagnosis of early onset of TB among HHCs.

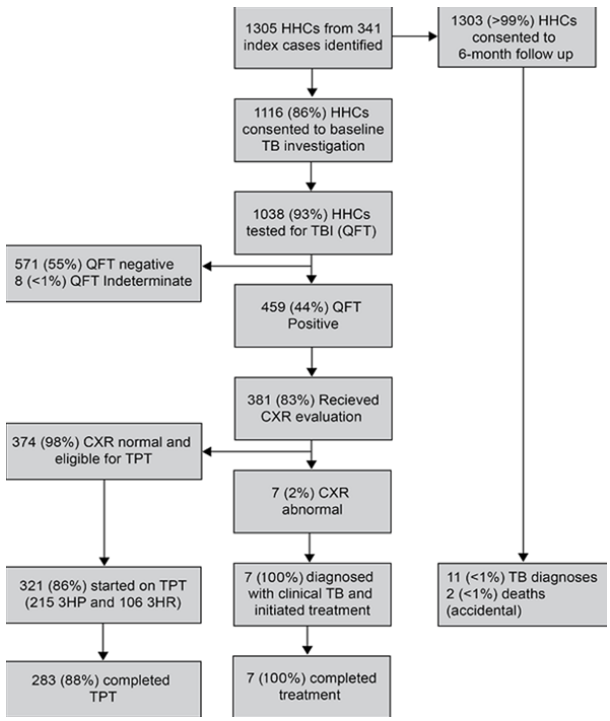

Figure 1. Participant flow household contact active and latent TB intervention, Nagpur India.

OA36-386-15 Incorporating geospatial analysis for targeted case finding activities for TB in rural communities of Pakistan

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Background and challenges to implementation: Pakistan, a high tuberculosis (TB)-burden country with ~608,000 incident cases, faces significant challenges in TB case detection, resulting in 30% of undiagnosed cases in 2022 (WHO 2023)[1]. With a majority of the population residing in peri-urban and rural areas, having limited healthcare access, active case finding (ACF) is critical to target undiagnosed TB among high-risk communities.
We aimed to assess the effectiveness of geospatial mapping to improve TB yield in rural Sindh province, refining our approach iteratively to determine the most effective method for ACF.
Intervention or response: We conducted community-camps in Mirpurkhas district, offering screening, diagnosis, and linkage to care for TB, hepatitis C, Covid-19, and mental health conditions. A point-of-care approach using a mobile van, equipped with artificial intelligence-assisted chest X-ray and Xpert MTB/RIF assay for TB screening

and diagnosis was deployed. Camp locations were identified based on an initial strategy involving TB case detection rates, population density thresholds, proximity to health facilities, and road network accessibility from July to November 2023. Starting December 2023, we refined our approach, incorporating high-yield camps and utilizing Google building footprint data to identify dense population clusters as part of a revised strategy.

Results/Impact: As part of the initial strategy, 28 camps were conducted with a cumulative TB yield of 1.01%. Comparatively, adhering to the revised strategy resulted in 31% improvement in TB yield through 16 camps, increasing the overall TB yield to 1.31% in the district (Figure 1).

Subdistrict-level analysis revealed substantial improvements in yield, notably in Digri (94%), Kot Ghulam Muhammad (108%), and Shujjabad (46%), from initial to revised strategy.

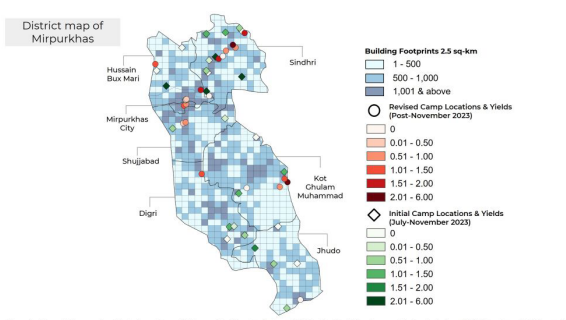

Figure 1: Geospatial comparison illustrating enhanced TB case detection rates between initial and revised TB active case finding strategies within Mirpurkhas district in rural Sindh.

Reference:
1. Global tuberculosis report 2023. Geneva: World Health Organization; 2023. License: CC BY-NC-SA 3.0 IGO.

Conclusions: Our findings underscore the importance of utilizing evidence and geospatial mapping to optimize TB case-finding in resource constrained settings such as rural Pakistan. Contextualizing and tailoring ACF approaches to meet local needs is critical to maximizing impact, relevance, and effectiveness in diverse, high-incidence settings.

OA36-387-15 Can the MATCH framework be used to prioritise the location of active case finding for TB in Vietnam?

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Background: The MATCH framework uses subnational data to identify geographies where people with a particular health condition are likely to be missed by existing health services. We retrospectively assessed the framework's ability to prioritize locations for active case finding (ACF) for TB in Vietnam.

Design/Methods: Between December 2021 and March 2023, 146 ACF events were implemented across five provinces of Vietnam; event locations were selected by government officials without data-driven justifications. Principal component analysis (PCA), a data reduction technique, was conducted to classify 707 communes in the intervention provinces into five groups based on their TB notifications, poverty, urbanicity, and health facility locations. A multi-level logistic regression analysis of ACF participant data measured the association between different PCA commune risk groups and TB detection rate.

Results: 40,513 people were screened by chest X-ray, resulting in identification of 372 people with TB (detection rate = 918/100,000). ACF events organized in PCA commune groups 1 and 5 had TB detection rates of 769 and 1,330 per 100,000 respectively. ACF events organized in PCA commune groups 2-4 had a combined TB detection rate of 588 per 100,000.

Controlling for participant demographic and clinical factors, ACF events organized in PCA commune group 5 were associated with a higher TB detection rate than ACF events in PCA commune groups 2-4 (adjusted odds ratio [aOR] 2.21; 95%CI 1.65-2.96), whereas ACF events in PCA commune group 1 had a marginally higher detection rate (aOR 1.36; 95%CI 0.98-1.90).

PCA commune group	Number of communes	Yield of TB during ACF (per 100,000)	Adjusted Odds Ratio (95% CI)	% of communes with ≥50% of population living in poverty	% of communes with ≥90% of population living ≥10km from a health facility	% population living in rural area	All forms TB notification rate before COVID (per 100,000)
1	143	769	1.36 (0.98-1.90)	50.4%	59.4%	82.5%	39.8
2-4	424	588	Ref	42.5%	58.3%	92.5%	51.2
5	140	1,330	2.21 (1.65-2.96)	33.6%	50.7%	79.3%	99.8

Conclusions: These results indicate that a PCA grounded in the MATCH framework can successfully identify areas with higher rates of undiagnosed TB in communities. Future studies may prospectively evaluate the use of this approach to select ACF event locations, with the aim of maximizing TB case finding efficiency in Vietnam.

OA36-388-15 Comparison of TB prevalence between contacts of bacteriologically confirmed and clinically diagnosed index people with TB

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Background: In 2022, the National TB program in Zambia expanded the scope of contact investigation (CI) to include screening of contacts to clinically diagnosed (CD) tuberculosis (TB) patients, in addition to those of bacteriologically confirmed (BC) TB. The pooled yield of TB among contacts in high burden countries is 3.6%. We aimed to determine the prevalence of TB among contacts investigated for TB under programmatic setting in Zambia.
Design/Methods: We analyzed program data collected between October 2022 to December 2023. We report the TB prevalence from CI disaggregated age groups (< 5 years and ≥ 5 years) and type of TB (BC or CD).
Results: Of the 56,498 TB patients, 30,753 (54.4%) were BC and 25,745 (45.6%) were CD. Overall, 40,191/56,498(71.1%) TB patients had their contacts traced, 149,080 contacts were elicited of which 142,875(96%) were screened for TB. Among those screened 13,449 (9.4%) were < 5 years. A total of 942 (0.7%) were diagnosed with TB of which 29.3% comprised children aged <5 years. Among the < 5 contacts, the prevalence of TB was higher among those whose index was BC compared to those whose index was CD: 2.9% and 0.6% respectively (P<0.001). Similarly, in those ≥5 years, prevalence was higher in BC contacts compared to CD contacts: 0.8% compared to 0.1% respectively (P< 0.001).
Conclusions: Where feasible contact tracing should be done for both BC and CD index TB patients. In resource limited settings contact tracing of BC index TB patients should be prioritized; the prevalence of TB among contacts to BC TB patients is significantly higher than that among CD contacts irrespective of the age of the contacts.

OA36-389-15 Finding the missing children: Experience on enhancing paediatric TB diagnosis in Bombali district, Sierra Leone

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Background and challenges to implementation: Detection of tuberculosis (TB) in children remains below the expected in most settings. In 2022, WHO updated guidelines included new tools to improve diagnosis in this population.
Intervention or response: Since 2020, Médecins Sans Frontières (MSF) supports TB activities in the DOTS centres (8 rural and 4 in urban areas), and regional hospital in Bombali district, Sierra Leone. In 2022, TB health promotion and symptom assessment was introduced in the hospital pediatric wards, outpatient departments of supported health facilities, and among RR/MDR-TB household contacts. Between September and October, health care workers were trained on new WHO pediatric TB treatment decision algorithms, and their use integrated into clinical care.
Concomitantly, LF-LAM, and stools as specimen for Xpert Ultra were introduced as per WHO guidance. Chest x-ray was available in the hospital, as well as a TB sample transportation system between DOTS centres and regional laboratory.
Results/Impact: In 2021, the proportion of children < 15 enrolled on TB care was 10.9% (n=147/1344), and in 2023, 20.9% (n=384/1840), while on RR/MDR-TB care was 0% (n=0/48), and 11.1% (n=7/63) respectively. In 2023, Xpert Ultra was performed in 1823 samples from children, of which 79.1% were under 5, and 81% were on stool specimens. MTB was detected in 3.6% (n=51/1419) of stool and 13.6% (n=45/330) of sputum samples, and rifampicin resistance on 4.2% (n=4/96). No significant difference in positivity rate was found according to gender, referral centre (urban versus rural), or age group (0-4 versus 5-14 years old). LF-LAM positivity in children was same as in adults (32%).
Conclusions: It was feasible to integrate new WHO TB algorithms and tools in a resource limited setting. The intervention resulted in a 2-fold increase in proportion of pediatric TB in the district, and the improvement on identification of RR/MDR-TB among children.

OA36-390-15 Optimising TB case finding among prisoners through enhanced peer-led approach in Kenya

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Background and challenges to implementation: Globally, people newly diagnosed with Tuberculosis (TB) dropped from 7.1 million in 2019, to 6.4 million (–10%) in 2021. This drop suggests significant increase in the number of people with TB missed in both general and congregate settings. TB in prison is estimated to be 10 times higher than the general population with an incidence rate of 1148 per 100,000 persons in Sub Saharan Africa. Kenya's 134 prisons host 65,000 prisoners with annual turnover of 200,000.

Despite routine TB case finding interventions, TB notification in prisons remains low. To optimize case finding, Amref health Africa in collaboration with Kenya Prisons Service, and National Tuberculosis and Leprosy Program implemented enhanced Peer Led approach in 30 high volume prisons through Global Fund support.

Intervention or response: From July 2022 to December 2023, 120 peers (4 in each prison) among prisoners were identified and each attached to prison ward. Peers were sensitized alongside documentation officers and medical orderlies on TB detection and management within prisons. Their role was to create awareness, identify, document presumptive prisoners and link them to clinician for further screening and testing. Peers were provided with cleaning detergents and personal effects worth $2.5 monthly as a token. Reports were aggregated and submitted monthly for analysis and use.

Results/Impact: During the period, 152,597 new and old prisoners were hosted out of whom 126,310 (83%) were screened and 5922 (5%) identified as presumptive by peers. A total of 859 (632 old and 227 new) prisoners were diagnosed with TB and initiated on treatment. Engaged prisons registered 57% increase from 658 inmates with TB notified in 2022 to 1,022 in 2023.

Conclusions: Peer led approach demonstrated significant yield in tuberculosis case identification an option for scale up in all prisons and related congregate settings. Strong documentation and reporting systems are key for informed decision making.

OA36-391-15 Contact investigators with health background: Changing drug-resistant TB narratives in children and adolescents in a southwestern state, Nigeria

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Background and challenges to implementation: In 2022, an estimated 410,000 people developed drug-resistant tuberculosis (DR-TB) globally, with just 43% of them notified. Nigeria is one of the countries with a high DR-TB burden with an estimated burden of 12,000, and the estimated proportion of MDR/RR-TB among new TB cases and previously treated TB cases is 2.5% and 19% respectively.

Childhood TB (CTB) notification has remained low in Nigeria both for drug-susceptible TB and DRTB. In Oyo State in 2021, 10.3% of the DRTB cases were less than 20 years with ages 0 – 14 years accounting for 37.5% proportion of less than 20 years with DRTB.

Intervention or response: We engaged ten contact tracers (CTs) with health backgrounds and trained them on contact investigation with a focus on child and adolescent contacts of DRTB patients. Children and adolescent household contacts of DRTB patients were screened using the World Health Organization's four symptom screening questions. The CTs were linked with clinicians in facilities to provide further review of contacts presumed to have TB. Stool sample collection was encouraged for ages less than 5 years or older children who cannot produce sputum samples. Samples were tested using GeneXpert, and were necessary, chest X-ray was prescribed by clinicians.

Results/Impact: In 2022 and 2023, of the total 197 and 179 DRTB cases diagnosed, 11.7% (23 DRTB patients) and 12.8% (23 DRTB patients) were less than 20 years respectively. Children (0 - 14 years) who were identified through contact investigation accounted for 60.8% and 65% of DRTB cases in ages less than 20 years in 2022 and 2023 respectively. Children (0 - 4 years) diagnosed through stool examination among CTB were 50% and 47% in 2022 and 2023 respectively.

Conclusions: Contact investigation using contact investigators with health backgrounds successfully changed the narrative of DRTB case findings in both children and adolescents within two years of implementation.

OA37 Tobacco and e-cigarette: Feature of use and intervention approaches

OA37-392-15 Gender differences in the determinants of tobacco use in Tanzania: Evidence from a nationwide cross-sectional survey

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Background: Tobacco use is a leading cause of preventable deaths and disability globally. However, evidence of gender differences in the socio-structural determinants in sub-Saharan Africa is scarce. This study assessed the gender differences in determinants of tobacco use in Tanzania.
Design/Methods: The study utilized data from the 2022 Tanzania Demographic and Health Survey (TDHS), with a sample size of 15,254 women and 5,763 men. The outcome variable was tobacco use (categorized as „No" or „Yes"). The predictor variables included tuberculosis knowledge and socio-demographic and household characteristics.
We used complex sample logistic regression to identify the predictors of tobacco use. We set statistical significance at a p-value of less than 0.05.
Results: The prevalence of tobacco use among women and men is 0.4% and 10.7%, respectively. Age 20-29 (AOR=2.33, 95%CI: 1.13-4.52, ρ=0.023), 30-39 (AOR=3.41, 95%CI: 1.66-7.02, ρ=0.001), 40-49 years (AOR=5.64, 95%CI: 2.75-11.57, ρ<0.001), residing in the Eastern Zone (AOR=2.07, 95%CI: 1.07-2.98, ρ=0.031), being a farmer (AOR=1.81, 95%CI: 1.02-3.20, ρ = 0.042), a manual worker (AOR=2.43, 95%CI: 1.40-4.20, ρ = 0.002), being in the poorest wealth quintile (AOR=2.09, 95%CI: 1.27-3.45, ρ = 0.004), daily alcohol use(AOR=11.87, 95%CI: 7.45-18.92, ρ<0.001), occasional alcohol use (AOR=3.27, 95%CI: 1.76-6.05, ρ<0.001), and lack of health insurance (AOR=3.16, 95%CI: 1.48-6.75, ρ = 0.003) increased men's likelihood of tobacco use.
Among women age 40-49 years (AOR=6.20, 95%CI: 1.59-24.22, ρ=0.009), recent internet use >12 months (AOR=7.49, 95%CI: 2.16-25.98, ρ=0.002), being in the poorest quintile (AOR=7.45, 95%CI: 2.10-26.44, ρ=0.002), poorer wealth quintile (AOR=6.25, 95%CI: 1.79-21.80, ρ=0.004), having 2-4 children (AOR=3.01, 95%CI: 1.16-7.86, ρ=0.024), and daily alcohol use (AOR=7.91, 95%CI: 2.43-25.76, ρ=0.001) increased the odds of tobacco use.
Conclusions: The prevalence of tobacco use is higher among men than women. Socio-structural determinants of tobacco use differ by gender. Tanzanian policies and interventions for tobacco control must consider these gender differences.

OA37-393-15 Initiation, cessation and relapse of tobacco smoking among participants in a large longitudinal cohort in rural South Africa

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Background: Tobacco smoking is believed to be increasing in many low-and-middle-income countries. Yet, large longitudinal cohort data to precisely estimate such trends are sparse. We investigated changes in smoking status and their determinants over approximately 3 years in rural South Africa.
Design/Methods: Participants enrolled in the Vukuzazi population cohort in the uMkhanyakude district in KwaZulu-Natal, South Africa completed a baseline tobacco behavioral survey during May 2018-March 2020. A follow-up survey was conducted during February 2021-November 2022 among participants aged ≥15 years who reported current and former smoking at baseline (to detect cessation and relapse) and in randomly selected 15-29-year-old participants who reported never smoking at baseline (to detect initiation).
We fit regression models to estimate initiation, cessation and relapse of tobacco smoking between baseline and follow-up, and identify sociodemographic and behavioral variables associated with each outcome.
Results: Overall, 52% (754/1448) of those recruited participated in the follow-up survey, which occurred a median of 3.0 years (IQR:2.6-3.2) from baseline. The occurrence of initiation (from never to current or former smoking), cessation (from current to former smoking) and relapse (from former to current smoking) was 12.0%, 12.9% and 10.9%, respectively. Males had significantly higher odds of initiating smoking than females (adjusted odds ratio [AOR] 12.81, 95% confidence interval [CI]:3.54-46.36). Moderate to heavy smoking (≥10 products per day; AOR 0.27, 95% CI:0.08-0.93 relative to light smoking, <10 products per day) and middle socioeconomic status (AOR 0.37, 95% CI:0.15-0.89 relative to low socioeconomic status) were associated with lower odds of smoking cessation. No covariates were significantly associated with relapse.

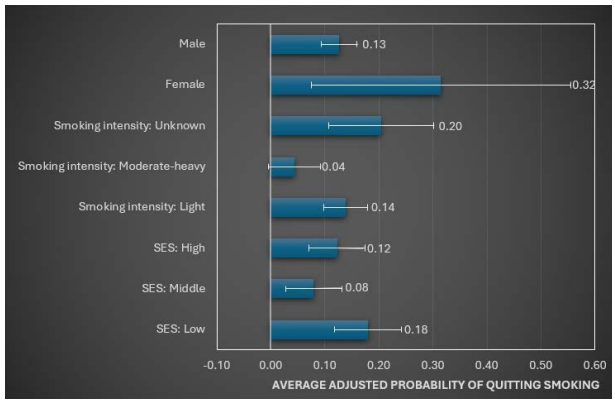

Figure 1. Average adjusted predicted probabilities of smoking cessation by sex, socioeconomic status (SES) and smoking intensity.

Conclusions: Over a median of three years, most people retained their smoking status. Fewer than 1 in 8 smokers quit. Prevention interventions are needed to address high initiation among young males. People who smoke moderately or heavily and with middle socioeconomic status may benefit from targeted cessation interventions.

OA37-394-15 Prevalence of e-cigarette use, profile of e-cigarette users, and relationship between e-cigarette use and cigarette smoking in South Africa

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Background: A major barrier to the policy debate around e-cigarettes is the paucity of evidence on their health consequences but also on their consumption patterns. Nationally representative and publicly available surveys measuring e-cigarette use in South Africa are very limited. The South African E-cigarette Survey 2022 was thus coordinated by the Tobacco Control Data Initiative (TCDI) to track e-cigarette consumption patterns in South Africa and support policy formation.
The study contributes to pressing research and policy questions by estimating consumption patterns of electronic nicotine and non-nicotine delivery systems and heated tobacco products (henceforth defined as "novel products") amongst adults (>18) in urban South Africa.
Design/Methods: The survey was specifically designed to estimate the prevalence of novel product use, to describe the demographics of novel product users, and to understand the interaction between combustible cigarette smoking and novel product use.
Results: Results revealed that more than one out of every 10 South African adults in urban areas (11.3%) had ever tried novel products. Further, it was shown that more than half (58%) of all current regular novel product users were also current regular cigarette smokers, with the overall prevalence of dual users being 2.3%. In terms of the sequence of use, it was shown that:
1. One in five (19%) novel product users who had never regularly smoked cigarettes started smoking cigarettes after using novel products, and;
2. One in eight (13%) cigarette smokers who began using novel products after smoking cigarettes later quit smoking cigarettes.
To stop or avoid smoking tobacco was the most commonly cited reason for novel product use (30% of users). In terms of beliefs, dual users believed that novel products were less addictive and had less health risks than cigarettes.
Conclusions: These results should be used to inform novel product use in South Africa.

OA37-395-15 Prioritising hazardous constituents in smokeless tobacco products for tobacco regulation in India

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Background: Smokeless tobacco products (STP) are a major public health concern linked to increased risks of multiple cancers and neurological and cardiovascular diseases. India has the highest prevalence of smokeless tobacco use globally. STP contains numerous toxic and carcinogenic constituents, including tobacco-specific nitrosamines (TSNAs), polycyclic aromatic hydrocarbons, toxic metals, and others.
So, the current study aims to prioritise the hazardous constituents in STP based on the toxicity, attractiveness, and addictiveness of the constituents.
Design/Methods: A database of hazardous constituents in STP was created through a systematic literature review by searching PubMed, Web of Science, SCOPUS databases, and existing reference lists like the WHO TobReg, IARC, and FDA lists according to Preferred Reporting Items of the Systematic Reviews and Meta-Analysis (PRISMA) guidelines from 2005-2023. From the 509 studies identified, 64 articles were included in the final analysis. A multi-criteria decision analysis (MCDA) approach involving expert elicitation was employed to prioritise the constituents based on toxicological properties, exposure levels, and health effects.
Results: This study synthesised a database of 83 chemical constituents and three physical parameters in Indian smokeless tobacco products, including 7 Group 1 human carcinogens, 8 Group 2A probable carcinogens, and 24 Group 2B possible carcinogens per IARC classifications. Significant variability existed in toxicant levels like TSNAs (NNN, NNK) and metals across brands, with several products exceeding safety limits for TSNAs and lead. The

MCDA prioritised TSNAs like NNN and NNK and heavy metals like lead and cadmium as top-ranked hazardous constituents for regulatory focus.
Conclusions: Comprehensive regulation of STP contents in India is crucial given the high prevalence of use and presence of multiple carcinogenic and toxic constituents. Recommendations include mandatory labelling of toxicant levels, setting permissible limits, establishing rigorous testing capabilities, research collaborations, and standardised testing protocols to effectively implement Articles 9 and 10 of WHO FCTC for tobacco product regulation.

OA37-396-15 From one to endless: A mixed-methods study of loose cigarette purchase and adolescent smoking in Indonesia

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Background: This study is the first mixed-method study that investigate the relationship between purchasing loose cigarettes and adolescent smoking habits in Indonesia, focusing on frequency, intensity, and initiation of smoking.
Design/Methods: We analyzed the secondary data from a national survey, the 2019 Global Youth Tobacco Survey (GYTS), to examine the association between loose cigarette purchase and smoking frequency, intensity, and nicotine dependence among students aged 11-17 years. Later, we arranged focus group discussions (FGD) involving junior and high school students to explore experiences in purchasing loose cigarettes and how it affected their smoking initiation and current cigarette consumption. A total of 49 eligible students agreed to participate in FGD and were later divided into 12 FGD groups.
Results: Purchasing loose cigarettes in the past 30 days was significantly correlated with nondaily smoking (AOR = 1.55; 95% CI = 1.14-2.09), consuming <5 cigarette sticks per day (AOR = 2.05; 95% CI = 1.52-2.75), and having lower nicotine dependence (AOR = 1.58; 95% CI = 1.13-2.20) than purchasing other cigarette types. This smoking pattern among adolescents could be interpreted as smokers in the experimental phase and they possessed a higher risk of becoming regular smokers.
Most FGD participants, particularly those with lower weekly allowance, bought loose cigarettes in their first attempt at smoking. Affordability and accessibility were the main reasons that encouraged participants to continue buying loose cigarettes. The widespread loose cigarette sale also persuaded participants to buy tobacco products more frequently, thus spending at least half of their weekly allowance on tobacco products, ranging from IDR 30,000 - 200,000 (USD 2 - USD 13) per week. Finally, our study highlighted that only few students in this study either had to show their identity card or were denied when purchasing loose cigarettes.
Conclusions: Our findings support the enactment of banning loose cigarette sales in Indonesia.

OA37-398-15 Windows of opportunity to navigate the difference between tax increase and market transaction price on tobacco products in Indonesia

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Background: In the past 10 years since 2012, Indonesia has consistently increased excise taxes on tobacco products to increase retail selling prices and reduce the accessibility of cigarettes, especially among the poor and children. However, cigarette excise rates have not had a significant impact on increasing cigarette market transaction prices. The complexity of excise tax structure and permissibility of reducing the market transaction price by 15% from the retail selling price set by the government.
This study aims to document cigarette price data in various regions and compare transaction prices and trend of increasing excise tax of cigarette from 2018 - 2023.
Design/Methods: This study was part of a price monitoring survey, a cross-section study assessing the market price of each brand, brand variant, and pack size in Indonesia conducted from 2018 until 2023. A non-probability convenience sampling method is used to select the venues. Cities and districts are selected based on the presence of local partners and representation of the western, middle, and eastern parts of Indonesia.
Results: Total number of cigarette packs collected ffrom 2018 are 762 packs and in 2023 there were 10283 packs. Data shows average excise tax increase above 20% (2020) at the same time the average market transaction price increased 37% from the previous year. Meanwhile, if the average increase is below 10% (maximum 10%) and the price decrease.Type of cigarette increase in market transaction price was hand cigarettes even 100% more price set, while machine-type cigarettes on average reduced their market transaction price.
Conclusions: An increase in excise rates above 20% shows that the impact of the increase in cigarette prices is greater (above 30%) than excise rates of 10% or below.

The government must again navigate the tobacco excise structure, in terms of increasing excise rates - simplifying layers and monitoring market transaction prices to 100%.

OA37-399-15 Creating a global tobacco control treaty surveillance system

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Background and challenges to implementation: Over 180 countries have been reporting their progress on the implementation of the WHO Framework Convention on Tobacco Control since 2008. However, these important datasets have not been consolidated, assembled and organized in an online, functional, user-friendly manner that all tobacco control stakeholders can readily access. The absence of a consolidated online data surveillance platform has constrained treaty monitoring, reporting and implementation.

Intervention or response: To address this challenge, ASH Canada and the Institute for Global Tobacco Control at Johns Hopkins Bloomberg School of Public Health created a robust, interactive online treaty monitoring platform (www.globalprogresshub.com).

The contents, capabilities, features and functions of the platform were determined in consultation with an advisory committee consisting of 15 international experts and based on the availability and contents of reporting datasets and the capabilities and limitations of the chosen data analytics software application (Tableau).

Results/Impact: The *Global Tobacco Control Progress Hub* contains over 300 tobacco control indicators from over 180 countries spanning up to 12 years of reporting and representing over 400,000 data points. The Progress Hub includes four dashboards that allow for various data groupings, breakdowns and comparisons by country, WHO region, national personal income level and human development index gradients. The platform also includes national scoring, ranking and longitudinal results for each reporting country and the ability to compile national FCTC shadow reports.

Conclusions: The Global Progress Hub provides a new window into the world of FCTC implementation by providing tobacco control stakeholders with online access to the major treaty implementation datasets. This innovative open data platform allows for enhanced monitoring surveillance, reporting and implementation of the treaty.

OA37-400-15 The design and effectiveness evaluation of customised smoking cessation messages recommendation system

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Background: Mobile intervention improves the accessibility and convenience of smoking cessation services.The purpose of this study is to design a customized mobile smoking cessation system and evaluate its efficacy and the acceptability.

Design/Methods: First, we developed a smoking cessation message recommendation system based on The Transtheoretical Model and Stage of Change (TTM). We conducted a three-arms randomized controlled trial in Shanghai from 2020 to 2022. Current smokers aged 18 -65 were recruited and randomized to 3-month customized messaging (CM) or non-customized messaging (NCM) intervention or to the control group in a 1:1:1 ratio. The participants in control group could only receive other health messages unrelated to smoking cessation. The primary outcome was self-reported 7-day point prevalence abstinence (PPA). The intention-to-treat analysis was used. Besides, the acceptability was assessed at the third follow-up survey.

Results: Totally, 432 messages were included in the system (Table 1) tailored to each stage, including the texts, pictures, audios, and videos.

Stage	TTM construct	Message Content
Precontemplation	Consciousness Raising; Emotional arousal; Environmental revaluation	Harm of tobacco; The Pros and Cons of smoking; Encouraging message; Smoke-free social norm
Contemplation	Consciousness Raising; Self-revaluation; Self-efficacy; Skills; Environmental revaluation	The Pros and Cons of quitting; Self-health assessment; Quitting guidance; Success quitting cases; Encouraging message; Smoke-free social norm
Preparation	Consciousness Raising; Self-liberation; Self-efficacy; Skills; Helping relationship	Abstinence symptom; Set a quit day；Inform others you quitting; Quit preparation List ；Quitting guidance; Success quitting cases; Encouraging message
Action	Skills; Self-efficacy; Helping relationship; Reinforcement	Quitting strategies; Success quitting cases; Encouraging message; Mindfulness Practice; Funny joke; Reward or punish themselves
Maintenance	Skills; Self-efficacy; Helping relationship; Reinforcement	Quitting strategies; Success quitting cases; Encouraging message; Mindfulness Practice; Funny joke; Reward or punish themselves
Relapse	Consciousness Raising; Emotional arousal; Self-revaluation; Self-efficacy	Harm of tobacco; the Pros and Cons of smoking/quitting; Self-health assessment; Success quitting cases; Encouraging message

There were 691 smokers participated, with 506, 437 and 401 people completed the 3 times follow-up respectively. The baseline characteristics of participants among the CM (n =219), NCM (n =234), and control (n = 238)

groups were similar. After the intervention, the 7-day PPA in each group were 23.7%, 17.1% and 15.1% (P=0.047). Participants in CM group (OR=1.75, 95% CI: 1.09-2.80) were more likely to quit than those in control group.
One month after the intervention, the 7-day PPA in each group were 19.2%, 18.8% and 15.5% (P=0.538). Three months after the intervention, the 7-day PPA turned 23.7%, 19.2% and17.2% (P=0.206).
About the acceptability, 85.8% of participants in CM found the system helpful, and 93.7% said they would recommend it to other smokers.
Conclusions: Our customized smoking cessation messages recommendation system may help smokers quit, which can therefore be considered for use in large-scale intervention efforts in China.

OA38 Amplifying community voices through advocacy and awareness

OA38-401-15 Cross-border collaboration on TB services: Adapting advocacy and sustainability approaches for improved management and long-term collaboration

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Background and challenges to implementation: Kenya and Uganda are high-burden TB countries that struggle to meet diagnosis and treatment goals, especially in populous border areas, and lack a common platform to advance sustainability of cross-border TB services. Through a grant from the USAID-funded Tuberculosis Implementation Framework Agreement Project (TIFA), the Intergovernmental Authority on Development (IGAD) is establishing this platform. As the partner leading coordination, IGAD stewards advocacy planning with other TIFA grantees and partners including National TB Programs (NTPs) in Kenya and Uganda, and Centre for Health Solutions-Kenya, focusing on long-term collaboration and sustainability.
Intervention or response: Through IGAD's grant, the cohort is developing a Sustainability and Advocacy Strategy to translate cross-border TB grant experience into shared policies and guidelines among both NTPs, and identify advocacy opportunities for funding for shared priorities.
As part of coordination support, TIFA customized a Sustainability and Advocacy Strategy template and worked with IGAD as they crafted a cross-border TB advocacy strategy. IGAD used this template to outline policy and financing goals with defined objectives, key asks aligned with decision-makers at sub-national, national and regional levels, and tailored messages linking evidence to advocacy requests. IGAD integrated reviews of the draft strategy into other grant activities to gather contributions from cross-border colleagues for a unified strategy.
Results/Impact: The collaboration between IGAD and other cross-border grantees underscores the importance of adaptable strategies for advancing sustainability, especially for complex issues such as cross-border TB.
By leveraging advocacy strategies and fostering coordination among diverse stakeholders, this partnership uses targeted approaches to advance policy and funding goals.
Conclusions: IGAD is part of a unique cohort of TIFA grantees managing concurrent activities to address cross-border TB challenges. As coordinating partner, IGAD leads the collaborative development of a sustainability and advocacy strategy to identify shared priorities and opportunities to include cross-border TB interventions in policies and funding for Kenya and Uganda.

OA38-402-15 Provider-led advocacy and community engagement: Game changer in TB case finding

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Background and challenges to implementation: Nigeria is a high TB burden country with estimates of 219 cases/100,000 population. It also contributes 11% of the missing TB cases globally. A person infected with TB disease will infect 5-15 persons in close contact in the course of a year. To curtail the community transmission of mycobacterium tuberculosis, community engagement and advocacy cannot be overemphasized as a vital component of community-based active TB case finding especially in hard-to-reach rural communities.

Intervention or response: The Global Fund PPM Grant Cycle 6 project through the Institute of Human Virology Nigeria (IHVN) with its sub-recipient Damien Foundation Nigeria, identified challenges and supported various community based strategic activities in a network of rural communities in Afijio, Oyo state, Nigeria between March 2023- December 2023. The interventions included:

1. Provider-led community advocacy to communal leadership, popular opinion leaders and key stakeholders by creating awareness on TB symptoms and signs.
2. Provider led role play to increase awareness and encourage community folks to show up for TB screening.
3. Provider-led community sensitization and active participation in community outreaches. and house-house TB screening and case search.
4. Targeted distribution of simplified Information education communication (IEC) materials written in simplified words and common dialect.
5. Incentive support for outreaches that were carried out.
6. Integration of TB screening with other co-morbidities by collaborating with other community-based organizations during outreaches.

Results/Impact: From Q1 2023 to Q4 2023, TB case notification increased by seven-folds in the community, In absolute numbers case notification prior to the intervention was 7 cases in Q1 2023. However, by Q4 2023 case notification was 49 cases. Reflecting a seven-fold increase.

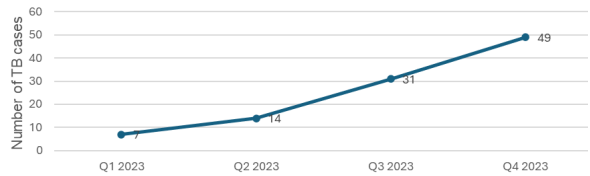

Figure. Quarterly TB case notification.

Conclusions: Provider-led community engagements and sensitization could improve TB case finding. Deliberate efforts on active community engagement, sensitization, advocacy to communal leadership, provision of support and targeted outreach activities will facilitate finding the missing TB cases in our hard-to-reach communities.

OA38-403-15 Stop TB country platform enhancing coordination and advocacy efforts in Zimbabwe

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Background and challenges to implementation: The TB response was marred by duplication of efforts, minimal collaboration, lack of cohesion, fragmentation, and inefficient use of resources.

Additionally, there was a lack of accountability and transparency in the TB landscape, making it difficult to track progress and assess impact.

Intervention or response: The country established the STPZ in 2019, aimed at streamlining efforts, enhancing collaboration, and sustaining linkages to maximize the impact of interventions in the fight against TB.

Results/Impact: The STPZ coordinates key stakeholders in TB response convening stakeholders, setting priorities, and developing joint strategies. Since its inception, the platform has leveraged collective expertise and resources to address critical gaps, advocate for policy changes, and mobilize support for national TB programs.

Notably, STPZ assessed the TB funding landscape in Zimbabwe, assessed UNHLM targets commitments, and achievements in preparation for the UNHLM 2023, and conducted public expenditure data analysis and synthesis for advocacy. Since its inception, STPZ led to the implementation of the Multi-Sectoral Accountability Framework for TB (MAF-TB).

This provided a platform for creating synergies and sharing best practices facilitating a multi-sectoral approach to TB response through engaging both traditional and non-traditional actors including celebrities and the private sector and capacitated them to contribute towards the elimination of the TB epidemic.

Conclusions: The effectiveness of a country's TB response lies in the ability to foster collaboration, coherence, accountability, foster partnerships, promote accountability, and drive sustainable progress in the fight against TB. By bringing together diverse stakeholders under a unified framework, the STPZ is catalyzing collective action, amplifying TB advocacy efforts, and advancing community-centered approaches to TB response.

OA38-404-15 Leveraging interschool competitions to enhance community TB advocacy, communication, and social mobilisation: An experience from Zambia

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Background and challenges to implementation: The 2020 Zambia epidemiological review reported a wide gap between estimated TB incidence and notifications among adolescents. As a result, the 2022-2026 National TB strategic plan included increased TB programs targeting adolescents and young people as one of its major actions. However, the traditional TB awareness and demand creation interventions do not reach the adolescent demographic.

Intervention or response: In 2023, the Ministry of Health in collaboration with the Ministry of Education, with support from the USAID Tuberculosis Local Organizations Network (TBLON) project and other private sector players, started implementing National Interschools competitions on TB to raise awareness of the disease among adolescents, pupils and the community overall.

Two competitions have been held so far, including debates/quiz in 2023 and music competition in 2024. The learners researched on different thematic areas of the TB care cascade and efforts to end TB, while working in collaboration with the local Ministry of Health TB experts, former TB patients and their teachers to acquire information to inform their stance during debates/quizzes as well as song compositions. These competitions were publicized through various media platforms including social media.

Results/Impact: In 2023 and 2024, 40 and 115 schools, respectively, participated in the competitions, with 320 (2023) and 1,035 (2024) learners directly taking part. The competition reached 15,000 and 127, 920 students from the competing schools and 116,285 and 1,674, 989 individuals from the online community in the respective years.

Following the competition, some participants spearheaded the formation of a TB club at their school to sustain the TB awareness and social mobilization efforts.

Conclusions: The Interschools competition on TB is effective in increasing adolescents' participation in TB programmes. The effect of the competition on TB knowledge and demand for TB services among adolescents needs to be systematically measured.

OA38-405-15 An ideal platform for amplifying community voices: The experience of implementing I-monitor ATM+ Kenya App

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Background and challenges to implementation: Real time feedback from the communities on status of health care service delivery remains an asset in ensuring ownership and sense of responsibility for health care services. In order to facilitate this, Amref Health Africa adopted and implemented i-monitor, an innovative solution tool leveraging on technology to enable monitoring, recording, reporting and feedback mechanism of the health services provided.

Intervention or response: For effective use and scaleup, numerous refresher trainings and installations of i-monitor solution were done to stakeholders.

All users are now able to report or give feedback on the services they receive and track pending requests within the system. The super-users have spearheaded the role of resolving and escalating all concerns reported on services for action within five thematic areas namely; Commodities, Human Rights, Service Delivery, Social Support and Treatment Literacy as at the evaluation done at the end of February 2024.

Results/Impact: A total of 25,772 issues were reported across five thematic areas: Commodities 9,931 (39%), Service Delivery 7,502 (29%), Human Rights 3,953 (15%), Social Support 1,884 (7%) and Treatment Literacy 2,502 (10%).

Reported issues were analyzed and escalated to the relevant county departments for action where only 9,703 (38%) have been actioned on while 16,069 (62%) are awaiting to be actioned on.

From the analyzed data, there has been a notable improvement in community engagements, Health streamlining towards service users' needs and many victims have got justice and platform to seek and receive services.

Conclusions: Direct engagement of communities is a fertile avenue to understanding the challenges faced and opportunities for strengthening and fast-tracking resolve of reported issues.

OA38-406-15 Unlocking access to life-saving bedaquiline worldwide: Challenges and noteworthy Ukrainian experience for global public campaign

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Background and challenges to implementation: Bedaquiline is a breakthrough medication for multidrug-resistant tuberculosis treatment, showcasing remarkable efficacy. Even though the primary patent on bedaquiline expired in July 2023, Johnson & Johnson and Janssen, a subsidiary of Johnson & Johnson, hold multiple secondary patents on bedaquiline throughout the world - a practice called evergreening, which allows patent holders to extend their monopolies even when the primary patent on an active pharmaceutical ingredient has expired.
Intervention or response: Thanks to the public campaign of civil society on challenging bedaquiline secondary patents in different countries and highlighting the issue of its overpriced, in September 2023, Johnson & Johnson confirmed intent not to enforce patents for bedaquiline for the treatment of multidrug-resistant tuberculosis across 134 Low- and Middle-Income Countries.
However, legal proceedings challenging bedaquiline secondary patents are still pending in numerous countries. The question of why the patent holder defends patents in courts that they do not plan to enforce remains unanswered. In August 2023, the largest patient-led organization in Ukraine 100% LIFE filed two lawsuits against Janssen to invalidate secondary patents on bedaquiline and their term extensions.
Following several rounds of negotiations, Janssen consented to renounce all challenged patents within the Ukrainian territory in exchange for the withdrawal of lawsuits.
Results/Impact: With the renouncement of bedaquiline patents, the Ukrainian market is guaranteed to be open for considerably more affordable generic versions of bedaquiline, which, as estimated, could be mass-produced for $48 to $102 per treatment course.
Conclusions: Renouncing or abandoning bedaquiline patents is the only reliable mechanism ensuring accessibility to all patients dependent on this vital treatment. Currently, successful experience of 100% LIFE is being used in Moldova.
However, the Ukrainian experience can be applicable in all countries where patents on bedaquiline or their term extensions are being opposed to guarantee access to generic versions of life-saving TB drug on the global level.

OA38-407-15 Ethical challenges in lung transplantation in India: A critical analysis

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Background and challenges to implementation: Lung transplantation has emerged as a life-saving treatment for end-stage lung diseases worldwide, including in India. However, the ethical landscape surrounding lung transplantation in India presents complex challenges stemming from cultural, socio-economic, and healthcare disparities. This paper analyses the ethical dimensions of lung transplantation within the Indian context.
Intervention or response: A systemic literature review of relevant English language studies and articles (including grey literature) published from January 1, 2021, through June 30, 2023, was conducted. Search methods encompassed databases such as the Cochrane Library, PubMed, PubMed Central, EBSCO Psychological and Behavioral Sciences Collection, Google Scholar, citation ancestry searching, and insights from individuals with expertise in the subject area.
Autonomy, beneficence, nonmaleficence, and justice are the four fundamental ethical principles in medicine, and they underpin this descriptive analysis.
Results/Impact: One of India's primary ethical dilemmas in lung transplantation revolves around equity and access to this scarce resource. Limited availability of donor organs exacerbates disparities, favoring affluent patients who can afford private healthcare facilities over marginalized populations, highlighting the importance of the ethical principle of justice.
Additionally, concerns about organ trafficking and unethical practices further complicate the ethical discourse. Furthermore, the allocation process for donor organs raises ethical questions regarding transparency, fairness, and prioritization criteria. Without a national registry and guidelines, the decisions about recipient selection and transportation of lungs may be influenced by subjective factors.
Moreover, cultural and religious beliefs in India influence attitudes toward organ donation, adding another layer of complexity and necessitating respect for autonomy and cultural sensitivity in healthcare practices.
Conclusions: Navigating the ethical terrain of lung transplantation in India necessitates careful consideration of cultural, socio-economic, and institutional factors. By addressing these challenges, stakeholders can strive towards a more equitable and ethically sound approach to lung transplantation, ensuring access to this life-saving intervention for all segments of society.

OA38-408-15 TB awareness and knowledge through effective communication: A systematic review of interventions in India

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Background and challenges to implementation: Tuberculosis (TB) poses a substantial public health challenge in India, contributing significantly to global TB-related deaths. The Global-TB Report 2023 highlights India's role in increasing TB fatalities, with the country alone responsible for 36% of TB deaths among HIV-negative individuals. Currently, 13,54,213 individuals are receiving treatment as per Nikshay portal.
To address this issue, the government has initiated various programs under the National Tuberculosis Elimination Program (NTEP); Nikshay Mitra, Nikshay Poshan Yojna and TB champions aiming to increase awareness and support patients. Information, Education, and Communication (IEC) activities play a crucial role in disseminating information, prevention, diagnosis, and treatment practices.
Intervention or response: This systematic review evaluates 42 studies following PRISMA guidelines for data collection focusing on communication strategies in TB elimination programs across India. Utilizing various IEC approaches such as mass media campaigns, school-based programs, and community engagement, the review provides a comprehensive analysis across different settings and populations.
Results/Impact: Findings demonstrate the effectiveness of IEC interventions in improving TB-related knowledge, attitudes, and practices. Broadly, intensified media campaigns led to increased awareness and improved self-reporting among symptomatic individuals, with 71.0% of the general population exposed to IEC messages. 65.4% correctly recalled information about treatment centres, and 89.2% were aware of free treatment options.
Educational interventions among school children enhanced knowledge levels regarding TB, with a mean pre-test score of 7.05 (64%) increasing to 9.15 (83.2%) in the post-test. Incorporating Quality-Adjusted Life Years (QALY) as a measure of cost-effectiveness revealed the substantial impact of these interventions on health outcomes and quality of life among affected populations.
Conclusions: IEC and diverse communication methods enhance TB awareness, reduce stigma, and prompt early treatment. Strategies through mass media, community engagement, and interpersonal channels are crucial for diverse communities and TB-Elimination efforts. Integrating QALY underscores their cost-effectiveness in improving health outcomes and quality of life for TB-affected individuals.

OA39 Optimising finding TB in children

OA39-409-15 Optimising district selection for implementing child TB treatment-decision algorithms: Insights from a hybrid study in Mozambique and Zambia

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Background: Generating evidence for WHO-suggested TB Treatment Decision Algorithms (TDAs) in children calls for hybrid effectiveness and implementation studies. Strategic selection of study settings should consider capacity to deploy TDAs, and diversity of districts and facilities to maximise transferability of findings and support scalability.
Design/Methods: Within the Decide-TB project, we conducted a 2-step district selection survey (September-December 2023) of all districts in Mozambique and Zambia. First, a desk review of 2022 Ministry of Health DHIS2 data was used to rank districts on out-patient department (OPD) attendance among children <15 years (high to low); TB case notifications (high to low); proportion of child TB among all TB, weighted by the proportion of children <15 years among district population (low to high); and minimum diagnostic capacity (presence of chest x-ray [CXR] and/or Xpert MTB/RIF).
Second, a facility-level assessment was conducted in 10 pre-selected districts per country, for data cross-checking of step 1 data. Researchers and National TB Programme (NTP) representatives reviewed lists of pre-selected districts, considering statistical thresholds, country-specific feasibility criteria, and national priorities.
Results: Data from 161 districts (11 provinces) in Mozambique and 116 districts (10 provinces) in Zambia were collected. Median national OPD attendance for Mozambique and Zambia was estimated respectively at 1,145,144 [93,3678; 1,441,836] and 76,699 [53,140;109,324], TB notification at 346/100,00 [237; 497] and 189/100,00 [98; 269], weighted child TB detection at 21.9% and 23.1%, presence of both CXR/Xpert MTB/RIF at 40.3% and 68.1%. High-ranking districts but with lack of political stability, highly remote, with tertiary hospitals were excluded.

Consensus was reached to include less highly ranked rural districts to maximize diversity and representativity (Table 1).

	District	Profile	OPD attendance <15 y (first visit only)	TB notification – cases per 100,000	Child TB case detection among all TB cases – %	Weighted child TB case detection – %	TDA capacity: Xpert and CXR
Zambia	Luanshya	Urban	128,445	287	10.4	12.5	Yes
	Chingola	Urban	71,130	480		9.7	Yes
	Chirundu	Rural	19,135	294		5.4	Yes
	Kalomo	Rural	38,632	101		17.5	Yes
Mozambique	Jangamo	Rural	108,295	566	12.1	19.2	Yes
	Zavala	Rural	81,703	422		19.6	Yes
	Buzi	Rural	129,319	420		21.0	Yes
	Nhamatanda	Rural	234,298	414		19.2	Yes

Table1: Child TB diagnosis assessment and site selection findings per district, Zambia (ZM) and Mozambique (MZ)

Conclusions: Combining robust statistical analysis with NTP priorities and contextual realities to select study settings in a hybrid study design involves "trade-offs", implications of which will be assessed through interdisciplinary implementation research.

OA39-410-15 Oral swab testing for the diagnosis of paediatric TB: An interim analysis of diagnostic accuracy in the NOD-pedFEND cohort

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Background: Microbiological diagnosis of pediatric TB remains challenging. Current testing methodologies, such as gastric and nasopharyngeal aspirates, are invasive and uncomfortable. Oral swabs are promising and easy to collect alternatives; however, there is no data on the diagnostic gain from double-swab testing with Xpert MTB/RIF Ultra (Ultra) in children.
Design/Methods: Children <5 years old with symptoms suggestive of TB disease were recruited from two sites in Uganda from August 2021. Swabs were collected from the oral cavity and tested with a modified protocol on Ultra, the majority as double swabs (two consecutive swabs stored in a single cryovial). Diagnostic accuracy was determined against a microbiological reference standard (MRS) (Ultra and culture on two nasopharyngeal aspirates and one gastric aspirate; Ultra on one stool). Clinicians were blinded to the oral swab results.
Results: Of 453 children enrolled, 33 (7.3%) had microbiologically confirmed TB. 6/453 (1.3%) of children had positive Ultra results on an oral swab. Based on the MRS, sensitivity of swabs was 2/33 (6.1%), specificity was 416/420 (99%), and the error/invalid rate was 0/453 (0%). All 4 children with positive oral swab results but negative MRS were started on TB treatment by attending clinicians based on clinical diagnosis, and, excluding one child lost to follow-up, were deemed to have unconfirmed TB.
Conclusions: These are the first data available in children using double oral swabs collected in a single cryovial and tested prospectively with Ultra. Despite the low sensitivity, the presentation of MRS negative participants who tested positive on a double oral swab suggests that oral swabs can identify children with TB not readily diagnosed via other testing modalities. With their low error rates, swabs could be a useful add-on test for children in settings with Ultra and where aspirates are less feasible. Further optimization of swab collection and processing is warranted to improve sensitivity.

OA39-411-15 Cross-cutting lessons from the implementation of treatment decision algorithms for children with pulmonary TB: Results from a five-country prospective study

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Background and challenges to implementation: A specific challenge to the successful implementation of World Health Organisation treatment decision algorithms (TDAs) to diagnose pulmonary tuberculosis (TB) in children, is the heterogeneity of the healthcare systems targeted for their use. Facilities vary by type, population, resources and funding structures, leadership, and management. The TB-ALGO-PED study collected qualitative data on the processes, challenges, and lessons from

TDA implementation at 5 sites: Nigeria, Niger, Guinea, Uganda, and South Sudan. The purpose was to identify common targets for effective implementation that transect different healthcare systems.

Intervention or response: A structured framework of documentation was completed by each site. This included a context description and a step-by-step breakdown of pre- and post-implementation pathways of TB management, highlighting logistical and clinical challenges. Further clarifications were obtained through 3 focus-group discussions with implementers, medical departments, and researchers. The data was triangulated, and a Theory of Change model created.

Results/Impact: The results indicate a need for:

1. Investment in a pre-implementation context assessment - the implications, adaptations and health system strengthening required prior to an intervention.
2. Local leadership of change, particularly in Ministry of Health and partner organisation facilities.
3. A structured approach to service development, with defined standards and time-points for reassessment and modification of procedures.

Conclusions: The analysis indicates the value of leadership and a structured approach to implementation, based on quality-improvement models. Sufficient time and capacity invested in a nuanced, data-driven assessment of existing TB management, may help to predict the impact of change in terms of processes, personnel, and resources, with a pro-active scale-up of capacity.

A pre-implementation plan that encompasses these elements, considering inputs, activities, outputs and intended impact, may support the sustainable use of the TDAs.

OA39-412-15 "You can save a life if we get algorithms right": A multi-country qualitative evaluation of new paediatric treatment decision algorithms for TB in children

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Background: Under-diagnosis of tuberculosis in children remains a major concern worldwide. The World Health Organization (WHO) recommends two new treatment decision algorithms for TB in children less than 10 years presenting with presumptive pulmonary TB. The algorithms are adapted to contexts, with, and without radiography, include laboratory testing if available, and aim to facilitate clinical reasoning by assigning scores to symptoms and radiological features. However, little is known about the feasibility and acceptability of implementing these algorithms in Sub-Saharan Africa settings.

Design/Methods: Using a qualitative study design, we followed the acceptability framework, and the framework on barriers towards the TB diagnosis to structure our work. We conducted 45 semi-structured interviews, 8 focus group discussions, and non-participant observations in nine health facilities in Uganda, Niger and Guinea. We analysed the data thematically, and using the discourse analysis with a deductive and inductive approach.

Results: The results show that the implementation of algorithms plays a role in strengthening health workers's sense of autonomy and efficiency. The scoring system was found to be very useful and user-friendly, according to the participants.

Nevertheless, despite the positive attitudes towards the algorithms, their adoption in the diagnostic practices remains linked to various socio-cultural and structural factors. These include delays in children arriving at health facilities, high workload for health workers as well as lack of essential resources in the health centres.

Conclusions: This study found that the new TB algorithms were perceived positively by health workers, and well accepted in the three countries.

However, it illustrates the extent to which the implementation of innovative tools in healthcare structures needs to consider the existing system and barriers to ensure long-term use.

OA39-413-15 Impact of PAED surge on paediatrics TB case detection in Katsina State

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Background and challenges to implementation: In 2022, around 1.3 million children worldwide were diagnosed with tuberculosis (TB), resulting in 250,000 deaths, especially among those with HIV-associated TB. The World Health Organization (WHO) anticipates that 10% to 20% of TB cases will occur in children, particularly in heavily affected regions. Nigeria, ranking as Africa's top TB burdened country and sixth globally, faces challenges in diagnosing TB in children due to their inability to produce sputum and parents reluctance to collect stool samples. KNCV Nigeria initiated the USAID-funded TB LON 1 & 2 programs, including the PAED SURGE intervention, aimed at improving childhood TB diagnosis in high-burden countries like Nigeria.

Intervention or response: KNCV Nigeria with USAID funding to implement TB LON 1 & 2 projects, targeted intensified active case finding for paediatric populations in Akwa Ibom, Bauchi, Katsina, and Kano from August 2022 to September 2023. Key strategies included training screening officers and facility staff in nutrition clinics using WHO symptom checklists, deploying portable digital X-rays and AI for screening in schools and communities, and conducting stool based GeneXpert tests for cases unable to produce sputum. These efforts aimed to enhance TB detection and management among children, particularly in underserved areas, as part of a broader initiative supported by USAID funding.
Results/Impact: : During the review period, significant Paediatric surge activities were conducted in Katsina communities, leading to notable increase in tuberculosis (TB) yield from 7% to 13.5% between 2022 and 2023. The number of children screened monthly also surged from 595 to over 2000.

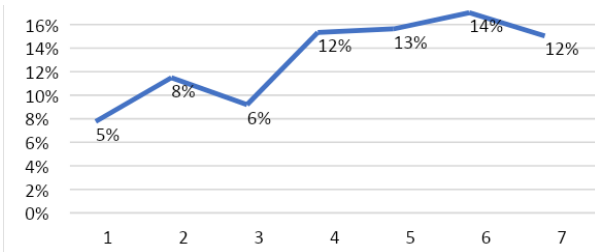

Figure. Average TB yield of children in Katsina state.

Conclusions: These outcomes highlight the effectiveness of Paediatric surge activities in enhancing TB detection rates and broadening healthcare access for children in the community. Paediatric TB is rising, and Active Case Finding (ACF) effectively identifies cases in children, more paediatric centred intervention should be embarked upon by stakeholders to raise awareness and improve health of children.

OA39-414-15 Improving the diagnosis of TB in children with the implementation of new WHO algorithm in Maradi, Niger

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Background and challenges to implementation: Niger has a high prevalence of malnutrition: in 2022, 12.2% global acute malnutrition (GAM), 2.4% of which was severe acute malnutrition (SAM). From 2018 to 2022 Médecins sans Frontières (MSF) treated an average of 24.000 children with SAM per year in Maradi District, amongst whom an average of 35 per year are diagnosed with tuberculosis (TB).
To improve TB diagnosis, we implemented the new World Health Organization (WHO) recommended treatment decision algorithms for pulmonary TB (PTB) in children.
Intervention or response: The algorithms were implemented in Madarounfa Hospital (nutrition and pediatric wards) and at Dan Issa Ambulatory Therapeutic Feeding Center (ATFC), Maradi District. All hospitalized children with SAM were considered to have presumptive TB and were eligible for evaluation with the algorithm, whereas in pediatric ward and ATFC a screening questionnaire was used to determine eligibility. The algorithm is based on clinical signs and symptoms, with the possibility for hospitalized children to access X-ray and microbiological examination (Xpert-MTB using stool samples). Implementation started in June 2023 in a phased manner, starting in ATFC and gradually expanding to other services.
Results/Impact: Between June and November 2023, 7161 children with SAM were seen in the ATFC and 2941 in the hospital. Among hospitalized children, 2033 (69%) were evaluated with the algorithm, among which 150 (7%) had an X-ray. In 6 months, 73 TB cases were diagnosed among children with SAM (59 hospitalized, 14 in ATFC) and 6 in the pediatric ward, representing 5 times more than the average of the 5 preceding years. Among the 65 cases diagnosed in the Hospital, 10 had a positive Xpert-MTB test (15%).
Conclusions: The use of treatment decision algorithms significantly increased the notification of TB amongst children with malnutrition. Identifying children with presumed TB and ensuring access to X-ray can be challenging in areas with high prevalence of malnutrition.

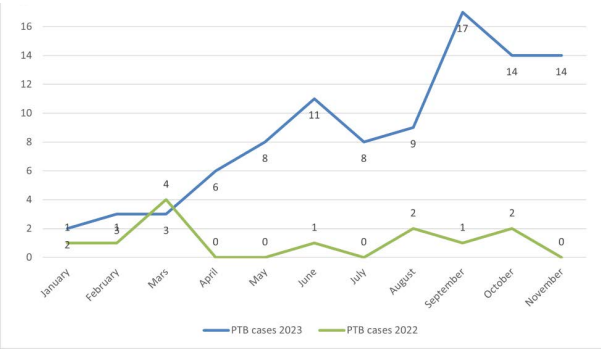

Figure. Pediatric PTB cases notified in Madarounfa, Niger, 2022 - 2023.

OA39-415-15 Use of gastric aspiration/sputum induced rooms and GeneXpert increase bacteriologically confirmed TB in children less than 5 years old in Peru

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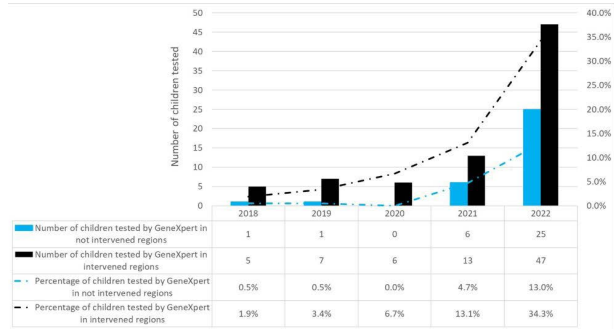
Background and challenges to implementation: Generally, children under 5 years of age do not have bacteriological confirmation of tuberculosis (TB) and even less of resistance to anti-tuberculosis drugs, even though we have more sensitive molecular diagnostic methods such as GeneXpert. Obtaining a respiratory sample in children under 5 years of age is difficult to obtain, so generally is not done. Gastric aspiration and sputum induced techniques are necessary to be done at the primary care level, especially in high TB burden settings to increase the use of GeneXpert. Decentralizing the gastric aspiration and induced sputum rooms at the primary care facilities and training nursing staff in these techniques should improve the proportion of children tested by GeneXpert.
Intervention or response: Since 2018, there has been at least one GeneXpert in each of the 24 regions of Peru to increase TB rate notification, with children under 5 years of age being one of the prioritized groups to be tested. To increase the use of GeneXpert in children under 5 years old to detect TB, the Peruvian National TB Program implemented 14 gastric aspiration and induced sputum rooms in five highest TB burden regions at the primary care facilities and trained 240 nurses on these techniques and the importance of bacteriological confirmation of TB and MDR/RR TB.
Results/Impact: In 2022, there was a 20% increase in the proportion of children under 5 years old diagnosed with TB tested by GeneXpert compared to 2018 (21.8% (72/330) vs 1.3% (6/459)). The proportion of children under 5 years old tested by GeneXpert between 2021 to 2022 was higher in the intervened regions than not-intervened regions (34.3% vs 13.0%, p <0.0001).



	2018	2019	2020	2021	2022
Number of children tested by GeneXpert in not intervened regions	1	1	0	6	25
Number of children tested by GeneXpert in intervened regions	5	7	6	13	47
Percentage of children tested by GeneXpert in not intervened regions	0.5%	0.5%	0.0%	4.7%	13.0%
Percentage of children tested by GeneXpert in intervened regions	1.9%	3.4%	6.7%	13.1%	34.3%

Conclusions: Implementation of gastric aspirate and sputum induced procedures and training nurses on these techniques could have contributed to increase the children less than 5 years old diagnosed with bacteriologically confirmed TB tested by GeneXpert.

OA39-416-15 Enhanced diagnosis of pediatric household contacts using child-friendly samples: Programmatic setting experience in India

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Background and challenges to implementation: TB diagnosis in younger children is challenging due to difficulty in obtaining quality sputum and gastric aspirate samples. We describe lessons learned in a demonstration project that included enhanced screening for childhood and adolescent TB using molecular diagnostic tests with easier-to-collect stool and oropharyngeal (OP) samples from children and adolescent household contacts (HHC) in Nagpur India.
Intervention or response: From January 2022-February 2023, trained field coordinators identified, consented, and enrolled child and adolescent HHCs of persons with microbiologically confirmed drug-sensitive pulmonary TB

(PTB) for enhanced TB screening. OP and stool samples were collected at home as per participants willingness and transported to the nearest laboratory per national guidelines. Stool was processed by trained lab technicians using the simple-one-step (SOS) method and both samples tested with Nucleic Acid Amplification Tests (NAATs; Xpert MTB/RIF or Truenat MTB).

Results/Impact: Altogether, 234 child and adolescent HHCs of 341 PTB index cases in Nagpur consented and were provided enhanced TB diagnostic testing. Most children (77; 33%) were between 6-10 years of age (mean age 9). The majority of HHC were tested for TB with only OP (149), 6 with only stool, and 79 with both. One child was TB-positive by OP (Table 1), demonstrating potential utility of easy-to-collect and transport OP swabs for enhanced contact investigations. Limited stool testing highlights project challenges with collection and transport of stool specimens from HHC homes due to limited transportation agency approval of the sample type.

Additionally, a shortage of NAAT kits delayed testing. However, the results positively demonstrated that the additive HHC investigation workload was manageable by one laboratory and a technician.

Characteristic	Child and adolescent HHCs (n=234) of PTB index cases	
	N	(%)
District		
Nagpur Urban	172	73.5%
Nagpur Rural	62	26.5%
Age		
Mean age	8.9	
< 5y	67	28.6%
6-10 y	77	32.9%
11-14 y	51	21.8%
15-18 y	39	16.7%
Gender		
Male	103	44.0%
Female	131	56.0%
Sample type		
Oropharyngeal (OP) sample	149	63.7%
Stool sample	6	2.6%
Both OP and stool sample	79	33.8%
NAAT results		
Oropharyngeal sample		
MTB detected	1	0.4%
MTB not detected	221	96.9%
Invalid	6	2.6%
Stool sample		
MTB detected	0	0.0%
MTB not detected	78	91.8%
Invalid	7	8.2%

Table 1. Characteristics of the child and adolescent HHCs undergone enhanced diagnosis in Nagpur, Jan 2022-Feb 2023

Conclusions: Our results highlight the programmatic challenges in using child-friendly samples for TB testing. Robust mechanisms for sample collection transport, adequate logistics for testing, and more sensitive tools are needed to improve childhood and adolescent TB diagnosis in the program setting.

OA40 Closing the gaps: Active case finding

OA40-417-15 Digital chest X-ray with computer-aided detection (CAD) in community-based TB case finding in the Philippines

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Background and challenges to implementation: The Philippine government recognizes the need to strengthen tuberculosis (TB) screening approaches in response to low symptom screening sensitivity and scarcity of radiologists leading to missed cases and low sputum collection rates. Digital chest x-ray (CXR) with computer-aided detection (CAD) is a sensitive and cost-efficient tool. It is crucial to review the CAD performance within country-specific contexts for its programmatic use towards TB elimination.

Intervention or response: CAD software with a fixed abnormality threshold score of 0.50 was widely used in community-based TB screening to promptly identify individuals with presumptive TB and facilitate collection of spot sputum specimens for rapid TB diagnostic tests. Retrospective analysis on data from May 2021 to September 2022 described CAD diagnostic performance, area under the receiver operating characteristic curve (AUROC), area under the precision-recall curve (AUPRC), and probable factors affecting the sensitivity and specificity of performance.

Results/Impact: Among 2,038 individuals screened, CAD demonstrated high sensitivity (94.5%) but low specificity (29.0%) with AUROC of 0.8340 and Youden's index of 0.55 at a 0.92 score. AUPRC of 0.5138 indicates a good balance between precision and recall with a baseline classifier of 0.1330. AUROC was higher among females (0.8467) whereas AUPRC revealed better CAD performance among males (0.5276). AUPRC, being a prevalence-sensitive measure, focuses more on the minority class (TB cases) which may cause differences between metrics. Both gender (p=0.918)and TB history (p=0.222) were found to be not associated with sensitivity performance of CAD. The odds of females being classified as non-TB cases was 1.55 higher compared with males (p<0.000).

Conclusions: Considering the Philippine TB prevalence, both AUROC and AUPRC can be valuable metrics for evaluating CAD performance within context-specific implementation. The challenges associated with CAD use require collaborative efforts on prioritizing innovation, quality assurance, and strategic resource allocation to optimize integration of CAD systems in scaled-up case finding activities.

I. Performance of CAD When Using a Fixed Threshold Score (0.50)

Variable	Sensitivity (%)	Specificity (%)	Positive Predictive Value (PPV)(%)
All participants (n= 2,038)			
Youden's Index = 0.55	94.46	28.98	16.96
(score at 0.92)	74.17	80.81	37.22
Gender			
Male (n=1,028)	94.58	24.36	16.13
Female (n=1,010)	94.29	33.37	17.86
TB History			
With (n=237)	89.66	9.62	13.21
Without (n=736)	95.65	18.68	15.32

II. AUROC and AUPRC by Risk Groups

Variable	AUROC (95% CI)	AUPRC (baseline classifier)
All participants	0.8340 (0.8059, 0.8622)	0.5138 (0.1330)
Gender		
Male	0.8200 (0.7814, 0.8587)	0.5276 (0.1614)
Female	0.8467 (0.8054, 0.8881)	0.4981 (0.1040)
TB History		
With	0.7299 (0.6091, 0.8508)	0.3151 (0.1224)
Without	0.8141 (0.7691, 0.8591)	0.3291 (0.1563)

III. Associations Between Individual Characteristics and Diagnostic Performance

Variable	Sensitivity		Specificity	
	Positive test n/N (%)	Unadjusted OR (p-value)	Positive test n/N (%)	Unadjusted OR (p-value)
Gender				
Male	157/166 (95%)	1.06 (0.918)	651/862 (76%)	Ref
Female	99/105 (95%)	Ref	602/905 (67%)	1.55 (<0.0000)
TB History				
With	26/29 (90%)	0.40 (0.222)	187/208 (90%)	Ref
Without	110/115 (96%)	Ref	504/621 (81%)	2.05 (0.005)

OA40-418-15 Artificial intelligence for TB screening to improve active TB case detection among urban slum, rural and pastoralist TB-key affected and vulnerable populations in Ethiopia

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Background: Limited access to X-ray facilities and a shortage of trained radiologists in resource-constrained settings like Ethiopia impede its widespread use. Recent advancements in Computer-Aided Detection and Artificial Intelligence (AI) offer promising alternatives for digital CXR analysis, particularly in TB screening and triage. This pragmatic evaluation aims to comprehensively assess a novel ultra-portable digital X-ray system with AI, gathering crucial data to elucidate its functionality and impact. Through systematic documentation and analysis, the study seeks to provide evidence for the program.

Design/Methods: This study involved 12,181 individuals from TB key affected and vulnerable groups across three diverse settings: urban slums, rural areas, and pastoralist communities, undergoing Chest-Xray and symptom-based screening. Onsite X-ray image interpretation, supported by Quire AI and by radiologists upon return, was conducted for all images. Individuals with TB suggestive symptoms and/or abnormal chest X-ray findings by AI interpretation and/or radiologist assessment were invited to provide specimen for bacteriological tests. Data was collected using a structured format designed for this purpose.

Results: A total of 12,181 individuals (39% females, 61% males) underwent TB screening. Symptom screening identified TB suggestive symptoms in 8.2% (95% CI 7.7-8.7%) of community members. The concordance rate between AI X-ray interpretation and clinical symptom screening was 88%, while a 95% concordance rate was observed between AI interpretation and radiologist readings. Among 802 X-ray images with abnormal findings, 98% exhibited active TB indicators. The TB incidence rate was 927 per 100,000 population (95% CI 757.4-1,098), nearly 6.7 times higher than the national estimation. The sensitivity rate of AI-assisted X-ray screening was 93.5% (95% CI 86.5-96.9%) with a specificity of 63.7% (95% CI 61.0-66.3%). The tool demonstrated a high negative predictive value (99.25, 95% CI 98.37-99.66).

Conclusions: AI-assisted X-ray screening exhibited notable sensitivity, surpassing symptom-based screening, and significantly contributing to case detection rates.

OA40-419-15 The impact of targeted advocacy to community leaders in improving active case finding in the community: The Benue WOW Truck experience

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Background and challenges to implementation: Accessing tuberculosis (TB) services faces various hurdles in certain communities. KNCV Nigeria has actively utilized the community interventions to address some challenges to TB care access in health facilities such as lack of proximity and TB awareness. The community intervention was undertaken with the Wellness on Wells (WOW) truck, a mobile diagnostic unit equipped with digital x-ray and GeneXpert machines for both TB screening and diagnosis. The WOW truck had the added advantage of accessing remote locations and bringing TB diagnostics services closer to remote dwellers.

Intervention or response: Advocacies were done across 9 LGA's out of 23 in Benue state. The LGA Chairmen and Traditional rulers who were engaged openly endorsed

and mobilized their constituencies to participate in TB screening activities. The screening of the leaders further boosted the confidence of community members which led to more acceptability and service uptake. During advocacy, the stakeholders are also shown pictures of the WOW truck working in other communities, this also increases their interest in embracing TB services.

Results/Impact: From January to December 2023, the WOW Truck screened over 37,000 clients, making a substantial contribution to screening coverage in the effort to detect TB within remote communities. Utilizing the WOW Truck ensured the evaluation of all clients presumed to have TB, resulting in a 100% evaluation rate. This led to the diagnosis of 613 TB cases, with 21% TB yield.

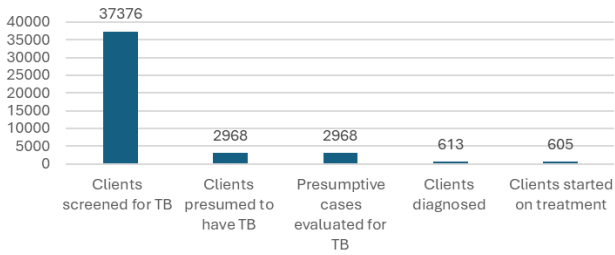

Fig 1: Wow Truck Cascade Performance Q1-Q4 2023.

Conclusions: Engagement with community leaders and stakeholders was integral to the success of Community ACF. The utilization of the WOW truck as an advocacy tool in community interventions has proved highly effective in improving TB screening and diagnosis in remote communities. Scaleup to other local communities can be vital in increasing TB active case finding.

OA40-420-15 Community-based active case finding for TB using chest X-rays: Lesson learned and challenges in Indonesia

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Background and challenges to implementation: In 2022, the Indonesian National TB Program recommended implementing community-based active case finding for Tuberculosis (ACF TB) using mobile chest X-ray (CXR) screening to identify people with TB rather than standard case detection. Consortium Penabulu-STPI, funded by the Global Fund, conducted community-based ACF using CXR in a selected province in Indonesia.

Intervention or response: The community-based ACF TB was conducted in four provinces in Indonesia from May to December 2023 in collaboration with primary health care centres under the coordination of provincial and district health offices. Activities include identifying the ACF targets based on index cases, selecting the CXR provider, preparing the logistics, meeting with stakeholders to get support, training local community cadres and monitoring the implementation process. A dedicated staff was appointed to manage the implementation process.

Results/Impact: Of the 36,607 target participants referred to ACF, 29,251 (79,9%) attended the mobile CXR screening. Of the CXR screened participants, 7,928 (27%) were presumptive of TB, and 3859 were tested with the Rapid Molecular Test (RMT). As a result, 570 (1.9%) TB cases were identified. Factors supporting ACF TB attendance include the involvement of local leaders in promoting the ACF and local cadres in distributing invitations, revisiting target participants, and accompanying them to attend the mobile CXR. The ACF was conducted on weekends, with transport provided for people with disabilities and door prizes for participants. Absence participants were due to feeling unwell and fear of discrimination if diagnosed with TB. Limited cartridge availability, causing only half of the eligible participants tested with RMT, and doctor's capacity to diagnose clinical TB remains a challenge in optimizing the TB case finding.

Conclusions: Implementing community-based ACF TB by involving local stakeholders and community cadres adds value to TB case findings. However, optimal implementation requires ensuring TB service readiness and attentive logistical planning.

OA40-421-15 The role of community engagement in promoting access to TB screening services: Lessons learned from Ubumi Bwandi Project in an urban community in Zambia

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health concern, and a leading cause of death in sub-Sahara Africa. Access to TB screening services remains a challenge due to limited

screening services and poor health seeking behaviour. We share experiences of using community engagement (CE) to promote access to TB screening, offered in a community hub and health facility, in Ubumi Bwandi project; a community-based TB screening initiative in an urban community in Zambia.

Intervention or response: Ubumi Bwandi offers TB screening alongside other services such as screening for hyperglycemia, high blood pressure, and cancer. CE adopted a wellness approach, creating awareness about the availability and importance of accessing these other services for improved wellbeing. Messages were developed and delivered during sensitization activities.

Outreach activities were also conducted using community health workers, and other health providers were invited to provide additional health services such as eye and ear screening. Activities and number of people reached or served were documented.

Results/Impact: Between 5th December 2023 and 24th March 2024, 14 outreach and five door-to-door sensitizations activities, reaching 6,262 individuals and 1,307 households, were conducted with 1,139 fliers distributed. More people were reached after work hours, over weekends and public holidays compared to during the day and weekdays.

More people living further from the hub were screened using outreach activities compared to those living nearby. The number of people coming to the hub increased when partner organisations offered additional services and when intensive sensitizations were conducted in the community.

People who were attracted by other services also accepted TB screening. A combination of approaches that are context specific, and responsive to the needs of people are required to increase TB screening.

Conclusions: To play a meaningful role in promoting access to TB screening services, CE should be responsive to the context, while leveraging available relationships and resources.

OA40-422-15 A view from ground level: The journey of 100,000 Philippine families screened for TB

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Background and challenges to implementation: Vulnerable populations such as those living in geographically isolated and disadvantaged areas (GIDA) experience structural and multifactorial barriers to screening, diagnosis, and care. Patient-centered active case finding (ACF) for tuberculosis (TB) has proved a valuable service for these vulnerable groups, but thousands of communities in the Philippines remain unreached due to social isolation, stigma, physical and financial barriers.

Intervention or response: Working through community leaders in GIDA in the Visayas, Mindanao, and Palawan, 100,553 vulnerable persons were screened with ACF in 733 communities. ACF was performed within a community-based poverty alleviation program which empowered community members to participate and lead.

Weekly program activities enabled follow up of persons with presumed TB. Transportation and nutritional support were also provided as needed.

Results/Impact: Of 100,553 vulnerable persons screened, 3,527 (3.5%) were identified with TB and 3,345 (95%) enrolled. The highest incidence was found in Negros Occidental (7.5%) and Sarangani (6.1%).

Conclusions: Households were amenable to participating in ACF activities when embedded in a poverty reduction program with engaged community leaders, rather than a one-off event led by outsiders. An underlying level of trust was built, which facilitates further care. The collaboration between a range of stakeholders was instrumental in providing screening that was accepted by GIDA communities.

Several challenges remain. Among vulnerable communities receiving the poverty reduction program, 12% were unreachable by ACF van. These communities could benefit from backpack X-ray units which are not yet FDA approved in the Philippines except under research protocol. Same day reading remains scarcely available in the Visayas and Mindanao, which would significantly reduce the number of patients lost to follow up. Distance to facilities for enrollment and follow-up is a physical and financial barrier. Even with transportation subsidized, the opportunity loss and additional expenses have consequences. Reaching marginalized households with ACF requires strategies that considers these needs to complete care.

OA40-423-15 Closing the TB case finding gap through artificial intelligence (AI)-aided screening of non-symptomatic population: Katsina State experience

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Background and challenges to implementation: Missing TB cases have continued to be the bane of TB programming in Nigeria even though there is a considerable improvement in case notifications in recent time. To address this challenge, intensive screening is directed to carefully selected communities wherein dwellers are massively screened, regardless of their symptoms. It is how-

ever fascinating to see that apparently healthy individuals with no symptoms but high index of suspicion from AI detected lesion turned out to be TB cases. This study therefore aimed to estimate the proportion of non-symptomatic patients whose eventual diagnosis was enhanced by artificial intelligence and hence help close the TB case notification gap in Katsina State Nigeria.

Intervention or response: A cross sectional retrospective review of data from AI-enabled portable digital Chest X-ray (CXR) between January 2022- January 2024 was conducted. Programmatically, CAD4TB was set at 0.50 (50%) for presumptive TB threshold. Community members were screened by AI-aided Portable Digital Xray, and their score read immediately. Presumptive cases were sent for GeneXpert. If unable to produce sputum, such film was sent to qualified radiologists for interpretation and possible clinical diagnosis using XMAP.

Results/Impact: 25,993 people were screened in different communities, 659 were without any TB symptom. This non-symptomatic population yielded 39 presumptive TB detected by CAD4TB at 0.5 score. This resulted in the diagnosis of 11 TB cases including 1 bacteriologically diagnosed.50 score. This resulted in the diagnosis of 11 TB cases including 1 bacteriologically diagnosed.

Total clients enrolled	26163
Total clients screen	25993
Total Number of Asymptomatic Clients Screened	659
Asymptomatic Clients presumed to have TB	39
Number of presumptive TB who completed evaluation	39
Total number of TB cases diagnosed	11
Number of TB cases diagnosed bacteriologically.	1
Total number of TB Cases Started on Treatment	11

Conclusions: Just as evidenced in other spheres, artificial intelligence is playing a big role in TB programming by helping in early detection of subtle, subclinical lung lesions which would have otherwise remained undiagnosed. There is need to intensify TB surveillance among susceptible populations regardless of TB symptom, possibly a need to scale up to national TB program screening policy.

OA40-424-15 Innovative and data driven engagement of the community to bridge the gaps in TB notification in Osun state, Nigeria: Experiences from 2020– 2023

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Background and challenges to implementation: Osun state with a projected population of 5.5million has the 2nd highest TB notification in Nigeria in 2022. The state in 2019 has one of the highest gaps in TB case notification in Nigeria with 77% gap in TB case detection. The programme in 2020 introduced comprehensive active TB case search in the community which was later guided using hotspot mapping tools (EPCON) which used data from community case finding combined with other independent variables to predict the high burden communities. This study aims at analyzing the impact of the community intervention guided by hotspot mapping tools on addressing the gap in TB notification.

Intervention or response: community Based organizations were engaged, and community TB workers were identified and trained to conduct active TB search in the community. EPCON hot mapping tools was introduced to enhance the yield from community interventions.

Results/Impact: Introduction of comprehensive community TB search led to over 600% increase in annual state TB case notification from 3,572 in 2019 to 25,466 in 2023. The annual TB cases from the community also increased by over 1000% from 1,569 in 2019 to 17,962 in 2023. The introduction of EPCON hot spot mapping in 2021 led to doubling of the yield from community intervention when compare with previous year 2020. The community TB cases increased by 127% from 3,988 in 2020 to 8,376 in 2021. The community currently accounts for 71% (17,962) of the TB cases notified in the state. The state in 2023 achieved 149% of the target.

Community TB cases from Osun state 2020-2023					
	2019	2020	2021	2022	2023
Estimated TB cases for the state (target)	15,304	15,737	16,182	16,640	17,111
TB cases notified	3,572	6,599	14,999	22,799	25,466
TB cases contributed by the community interventions	1,569	3,988	8,376	14,862	17,962
% community contribution to TB case ntification by the state	44%	60%	56%	65%	71%
State TB case detection rate (% of target achieved)	23%	42%	93%	137%	149%

Conclusions: The introduction of comprehensive community case search guided by hotspot mapping bridge the huge gap in TB notification with the state achieving 149% of the target and estimated cases. The hotspot mapping reduced the number needed to screen and test and double the yield from community TB case search.

OA41 Cutting-edge sequencing technology

OA41-425-15 TB lineage diversity in Eswatini from nanopore sequencing on stool and correlation with drug-resistant mutations

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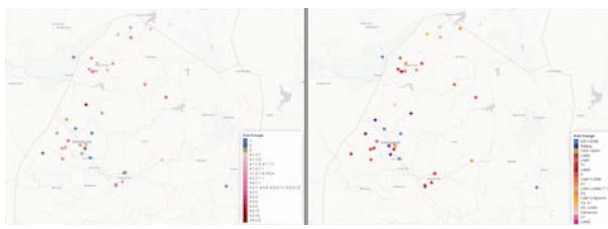
Background: Studies have demonstrated associations in *Mycobacterium tuberculosis* lineage and drug resistance. Utilizing targeted sequencing (TS), we evaluated the feasibility of nanopore sequencing of stool to identify lineage diversity and potential epidemiologic patterns, including mutations conferring drug resistance and geographic distribution in Eswatini.
Design/Methods: Leveraging specimens from 47 diagnostic study participants, lineage and sub-lineages were identified by nanopore TS utilizing spoligotype primers DRa and DRb with an automated pipeline referencing SITVIT2 on DNA extracted from stool or sputum culture filtrate. Lineage was correlated with drug resistant mutations identified by TS. 41/47 participants were mapped by general dwelling location converted into GIS coordinates using R.



Results: Stool and sputum culture TS had no disagreements on lineage determination. TS identified lineage 1, Indo Oceanic (14.9%, n=7), lineage 2, East Asian (17%, n=8), lineage 3, East African/Indian (4.3%, n=2) and lineage 4, Euro American (63.8%, n=30) with lineage 1 and 4 having the greatest geographic distribution. No drug resistance was found in lineage 3 and lineage 2 only had rifampicin resistance (His445Asp mutation). Only Lineage 4 harbored the Ile491Phe mutation (16.7%, n=5/30) that confers rifampicin resistance but is not identified by GeneXpert or phenotypic drug susceptibility testing on sputum cultures. Similarly, only lineage 4 harbored the Rv0678 mutation (13.3%, n=4/30) that confers bedaquiline and clofazimine resistance.
Conclusions: Nanopore sequencing of DNA extracted from stool can identify *M tuberculosis* lineages. Our evidence suggests that Eswatini contains lineage 1-4 with lineage 4 being the most prevalent and geographically distributed. Lineage 4 was the only lineage with mutations conferring resistance to bedaquiline and clofazimine (Rv0678) and the Ile491Phe mutation (rpoB) known to be missed by traditional diagnostic methods.
As sputum-based sequencing is difficult to implement in many settings, stool-based sequencing is a promising tool that could support investigation of *M tuberculosis* lineage and drug resistant associations.

OA41-426-15 Molecular insight into M. tuberculosis resistance to novel aroylhydrazones gained through in vitro mutagenesis and whole genome sequencing

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Background: The emergence of MDR-TB strains opens the way to identify novel compounds, whose structure-activity-toxicity relationships and mechanism of action must be clarified prior to further development.
We study series of new aroylhydrazones for their antimycobacterial activity, selectivity and toxicity that may lead to the identification of active compound and reveal their mechanism of action.
Design/Methods: We present the aroylhydrazone compounds regarding their: anti-TB activity, assessed trough EUCAST guidelines, *in vitro* spontaneous mutagenesis, performed on resistant mutant subcultures grown under increasing MIC concentrations of selected compounds and whole-genome sequencing, identifying the altered genes in the resistant mutants. The significance of amino acid change was assessed in silico using PAM1, SIFT.
Results: The compounds 3a (MIC 0.4412 μM) and 3b (MIC 0.3969 μM) demonstrated highest antimycobacterial activity, a lowest toxicity against HEK-293T and high selectivity index (SI=633.49 and 1978.83, respectively). They were used for *in vitro* selection of spontaneous resistant mutants. WSG of the resistant mutants identified 2 mutations for clone 3a and 1 mutation in clone 3b.
The first in clone 3a was synonymous mutation in Rv3366/spoU gene, which coding tRNA/rRNA methylase SpoU. The second was insert_frameshift in *Rv3696c*/*glpK* gene,

which coding *glpK* - glycerol kinase gene, responsible for the intermediary metabolism and respiration. Clone 3b had nonsynonymous SNP in *Rv3755c*.

Conclusions: Gene-gene network analysis shows that the gene *Rv3755c*, found in 94% of sequencing reads is linked to bacterial adaptation and located in the neighborhood of several ABC transporter genes, involved both in transport and in efflux

The results for 3a, found in 83% of sequencing reads suggest that GlpK phase variation may contribute to drug tolerance. Thus it was likely selected in response to action of this compound.

Understanding the structure-activity-toxicity relationships and the molecular target is vital in the earliest stages of antitubercular drug discovery and identification of novel anti-TB lead compounds.

OA41-427-15 Mapping the role of targeted next-generation sequencing in drug-resistant TB diagnostic algorithms

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Background: In 2023, WHO recommended Deeplex Myc-TB (GenoScreen) and AmPORE TB (Oxford Nanopore Technologies) targeted next-generation sequencing (tNGS) solutions for TB drug resistance detection. Based upon Seq&Treat evaluation results and considering recommended treatment regimens and availability of other molecular WHO-recommended diagnostics (mWRDs), we suggest clinical diagnostic algorithms incorporating tNGS for rapid and informed treatment of patients.

Design/Methods: Xpert TB-positive clinical samples from 763 patients in India, Georgia and South Africa were tested by both tNGS solutions. The ability of each tNGS solution to generate data for each drug for each sample was stratified by Xpert MTB/RIF assay semiquantitative result. The ability of each tNGS solution to generate data for all relevant drugs in TB and DR-TB regimens was compared to phenotypic drug susceptibility testing and whole genome sequencing.

The diagnostic performance of tNGS was also compared to available mWRDs. Given these data, we considered suitable use cases of tNGS in DR-TB diagnostic algorithms.

Results: The Genoscreen and ONT solutions generated sequencing data for 88.5% (675/763) and 93.1% (710/763) of samples, respectively. The GenoScreen and ONT solutions generated complete data to inform regimen selection for ≥76.8% and ≥71.4% of patients tested, respectively. A higher percentage of Xpert high and medium category samples generated sequencing data compared to those in the low and very low categories. Sensitivity per drug was equivalent or superior to other mWRDs (Table).

In a foreseen diagnostic algorithm, tNGS is used in reflex to a positive result from a centralized DR-TB assay, as an alternative to other expanded resistance assays.

	ONT (1 study | 763 participants)	Geno Screen (1 study | 763 participants)	Xpert MTB/RIF (5 studies | 921 patients)	Xpert Ultra (5 studies | 930 patients)	Truenat RIF (1 study | 309 specimens)	MTB-DRplus v2 (4 studies | 872 samples)	cDST Solutions (18 studies | 2874 specimens)	Genoscholar PZA-TB II (7 studies | 964 participants)	Xpert MTB/XDR (3 studies | 1605 participants)	MTB-DRsl v1 (9 studies | 1771 smear-positive participants)
RIF	97.4 (95.6, 98.6)	99.0 (97.6, 99.7)	95.3 (90.0, 98.1)	94.9 (88.9, 97.9)	84.3 (72.0, 91.8)	95.8 (92.6, 97.6)	96.7 (93.1, 98.4)			
INH	95.3 (93.1, 97.0)	96.5 (94.5, 98.0)				94.5 (91.4, 96.5)	86.4 (82.1, 89.8)		94.2 (89.3, 97.0)	
EMB	85.0 (81.0, 88.4)	95.6 (92.9, 97.5)								
PZA	74.9 (70.0, 79.4)	89.3 (85.4, 92.4)						81.2 (75.4, 85.8)		
MFX	94.7 (91.6, 97.0)	97.2 (94.6, 98.8)							93.1 (88.0, 96.1)	86.2 (74.6, 93.0)
AMK	87.9 (76.7, 95.0)	94.4 (84.6, 98.8)							86.1 (75.0, 92.7)	84.9 (79.2, 89.1)
BDQ	5.7 (1.0, 19.2)	81.3 (63.6, 92.8)								
LZD	46.9 (29.1, 65.3)	44.4 (25.5, 64.7)								
CLF	0.0 (0.0, 10.9)	87.5 (71.0, 96.5)								

Table. Sensitivity of tNGS solutions against other mWRDs compared to pDST

Conclusions: The tNGS solutions generated sequence data for most samples from a diverse DR-TB population and informed regimen selection with equivalent or better performance than available mWRDs. Operational research will be key to further support positioning in diagnostic algorithms and guide implementation.

OA41-428-15 Differentially expressed coding and non-coding RNAs reveal the mechanisms of transcriptome regulation and RNA signatures in clinical strains of M. tuberculosis

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Background: Small RNA (sRNA) and other long non-coding RNAs (lnRNAs) are potential novel markers that can be exploited for TB diagnostics and treatments and show promise in the fight against clinical strains of *Mycobacterium tuberculosis* complex (MTBC).
Design/Methods: The current study investigated the mechanisms of gene regulation and RNA signatures through RNA sequencing of total RNA and sRNA of clinical strains of lineage 2 (Beijing), and lineage 4 (F15/LAM4/KZN) compared to the laboratory H37Rv strain using a Hisat-Ballgown Bioinformatics pipeline.
Results: All strains exhibited differential regulation of total RNA and sRNAs that were unique for each strain as follows compared to the laboratory H37Rv: Lineage 2 sRNA (217), Lineage 4 sRNA (155); Lineage 2 mRNA (481), Lineage 4 mRNA (295). Characterization of all differentially expressed transcripts revealed the presence of well-known annotated transcripts, hypothetical proteins and ~30% unannotated transcripts. Unannotated transcripts included house-keeping and regulatory noncoding RNAs that were specific to either Lineage 2 or Lineage 4 strain compared to the laboratory H37Rv.
Furthermore, the regulatory noncoding RNAs (sRNA and lnRNAs) had high affinity for the repressed mRNA transcripts, providing insight into gene regulation of clinical strains of *M. tuberculosis* by these RNA markers.
Conclusions: The RNA transcripts identified in the current study can offer insights into the growth and metabolism of the MTBC members, as well as be exploited for diagnostics purposes in clinical samples.
Identification and characterization of RNA signatures and gene regulatory mechanisms within the MTBC lineages may provide a novel perspective in control strategies against these human-adapted, globally prevalent infectious pathogens.

OA41-429-15 The M. tuberculosis complex transcriptome is differentially regulated by non-coding RNAs that can be explored for novel TB biomarkers

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Background: *Mycobacterium tuberculosis* is a recalcitrant rife pathogen that has infected humans for millennia, and thus globally remains as one of the oldest, and deadliest pathogen of our lifetime. Studies have shown the critical role of *M. tuberculosis* non-coding RNAs in TB pathogenesis, however, detailed mechanisms behind their functions remain elusive.
Therefore, the current study was aimed at profiling mRNA and ncRNA within the MTBC, to provide insights on their molecular networks and pathways involved in transcriptome regulation.
Design/Methods: Coding and ncRNAs were extracted from clinical drug-resistant and drug-sensitive MTBC strains belonging to eight MTBC lineages together with laboratory H37Rv and H37Ra strains grown in standard 7h9 broth and cholesterol-rich minimal media. RNA-Sequencing library was prepared for the Illumina NovaSeq 6000 sequencing platform using Illumina mRNA and sRNA kits.
Results: Transcriptional responses of genes involved in mycolic acid synthesis were determined in MTBC strains cultivated in cholesterol relative to the strains grown in 7H9 medium of the same lineages. Coding and non-coding RNAs implicated in lipid metabolism for *lpqK*, *lspA*, *lprQ*, *echA18*, *echA21* and *JTY_0827* transcripts were differentially expressed in a strain-specific manner.
Through RNA Seq analysis, the current study mapped specific metabolic pathways related to channelling of metabolites produced from cholesterol degradation for each of the MTBC lineages relative to the virulent and avirulent laboratory controls.
Furthermore, increased expression of sRNAs involved in cholesterol metabolism was observed for mRNA transcripts that were highly repressed during growth in cholesterol, suggesting a specific molecular mechanism of regulation through these non-coding RNAs.
Conclusions: The differentially expressed coding and ncRNAs in a lineage specific manner provide insight into gene regulation for MTBC pathways and molecular networks that underlie disease pathogenesis, and the outcome of infection. Therefore, ncRNAs can be used as biomarkers towards developing RNA-based therapeutics and diagnostic tools for the treatment of TB.

OA41-430-15 A fully-automated molecular diagnostic system for the sensitive detection and quantification of multi-drug-resistant TB

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Background: To address the need for affordable molecular diagnostic tests for Mycobacterium tuberculosis (MTB) we have developed the MX8, a fully automated cartridge-based system capable of extracting and detecting MTB in unprocessed sputum with no off-board preprocessing (e.g. pre-liquification and centrifugation).
The test targets MTB-specific rRNA, a marker of viable MTB, and has an integrated RNA-based extraction control which reports on sample inhibition. The system achieves sensitive case detection but also has potential for disease monitoring applications. The system can process multiple sample types including stool, a more accessible sample for children and people living with HIV.
Design/Methods: A total of 44 unprocessed sputum samples were spiked with 200 CFU/ml M. tuberculosis var. BCG (ATCC 35743) (BCG). The samples were added directly to a TB Lysis tube, placed into the extraction cartridge, and then loaded onto the MX8. Sample liquefaction, bacterial lysis, rRNA extraction, and real-time PCR were automatically performed by the MX8 with no user intervention.
Results: BCG rRNA was detected in 40/44 sputa samples and the extraction control was detected in all samples with very similar Ct values. These data demonstrate a tentative limit of detection (LoD) of 250 CFU/ml (95% CI 167-354).

	Target	Average Ct	SD Ct	Positive	Total	% positive	Tentative LoD CFU/ml (95% CI)
200 BCG CFU/ml	rRNA	28.4	1.4	40	44	91%	250 (167-354)
	Extraction control	28.9	0.7	44	44	100%	N/A

Table 1: Analytical sensitivity of unprocessed sputa spiked with BCG

Conclusions: The new MX8 fully automated molecular diagnostic platform has a low analytical LoD for TB in sputa. Minimal user handling steps improve operator experience and reduces risk of error during sample processing. This highly sensitive assay has further applicability for disease monitoring as MTB rRNA targets are responsive to tuberculosis treatment, unlike molecular diagnostics such as Xpert-Ultra which only test DNA targets.

OA41-431-15 Evaluation of the Indigen MTB/DR-TB RT-PCR for rapid screening of TB and detection of rifampicin and isoniazid resistance

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Background: Tuberculosis (TB) is one of major global health issues due to its high mortality rate. One of the keys to successful management of TB is through rapid diagnosis of TB and early detection of drug resistance. The Indigen MTB/DR-TB RT-PCR is a multi-fluorescence Real-Time PCR assay for the diagnosis of *Mycobacterium tuberculosis* (MTB) and detection of Rifampicin and Isoniazid resistance.
This study aimed to evaluate the Indigen MTB/DR-TB RT-PCR assay performance on clinical sputum specimens.
Design/Methods: Sputum specimens were obtained from patients with presumed TB who visited TB health care facilities located in two major cities of Indonesia from September 2022 to January 2024. Specimens were assessed using acid fast bacillus (AFB) smear microscopy, MTB culture, drug susceptibility testing (DST), and Indigen MTB/DR-TB RT-PCR assay. Fisher's exact test (χ^2) was used to analyze Indigen performance compared to culture method.
Results: The performance of Indigen MTB/DR-TB RT-PCR assay was assessed using 656 specimens obtained from 656 patients with presumed TB. The overall sensitivity was 94% (95% CI: 90.71%-96.32%) and specificity was 98.80% (95% CI: 97.00%-99.68%) with Kappa value of 0.93 compared with MTB culture method.
When the analysis was performed on AFB-smear negative samples (n=430), lower sensitivity level was observed at 78.90% (95% CI: 69.01%-86.79%) whilst the specificity remained high at 98.83% (95% CI: 97.02%-99.68%).
In comparison to DST, Indigen demonstrated sensitivity level at 77.50% (95% CI: 61.55%-89.16%) and 81.80% (95% CI: 64.54%-93.02%) for RIF and INH resistance, respectively. The specificity level was 100% (95% CI: 89.72%-100%) for both RIF and INH resistance samples.
Conclusions: The Indigen MTB/DR-TB RT-PCR assay demonstrated rapid and reliable performance for detection of tuberculosis and resistance of Rifampicin and Isoniazid.

OA41-432-15 Culture-free whole genome sequencing of M. tuberculosis using ligand-mediated bead enrichment method

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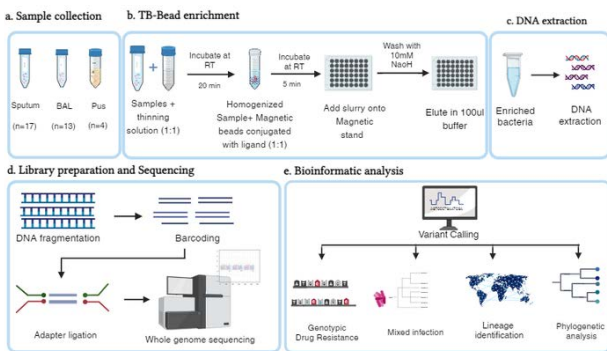
Background: Polyclonal *M.tb* infections often lead to heteroresistance, impacting treatment efficacy, relapse, and resistance amplification. While conventional methods like GeneXpert MTB/RIF do not detect polyclonal infections and minor alleles, WGS is accurate but relies on cultured samples, potentially reducing genetic diversity. Culture-free WGS can overcome these limitations, although it's challenging due to low bacilli against high background.
Design/Methods: We prospectively collected 34 samples (sputum, n=17; BAL, n=13 and pus, n=4) from patients with tuberculosis at Kasturba medical college Manipal, India. Post decontamination, ligand TB-Beads (Microsens ,UK) were used to concentrate *M.tb* followed by DNA extraction.
Sequencing was performed on Illumina HiSeq XTen. Data was analyzed using pipelines developed in-house. *TBProfiler* was used to detect drug resistance and lineage. Kruskal-Wallis test to determine difference in the genome coverage based on smear grading.



Results: *Mtb* was detected in 88.2% (30/34) of the samples of which 35.3% (12/34) were smear negative. There was a positive correlation between load of bacilli and genome coverage ($p< 0.001$). We detected 58 genes listed in WHO mutation catalogue in each positive sample (median coverage = 85%, IQR = 61%-94%), enabling the identification of mutations missed by routine diagnostics. Mutations causing resistance to rifampicin, isoniazid, streptomycin, and ethambutol were detected in 5/34 (14.7%) samples, including the *rpoB* S441A mutation that confers resistance to rifampicin which is not covered by Xpert MTB/RIF. In the AFB3+ sample, the mutation frequency for Ser441Ala was 100%, with a coverage depth of 235x. We also detected mixed infections in four samples (BAL=2, pus=1 and sputum= 1) where BAL sample was infected with four different strains of *Mtb*.
Conclusions: : We demonstrate the feasibility of magnetic bead-based enrichment for culture-free WGS of *Mtb* from clinical specimens , including smear-negative samples. This approach can also be integrated with low-cost sequencing workflows for rapid detection of resistance and mixed infections.

OA42 What you didn't know about Latent TB Infection

OA42-433-15 Estimating the global burden of viable M. tuberculosis infection

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Background: Challenges to assumptions about permanent tuberculous immunoreactivity and lifelong infection warrant a re-estimation of the global burden of viable *Mycobacterium tuberculosis* (*Mtb*) infection.
Design/Methods: We developed a mathematical model incorporating reinfection and self-clearance to estimate recent (within 2 years) and distal viable *Mtb* infections. First, we constructed national trends in annual risk of infection (ARI) using direct estimates from nationally representative *Mtb* immunoreactivity surveys and indirect estimates using tuberculosis (TB) prevalence derived from WHO incidence. We adjusted ARI underestimation based on immunoreactivity reversion probabilities. Then, Gaussian process regression was used to generate country-specific ARI trajectories from 1950, and national mixing matrices were applied to obtain age-specific risks of infection. Finally, we estimated self-clearance rates in line with recent findings and empirical data, exploring scenarios with variations in long-term clearance rates.
Results: In 2022, 2.1% (95% uncertainty interval [UI]:1.8-2.6) of the global population was recently infected with viable *Mtb*, amounting to approximately 168

million people (95%UI:145-209); whereas the population with remaining distal infections was between 8.0% (95%UI:7.3-8.9) and 14.8% (95%UI:13.7-15.9) depending on assumptions of long-term self-clearance rates. Of those recently infected, 11.7% (95%UI:10.6-12.4) were in children (<15 years).
Of all recent infections, the majority were found in Southeast Asia (46.9%; 95%UI:36.3-56.7) and Western Pacific regions (26.2%; 95%UI: 18.5-35.7).

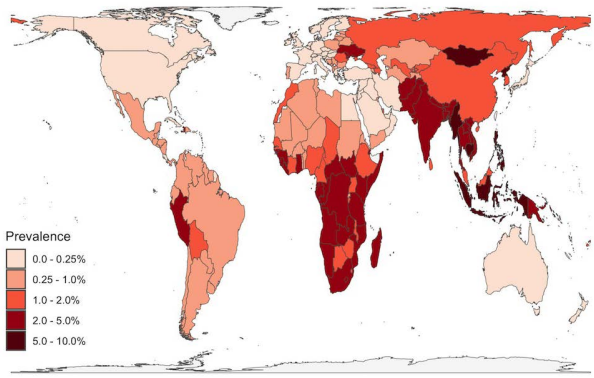

Figure. Global burden of recent viable Mycobacterium tuberculosis infection.

Conclusions: Our findings update previous estimates of *Mtb* infection burden, highlighting a substantial global population recently infected and at immediate risk of progression to disease. These underscore the need for enhanced diagnostic and management strategies to identify and treat those at high risk of TB disease.

OA42-434-15 A novel cytokine biomarker for predicting active TB from latent TB: A cohort study

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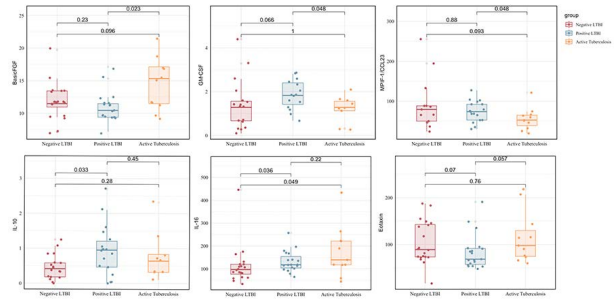
Background: While Interferon-γ release assays (IGRAs) and tuberculin skin tests (TST) are commonly used for diagnosing tuberculosis (TB), they face challenges in effectively differentiating between latent TB infection (LTBI) and active TB (ATB).
This study aimed to pinpoint potential antigen-specific biomarkers capable of predicting LTBI cases versus ATB cases.
Design/Methods: This study enrolled students who were in close contact during school tuberculosis outbreaks. A total of 60 students were included and categorized into three groups: 18 negative for LTBI, 21 positive for LTBI without ATB, and 21 positive for LTBI who subsequently developed ATB during follow-up.
The study measured the levels of 67 cytokines using Luminex assays to identify markers that could reliably discriminate between LTBI and ATB cases.
Results: Luminex assay results revealed that Basic Fibroblast Growth Factor (BasicFGF) expression levels were higher in the ATB group compared to the positive LTBI group (P=0.023). Additionally, the expression levels of Granulocyte-Macrophage Colony-Stimulating Factor (GM-CSF) and Macrophage Inflammatory Protein-1/C-C Motif Chemokine Ligand 23 (MPIF-1/CCL23) were significantly lower in the ATB group, with P values of 0.048 for both. Receiver operating characteristic (ROC) curve analysis of the 67 biomarkers indicated that BasicFGF (AUC=0.749, 95% CI: 0.527-0.877), GM-CSF (AUC=0.748, 95% CI: 0.531-0.901), and MPIF-1/CCL23 (AUC=0.727, 95% CI: 0.527-0.877) effectively distinguished between LTBI and TB cases. The combined use of all three markers yielded the greatest diagnostic efficiency (AUC=0.913, 95% CI: 0.719-0.989).



Conclusions: BasicFGF, GM-CSF, and MPIF-1/CCL23 demonstrate potential as diagnostic biomarkers for active tuberculosis (ATB). However, further validation through laboratory confirmation is essential to determine their predictive ability in distinguishing LTBI from active cases.

OA42-435-15 Trajectories of IGRA results over two years in independent cohorts from China, South Africa, Tanzania, and the United States

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Background: There is an ongoing debate about whether clearance of *Mycobacterium tuberculosis* infection occurs and at what magnitude. Recent studies quantifying 'uncertainty zones' of interferon-gamma release assays (IGRA) provide a more stringent estimate of reversion of IGRAs, potentially indicating clearance of the organism. We assessed trajectories of IGRA results over follow-up, accounting for 'uncertainty zones' through stringent cut-offs.

Design/Methods: We followed five cohorts of participants in South Africa, China, Tanzania, and the United States tested with an IGRA test at least three times over two years for stringent conversion and stringent reversion . Participants did not receive preventive therapy during follow-up. The annual risk of IGRA reversion was assessed after an IGRA conversion and among those with baseline positivity.
Results: In total, 26,596 IGRA measurements were taken over 13,593 years of follow-up ($N_{participants}$=7,683). Stringent reversion at year 2 after stringent conversion at year 1 varied between cohorts, occurring in 48% (43/90) for QuantiFERON, 37% (22/59) for WANTAI, and 17% (2/12) for T-SPOT.TB, respectively.
Stringent reversion at 1 year after baseline positivity occurred in 12% (47/404) for WANTAI. *M tuberculosis* reversion was more common in younger participants (Adjusted Odds Ratio [AOR], 0.95; 95% CI, 0.93–0.97) and those without recent close tuberculosis exposure (AOR, 0.35; 95% CI, 0.11–1.03 in South Africa; 0.10; 95% CI, 0.01–0.61 in China).
Conclusions: In diverse, population-based cohorts from a range of settings, these results suggest high annual rates of *Mycobacterium tuberculosis* infection clearance that decrease with time from exposure and age.

OA42-436-15 Factors associated with completion of short-term treatment for latent TB by international migrants in Manaus – AM, Brazil

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Background: The migration process is a complex phenomenon whose impact on health depends on several factors, including local and destination epidemiological indicators. One of the main barriers to adherence to tuberculosis treatment is its long duration, which is why a new drug was recommended by the World Health Organization and incorporated by the Ministry of Health, called 3HP (Isoniazid (H) and Rifapentine (P).
As stated above, the objective of the study was to identify factors associated with the completion of short-term treatment (3HP) for Latent Tuberculosis by international migrants.
Design/Methods: This is a cross-sectional study carried out in the city of Manaus, capital of the state of Amazonas, northern region of Brazil. It is noteworthy that Manaus is one of the cities with the highest number of tuberculosis cases and has an intense migratory flow, mainly from Venezuela.
The study population was made up of international migrants detected with latent tuberculosis and who underwent short-term treatment (3HP regimen) between 2021 and 2023. It was a binary logistic regression to identify characteristics associated with those migrants who completed treatment.
Results: 85 migrants with latent tuberculosis were identified in Manaus in the period analyzed, of which 67 completed treatment. Using binary logistic regression, it was identified that starting treatment within 20 days of diagnosis increases the probability of completion by 7.6 times (95%CI:1.84-46.92), as well as having children increases it by 5.26 times (95%CI:1.29-28.93) the probability of completing treatment. While those migrants residing in shelters were less likely to complete treatment (OR:0.14; 95%CI:0.02-0.54).
Conclusions: The study contributes significantly to the understanding of the dynamics of TB among international migrants living in Manaus, emphasizing the importance of adaptability and personalization in intervention and treatment strategies for this population.

OA42-437-15 Enhancing TB case detection in Afghanistan: The role of active household contact screening (2018-2023)

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Background and challenges to implementation: In 2019, the tuberculosis (TB) program of Afghanistan launched active household contact (HHC) screening to identify all forms of TB cases nationwide. Implementation was hindered by organizational deficiencies, inadequate resources, and limited community awareness about TB. Addressing these barriers was imperative to improve TB detection rates and enhance preventive measures such as Isoniazid Preventive Therapy (IPT).
Intervention or response: In collaboration with USAID-funded AFIAT, Urban Health Initiative, and the Global Fund, the National TB program undertook a comprehensive approach to active contact screening in 2020. This included door-to-door verbal screenings of TB index case

contacts, followed by referral to health facilities for testing. Diagnostic center health workers underwent extensive training and mentorship to enhance contact investigation skills. Data from 2020-2021 was unanalyzed due to COVID-19 and regime change.

Results/Impact: Between 2022 and 2023, a total of 102,444 all form TB cases were detected in Afghanistan. Over the two years, 438,776 HHCs (all groups: PLHIV, children<5, HHCs>5, etc.) were screened for TB symptoms, averaging four contacts per index case. Among those screened, 146,336 (33%) were identified as presumptive TB individuals, with 12,702 (9%) diagnosed with all forms of TB. Active contact screening significantly contributed to 12% of TB case detection nationwide from 2022 to 2023. Furthermore, 62,805 children under the age of five received IPT, with an 85% completion rate between 2022 and 2023.

	2018	2019	Before (2018-2019)	2022	2023	After (2022-2023)	Increase
All form TB cases detected	48,800	52,770	101,570	52,407	50,037	102,444	0.9%
Number of contacts evaluated for TB	114,909	147,730	262,639	211,631	227,145	438,776	67.1%
HHCs evaluated as % of expected HHCs	34%	40%	37%	58%	65%	61%	
Number of HHCs diagnosed as all form TB patients as number and % of total	4,813 (10%)	3,809 (7%)	8,622 (8%)	6,981 (13%)	5,721 (11%)	12,702 (12%)	47.3%
HHCs under five years of age	21,962	25,967	47,929	35,202	36,793	71,995	50.2%
HHCs under five years of age started IPT	20,261	24,614	44,875	31,228	31,577	62,805	40.0%
HHCs under five years of age completed IPT	15,740	19,125	34,865	23,328	29,809	53,137	52.4%
% of HHCs under five years of age completed IPT	78%	78%	78%	75%	94%	85%	

Table 1. Role of active household contact screening. 2018-2020. Afghanistan.

Conclusions: Active HHC screening emerged as a pivotal strategy to enhance TB case detection and facilitate IPT provision for children. The incidence of TB among HHCs was found to be 16 times higher than the WHO's estimated population incidence, highlighting the need for nationwide implementation of active contact screening to combat TB in Afghanistan.

Key recommendations include sustained investment in training, resources, and community engagement for initiative success and sustainability.

OA42-438-15 Duration of effectiveness of TB preventive treatment: An individual-participant meta-analysis

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Background: Treatment of individuals after tuberculosis (TB) exposure and/or *Mycobacterium tuberculosis* infection is widely recommended to prevent progression to disease. However, the duration of protection achieved from TB preventive treatment (TPT) is debated and may vary by setting.

We aimed to assess the effectiveness of TPT over time, including among settings of varying TB burden and by varying demographic risk groups.

Design/Methods: For this individual-participant meta-analysis, we assembled multiple cohorts from TB contact tracing studies published between January 1998 and April 2018. Studies were restricted to those with at least one year of follow-up. Using mixed-effects Cox regression models, we estimated adjusted hazard ratios (aHRs) for incident TB among those who tested *Mtb* infection positive at baseline by TPT status in six-month intervals from six months to four years post-exposure, followed by the period greater than four years.

Results: We identified 432,589 contacts from 34 cohorts in 28 countries; 5,063 incident TB cases were diagnosed over a median follow-up time of 2.9 years (range: 0-11 years).

Among 80,208 contacts with *Mtb* infection at baseline, the overall TB incidence rate was 9.8 per 1,000 person-years (PY); 1.6 per 1,000 PY in those who initiated TPT, and 19.4 in those who did not.

Overall, receiving TPT was associated with reduced risk of TB for at least 3 years (aHR, .34; 95% CI .12-.94 at 30-36 months), with considerable heterogeneity by background TB burden, age, and HIV status.

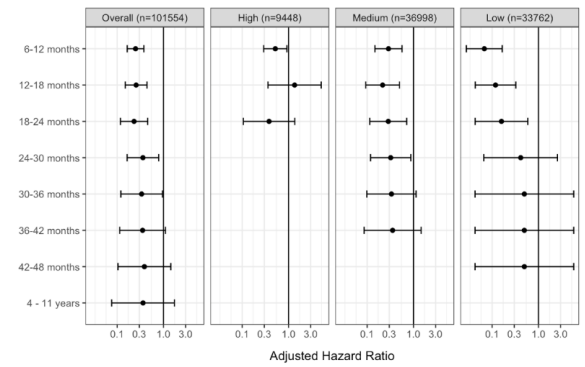

Figure. Adjusted hazard ratios for incident tuberculosis among contacts (restricted to those that tested positive at baseline) who were versus were not given TB preventive treatment, overall and by background tuberculosis burden.
Notes: X-axis displayed on log scale. Models were adjusted for contact age, sex, and HIV status, with random effects for each individual study and study design (prospective versus retrospective data collection). Background burden was defined as low (<20 cases per 100,000 population), medium (20-100 cases per 100,000 population), or high (>100 cases per 100,000 population).

Effects waned after one year in high-burden settings (Fig) and were considerably attenuated in people with HIV (aHR, .53; 95% CI .16-1.81 at 6-12 months, waning to aHR, .75; 95% CI .20-2.83 at 12-18 months).
Conclusions: TPT provided sustained protection against TB for at least 2-3 years in low and medium-burden settings but waned considerably faster in high-burden areas and among those with HIV.

OA42-439-15 Completion rate and adverse events of latent TB infection treatment in 25,127 subjects with different comorbidities: A 30-year retrospective study

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Background: With a relevant fraction of the global population infected with tuberculosis (TB), effective TB preventive treatment (TPT) is crucial to pursue the World Health Organization (WHO) EndTB strategy.
Our aim was to evaluate TPT completion rate (CR) and to describe the most frequent adverse events (AEs) according to the underlying risk factors for TB activation.
Design/Methods: We performed a retrospective study in a Reference Center for TB care in a low TB endemic country, Italy, on subjects diagnosed with LTBI from 1st January 1992 to 31st October 2023. All subjects who had tuberculin and/or IGRA positive test and were eligible for TPT were included.
Exclusion criteria were previous contact with a patient affected by rifampicin and isoniazid resistant TB, signs and symptoms of active TB and/or a suggestive chest Xray. CR and AEs were assessed for the total population and in four sub-groups: people living with HIV (PLWH), patients with autoimmune diseases undergoing immunesuppressive treatment (AP), neoplastic patients (NP) and transplant recipient candidates (TRC).
Results: 23878 subjects were started on TPT with an overall CR of 78.80%. CR was highest among TRC (165, 85.49%), followed by NP (40, 80.00%), AP (914, 79.96%), and PLWH (116, 76.82%). TPT related AEs were highest among NP (11, 22.00%), followed by AP (191, 16.71%), TRC (22, 11.40%) and PLWH (14, 9.27%). The most frequent AEs were gastrointestinal: nausea, vomit, dyspepsia, gastritis, abdominal pain and cramps. Gastrointestinal AEs were the most prevalent in the overall population (1165, 4.88%) and also in PLWH (7, 4.64%), AP (62, 5.42%), TRC (6, 3.11%) and NP (5, 10%) who also had an equal rate of asymptomatic hypertransaminasemia.
Conclusions: TPT administered in a reference Centre for TB care retains high CR and is well tolerated also in at risk population for AEs, such as TRC, NP, AP and PLWH.

OA43 Asymptomatic TB: How far and deep should we go? How do we find asymptomatic TB and what do we do about it?

OA43-440-15 Analysis of asymptomatic TB from Japan's Nationwide Surveillance, 2017-2022

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Background: Subclinical tuberculosis (TB), an intermediary state between latent TB infection and active TB with recognizable symptoms, has recently gained recognition. Facing delayed diagnoses, these individuals also risk transmitting the infection.
Our study, addressing the lack of documentation, sought to clarify subclinical TB's characteristics to better understand its progression.
Design/Methods: In Japan, routine health checks include chest radiography for nearly all adults. We reviewed data from the Nationwide Tuberculosis Surveillance System in Japan, focusing on patients diagnosed with pulmonary TB initially between 2017 and 2022. This study compared the characteristics of subclinical patients (defined as those lacking respiratory symptoms such as cough, sputum, and hemoptysis at detection) with patients presenting with active symptomatic TB.
Results: Of 65,598 pulmonary TB patients, 30,191 (46.0%) were classified as subclinical, 64.1% identified through health checks. Among them, positivity rates for acid-fast bacilli (AFB) smear, and culture were 36.5%, 67.1%, and 68.8%, respectively. When compared with active symptomatic TB patients, individuals with subclinical TB were younger (mean age 65.2 vs. 70.3 years), and less likely to have cavities (20.8% vs. 36.0%) or broad lesions (13.2% vs. 22.2%) on chest X-rays.
Furthermore, they had lower positivity rates for AFB smear (36.5% vs. 65.1%), and culture (68.8% vs. 82.9%). The prevalence of resistance to rifampicin or isoniazid was comparable between the groups. Subclinical TB patients experienced better treatment outcomes, with higher treatment success (69.9% vs. 63.6%) and lower mortality rates (20.0% vs. 27.2%).
Conclusions: Consistent with prior studies, our findings confirm that a considerable number of individuals in Japan with TB do not exhibit respiratory symptoms.

Approximately one-third of those had positive sputum smears, suggesting potential infectiousness. There is a critical need to measure the real infectivity among the population to inform public health strategies effectively.

OA43-441-15 Occurrence of subclinical TB in a community active case finding campaign

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Background: Subclinical tuberculosis, a condition where individuals are presumed to be infectious but do not have significant symptoms, is gaining attention. The World Health Organization recommends using the four-symptom screening rule (W4SS) for cough, fever, weight loss, and night sweats. We determine the proportion of subclinical TB among newly bacteriologically positive TB patients using three definitions: 1- screening negative for any cough, 2 – negative for prolonged cough, and 3 – negative for any W4SS.
Design/Methods: Communities from settlements that were deemed hard-to-reach and/or underserved were selected for voluntary TB screening campaigns, where each participant was asked about symptoms, had digital field chest radiography read by CAD4TB AI, and those with a positive screen offered sputum testing with Xpert MTB/RIF Ultra. Data were collected in Kobotoolbox and statistics, including measures of association, were calculated in Stata 18.
Results: Of the 18,662 who participated, 15,047(81%) had radiographs and 2,806 had sputum results. A total of 97 new bacteriologically positive TB cases were detected by GeneXpert (prevalence 520/100,000). The mean age of cases was 36 years (6 months–75 years), and 57 (58.8%) were male. Of these cases, 79 (81.4%) had a cough of any duration (prolonged in 57), 39 (40.2%) reported fever, 34 (35.1%) reported weight loss, and 43 (44.3%) reported night sweats. Fourteen (14.4%) patients were negative for any of the four symptoms. The proportion of subclinical TB using Definition 1 was 18.5% (95%CI; 11.3-27.7); Definition 2 was 41.2% (95%CI; 31.3-51.6) and Definition 3 was 14.4% (95%CI; 8.1-23.0).
Conclusions: Subclinical TB is a reality that TB programmes have to deal with and a consistent case definition is warranted. Using prolonged cough to screen for symptoms misses almost half of TB cases, yet using the W4SS or a more inclusive screening regimen will provide a definition of subclinical TB that misses the least number of cases.

OA43-442-15 Asymptomatic TB in children with household exposure to M. tuberculosis

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Background: Subclinical tuberculosis (TB) is common in prevalence surveys among adults. Little evidence is available to inform estimates of the prevalence and risk factors for subclinical TB in children.
Design/Methods: HIV-negative children aged 2–60 months with household exposure (HHE) to an adult TB patient within 12 months were enrolled. Symptom screening and interferon-gamma release assays (IGRA), chest radiographs (CXR), and induced sputum Xpert Ultra and MGIT culture were performed, regardless of symptoms. Confirmed TB was diagnosed by Xpert Ultra and/or MGIT culture; Unconfirmed TB was diagnosed by HHE plus one of: either CXR and/or symptom compatible with TB (cough, weight-loss, fever, or lethargy ≥2 weeks), or trace Xpert result. Subclinical TB was defined as Confirmed or Unconfirmed disease without reported symptoms.
Results: Between October-2019 and March-2024, 430 children were enrolled. Prevalent TB disease was diagnosed in 154/430 (35.8%) children, including 21/430 (4.9%) Confirmed and 133/430 (30.9%) Unconfirmed cases, of whom 35.7% (55/154) were subclinical and 64.3% (99/154) were symptomatic. 17 (81.0%) of the 21 Confirmed, compared to 38 (28.6%) of the 133 Unconfirmed cases (p<0.001) were subclinical. CXR was compatible with TB in 30/41 (73.2%) of subclinical versus 15/47 (31.9%) symptomatic cases (p<0.001). More subclinical (46/55, 83.6%) than symptomatic (18/99, 18.2%) cases were classified as Confirmed and/or CXR-positive.

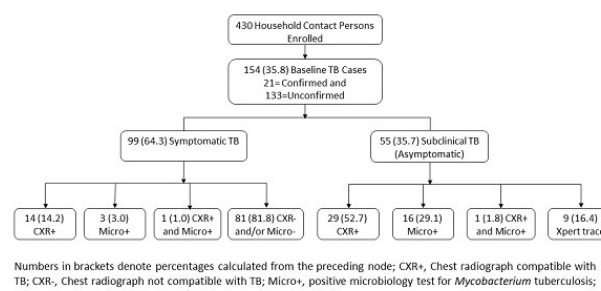

Figure 1. Diagnostic features of symptomatic vs subclinical TB cases in children with household TB exposure.

Curative TB treatment was started in 45/55 (81.8%) subclinical versus 34/99 (34.3%) symptomatic cases (p<0.001). In multivariable logistic regression, risk factors for prevalent subclinical TB, compared to controls without TB, were male sex (OR=1.91, 95%CI 1.04–3.52) and positive IGRA (OR=2.21, 95%CI 1.2–4.08).

Conclusions: Subclinical TB is common in child household contacts. Reliance on symptom screening to trigger TB investigation would miss most microbiologically-confirmed cases and one-third of all cases. The data suggest that all child household contacts should undergo CXR and induced sputum sampling to detect subclinical TB before preventive therapy is considered.

OA43-443-15 Estimating the risk of incident TB among individuals with Xpert Ultra trace sputum during community-based screening

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Background: Only about a quarter of individuals who received "trace" results during Xpert Ultra sputum screening in Uganda had microbiologically confirmed TB on further evaluation at baseline. However, some individuals without confirmed TB might be in early TB states or at elevated risk to develop TB.

Design/Methods: We conducted Xpert Ultra-based systematic screening for TB in Kampala, Uganda, and enrolled individuals with trace-positive results and age/sex-matched Xpert-negative controls.

Participants without TB on extensive initial evaluation were followed for up to 24 months, with repeat testing at 1, 3, and 6 months after a trace result, and for all participants at 12 and 24 months. We estimated two cause-specific hazards as measures of incident TB risk: of developing positive Xpert and/or culture (censoring those treated without microbiological confirmation) or being recommended TB treatment. We compared TB risks between subgroups using Cox models.

Results: Seventy-seven participants with Xpert-trace sputum screening results were followed, for a median of 349 days (Interquartile Range: 92-706). Of 72 participants with neither positive microbiology nor a clinical diagnosis at baseline, 18 (25%) later developed positive microbiological results and an additional 5 (7%) were diagnosed clinically. The cumulative cause-specific hazard of incident TB was 28.1% (95% confidence interval: 17.1-46.4) at 1 year and 48.6% (28.9-81.6) at 2 years when estimated microbiologically, and 33.3% (21.6-51.4) at 1 year and 51.0% (31.0-83.8) at 2 years when estimated based on treatment recommendation, versus 3.3% (0.8-13.5) at 2 years for Ultra-negative controls (Figure 1).

Among participants with trace screening results, incident TB was strongly associated with baseline imaging abnormalities (hazard ratio 7.7 [2.2-26.9] for microbiological TB; 14.0 [3.2-61.2] for treatment recommendation) but not with symptoms at enrollment.

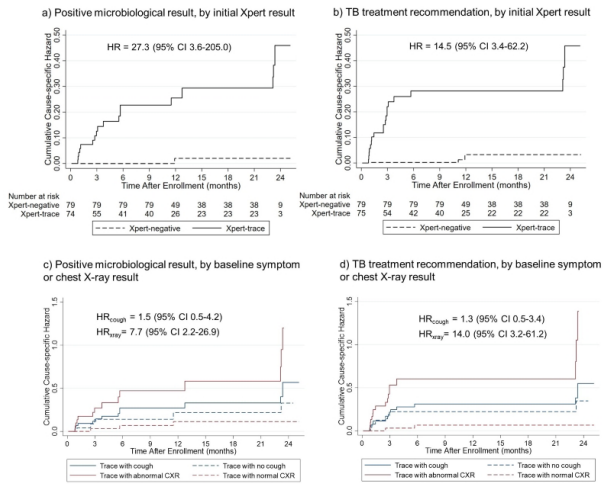

Figure 1.Cumulative cause-specific hazards of developing microbiologically confirmed TB (left) or receiving TB treatment recommendation (right), stratifid by initial Xpert result (top row) and by X-ray and cough status at enrollment (among those with initial trace-positive results, bottom row).
TB: tuberculosis. HR: hazard ratio, CI: confidence interval, CXR: chest X-ray.

Conclusions: Individuals with an Xpert trace sputum result remain at elevated risk for TB for at least two years, even after a baseline evaluation interpreted as excluding active TB.

OA43-444-15 Low levels of systemic inflammation in symptomatic and asymptomatic TB detected during community-based screening in rural South Africa

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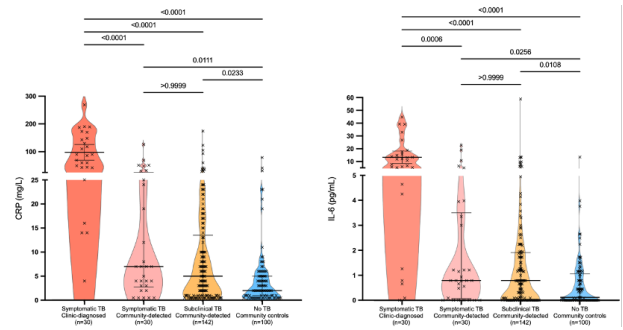
Background: Subclinical tuberculosis (TB) may comprise up to half of prevalent disease worldwide. We hypothesized that inflammatory biomarkers would be elevated in subclinical TB.
Design/Methods: Using a nested case-control design, we measured the concentrations of IL-6 and CRP in plasma from people with community-detected symptomatic or subclinical (WHO 4 symptom screen negative) microbiologically-confirmed TB (GeneXpert Ultra and/or Mtb liquid culture). We compared them to people with symptomatic TB diagnosed through passive case finding (clinic-diagnosed TB) and matched (age, sex, HIV-status) community controls without evidence of TB. Biomarker levels were compared between groups and correlated with measures representing bacterial (days to Mtb growth) and radiological (CAD4TBv7) burden.
Results: Both IL-6 and CRP were lower in people with community-detected than with clinic-detected TB, (IL-6: 0.8pg/ml, IQR (0.4-1.9) vs. 11.3pg/ml (4.8-17.2), p <0.0001; CRP: 5mg/L (1.0-15.0) vs. 88.0mg/L (42.8-153.5), p <0.0001) and higher than in community controls (IL6: 0.1pg/ml, (0.04-1.1), p=0.0014; CRP: 2.0mg/L (1.0-5.0), p=0.0023). Within the community-detected TB group there were no differences between people with symptomatic and subclinical TB (IL-6: 0.8pg/ml IQR (0.08-3.5) vs. 0.8pg/L (0.04-1.9), p>0.9999; CRP: 7.0mg/L (2.8-26.0) vs. 5.0mg/L (1.0-13.5), p >0.9999, Figure 1). Among people with community-detected TB both biomarkers weakly correlated with bacterial (IL-6: r=0.24, p=0.0014 and CRP: r=0.27, p= 0.0003) and radiological (IL-6: r=0.20, p=0.0111; CRP: r = 0.34, p <0.0001) burden. Among people with clinic-diagnosed TB both biomarkers moderately correlated with bacterial (IL-6: r=0.36, p=0.0489; CRP: r=0.54, p=0.0045) but not radiological (IL-6: r=0.25, p=0.2776; CRP: r=0.44, p=0.0676) burden.



Conclusions: People with subclinical TB display a wide range of systemic inflammation. Overall, inflammatory biomarkers in subclinical TB are higher than in community controls, lower than in people with clinic-diagnosed TB and weakly correlate with bacterial and radiologic burden of disease. Heterogenous levels of inflammation in subclinical TB may complicate the use of host biomarkers as screening tools

OA43-445-15 Unveiling the hidden epidemic: Prevalence of asymptomatic TB in Indonesia's prisons

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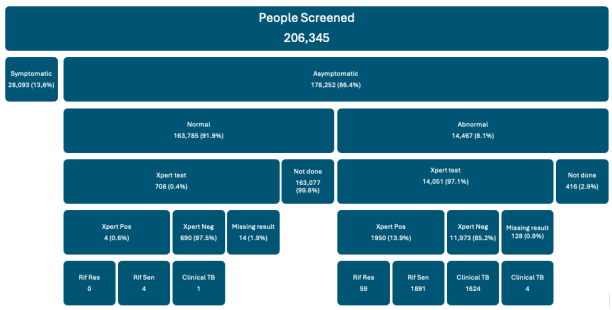
Background: Subclinical TB, a form of TB disease without typical symptoms yet detectable by radiologic or microbiologic assays, represents a diagnostic challenge. This study assesses the prevalence of subclinical TB in Indonesia's incarcerated population.
Design/Methods: From July to November 2023, a comprehensive TB screening protocol integrating symptom screenings, chest X-rays (CXR), and Xpert tests was administered to 206,345 individuals across 376 detention centers, prisons, and juvenile detention centers in 33 provinces of Indonesia. All individuals underwent symptom screening and CXR, with Xpert testing reserved for those with TB symptoms, a CAD4TB score >40 (indicative of TB), or risk factors. Bacteriologically confirmed and clinically diagnosed persons affected by TB received anti-TB treatment.
Results: From 206,345 persons screened, 28,093 (13.6%) displaying TB symptoms were excluded. Among the asymptomatic cases (178,252; 86.4%), CXR abnormalities were found in 14,467 (8.2%). Of those with CXR abnormalities, 14,051 (97.1%) underwent Xpert testing, revealing 1,891 (13.5%) rifampicin-sensitive MTB and 59 (0.4%) rifampicin-resistant MTB. Clinically diagnosed

TB was determined in 2,089 (4.9%) of those with a negative or missing Xpert result. Additionally, 708 asymptomatic individuals without CXR abnormalities but with risk factors were tested, detecting 4 MTB/RIF positives and 1 clinically diagnosed TB. In total, 4,044 (2.3%) persons with subclinical TB were identified, comprising 1,954 persons with infectious TB (48.3%) and 2,090 with non-infectious TB (51.7%). The total number of persons with bacteriologically confirmed TB in prisons during this comprehensive TB screening program was 2,691 (1,509 per 100,000), thus subclinical TB accounted for 72.6% of persons affected by infectious TB in prisons. Figure 1 depicts the cascade of TB screening among asymptomatic individuals.



Background and challenges to implementation: Subclinical TB, a form of TB disease without typical symptoms yet detectable by radiologic or microbiologic assays, represents a diagnostic challenge. This study assesses the prevalence of subclinical TB in Indonesia's incarcerated population.

Intervention or response: From July to November 2023, a comprehensive TB screening protocol integrating symptom screenings, chest X-rays (CXR), and Xpert tests was administered to 206,345 individuals across 376 detention centers, prisons, and juvenile detention centers in 33 provinces of Indonesia. All individuals underwent symptom screening and CXR, with Xpert testing reserved for those with TB symptoms, a CAD4TB score >40 (indicative of TB), or risk factors. Bacteriologically confirmed and clinically diagnosed persons affected by TB received anti-TB treatment.

Results/Impact: From 206,345 persons screened, 28,093 (13.6%) displaying TB symptoms were excluded. Among the asymptomatic cases (178,252; 86.4%), CXR abnormalities were found in 14,467 (8.2%). Of those with CXR abnormalities, 14,051 (97.1%) underwent Xpert testing, revealing 1,891 (13.5%) rifampicin-sensitive MTB and 59 (0.4%) rifampicin-resistant MTB. Clinically diagnosed TB was determined in 2,089 (4.9%) of those with a negative or missing Xpert result. Additionally, 708 asymptomatic individuals without CXR abnormalities but with risk factors were tested, detecting 4 MTB/RIF positives and 1 clinically diagnosed TB. In total, 4,044 (2.3%) persons with subclinical TB were identified, comprising 1,954 persons with infectious TB (48.3%) and 2,090 with non-infectious TB (51.7%). The total number of persons with bacteriologically confirmed TB in prisons during this comprehensive TB screening program was 2,691 (1,509 per 100,000), thus subclinical TB accounted for 72.6% of persons affected by infectious TB in prisons.

Conclusions: Dependence on symptomatic presentation for TB diagnosis risks overlooking persons affected by subclinical TB, perpetuating community transmission and potentially escalating TB incidence. Comprehensive screening, including asymptomatic individuals, is crucial for curbing the TB epidemic within high-risk incarcerated populations.

OA43-446-15 Characteristics of asymptomatic TB cases from the third national TB prevalence survey and their implications to active case detection in Cambodia

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Background: Cambodia observed a steady decline of tuberculosis (TB) case notification in 2010s, adopting active case finding (ACF) strategy with Chest Xray (CXR) screening and diagnosis with Xpert® MTB/RIF (GXP). The third national TB prevalence survey, started in June 2023, is a good opportunity to discuss current ACF strategies.

Design/Methods: Participants of the TB prevalence survey were screened by both symptoms and CXR. GXP Ultra was used as a primary diagnostic tool. Detected participants whose symptoms screened negative by survey definition were defined as having subclinical TB (ScTB) and recategorized into ScTB 1: cough lasting 1-13 days, and ScTB 2: no cough. A descriptive analysis was conducted to examine demographic and radiographic characteristics of ScTB cases.

Results: Among 2 348 screen positive from 28 671 participants, 2 338 cases had valid GXP results, with 178 GXP-Ultra positive participants. 172 were analysed after excluding patients on-treatment. Notably, 85% (147/172) were classified as Subclinical TB, and 45% (78/172) among them as ScTB 2.

Among TB cases under 55 years old, 88% (52/59) did not report persistent cough, and 49% (29/59) reported no cough at all. 73% and 77% presented with active TB suggestive findings by CXR, 67% and 51% with bilateral lesions, and 16% and 17% has medium to high GXP bacterial load for ScTB 1 and 2 respectively.

	Symptomatic TB	Subclinical TB	
Description	**Cough 2 weeks or more**	**Cough 1-13 days (ScTB 1)**	**No Cough (ScTB 2)**
n	**25**	**69**	**78**
sex = Female (%)	10 (40.0)	23 (33.3)	27 (34.6)
Age less than 55 years (%)	7 (28.0)	23 (33.3)	29 (37.2)
Education: Secondary school or less (%)	21 (84.0)	67 (97.1)	71 (91.0)
Strata (%)			
1. Rural	12 (48.0)	42 (60.9)	49 (62.8)
2. Phnom Penh (PP)	7 (28.0)	14 (20.3)	11 (14.1)
3. Urban not PP	6 (24.0)	13 (18.8)	18 (23.1)
BMI (%)			
1. Normal	14 (56.0)	33 (47.8)	39 (50.0)
2. Overweight and Obese	5 (20.0)	14 (20.3)	23 (29.5)
3. Underweight	6 (24.0)	22 (31.9)	16 (20.5)
Combined Xpert Grade (%)			
1. High	5 (20.0)	5 (7.2)	7 (9.0)
2. Medium	3 (12.0)	6 (8.7)	6 (7.7)
3. Low	6 (24.0)	25 (36.2)	27 (34.6)
4. Very low	5 (20.0)	14 (20.3)	20 (25.6)
5. Trace	6 (24.0)	19 (27.5)	18 (23.1)
Chest Xray Findings			
CAD* score (mean (SD))	54.75 (30.43)	70.12 (23.08)	64.63 (20.83)
CAD score less than 30 (%)	5 (20.8)	4 (6.1)	2 (2.6)
Central CXR Screening (%)			
1. Normal	3 (12.0)	1 (1.4)	2 (2.6)
2. Abnormal eligible for sputum	21 (84.0)	64 (92.8)	74 (94.9)
3. Other	1 (4.0)	4 (5.8)	2 (2.6)
TB (%)			
1. Active TB with cavity	7 (28.0)	20 (29.0)	9 (11.5)
2. Active TB	6 (24.0)	30 (43.5)	51 (65.4)
3. Possible TB	5 (20.0)	9 (13.0)	13 (16.7)
4. Healed TB	3 (12.0)	6 (8.7)	3 (3.8)
5. Other	4 (16.0)	4 (5.8)	2 (2.6)
Laterality (%)			
1. Unilateral	5 (20.0)	19 (27.5)	35 (44.9)
2. Bilateral	16 (64.0)	46 (66.7)	40 (51.3)
3. NA	4 (16.0)	4 (5.8)	3 (3.8)
Area Involved (%)			
1. Minimal	3 (12.0)	14 (20.3)	17 (21.8)
2. Moderate	15 (60.0)	38 (55.1)	57 (73.1)
3. Advance	3 (12.0)	13 (18.8)	1 (1.3)
4. NA	4 (16.0)	4 (5.8)	3 (3.8)

*CAD: CAD4TB version 7

Table 1. Characteristics of Xpert positive TB cases stratified by cough duration.

Conclusions: In Cambodia, current practice to invite people to ACF primarily based on age (≥ 55) and TB symptoms for younger individuals. This ACF inclusion criteria might miss up to 88% (52/59) of TB cases if using persistent cough and 49% (29/59) if using cough any duration as screening criteria for age < 55 years. These gaps may lead to missed opportunities for early case detection and intervention. Revisiting screening strategies for ACF in Cambodia is imperative to mitigate ongoing transmission and contribute to END TB targets.

OA43-447-15 Prevalence of asymptomatic TB in an infant vaccine trial in South Africa

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Background: Subclinical tuberculosis (TB) is common in adults, but its prevalence has not been well-documented in children.
Design/Methods: We analyzed the dataset of a TB vaccine trial conducted between 2009 and 2011 in South Africa, which enrolled 2,797 healthy infants aged 4–6 months who were evaluated for incident TB for a 15-month follow-up period, including seven visits. Standardized TB investigations were conducted if a household TB contact or symptoms suggestive of TB were reported. Confirmed TB was defined as positive microbiological results for *Mycobacterium tuberculosis* (*M.tb*). Unconfirmed TB was defined by at least 2 of the following: any symptoms suggestive of TB, chest X-rays (CXR) compatible with TB, a positive response to TB treatment, close TB exposure, or evidence of TB infection in participants without bacteriologic confirmation of *M.tb*. The absence of reported TB symptoms among confirmed and unconfirmed TB cases was defined as subclinical TB.
Results: In total, 1,027/2,797 (36.7%) children were investigated for TB; 369/1,027 (35.9%) were treated, among whom TB was confirmed in 47/369 (13.3%) and unconfirmed in 322/369 (65.5%). 115/369 (31.2%) children treated for TB had subclinical disease, including 7/47 (14.9%) confirmed and 108/322 (33.5%) unconfirmed cases. There was no difference in the frequency of CXR compatible with TB between subclinical 16/115 (13.9 %) and symptomatic 57/254 (22.4%) cases (p=0.079). Adjusted Odd ratio (AOR) for the risk factors for subclinical TB (n= 345/369) were age in months (0.97 [95%CI 0.97-0.98]) weight at TB diagnosis (AOR1.25 [95%CI 1.11-1.40]), CXR not compatible with TB (AOR 0.41 [95%CI 0.21-0.79]).
Conclusions: There was a moderately high prevalence of subclinical TB detected by active surveillance of children who participated in a TB vaccine trial in a high-burden setting. These findings have relevance for therapeutic decision-making and for the interpretation of vaccine efficacy results for the prevention of childhood TB.

OA44 Advancements in Pharmacokinetics of anti-TB drugs from bench to bedside

OA44-448-15 Using a mouse model to enable quantitative modeling of NC-009 Phase 2 study results and support Phase 3 protocol design for TBAJ-876 development

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Background: Relapsing mouse model (RMM) data have been used to predict ≥90% sputum culture conversion in patients after 8 weeks of SPaL treatment. NC-009 participants must extend their treatment on HR for 7 weeks until definitive culture-negative data are available from the week-8 timepoint and may complete their treatment at week 15 if pre-specified criteria are met.
Modeling how the HR extension phase may impact relapse up to 52 weeks post-treatment and treatment-duration predictions for an all-SPaL regimen are being assessed in the RMM.
Design/Methods: The BALB/c RMM with Mtb strain H37Rv is used. Dosing begins 2 weeks post-infection (≥ 10^7 lung CFUs). Groups of mice (~4/arm/timepoint) are treated for various periods (4-12 weeks) with SPaL alone, or SPaL followed by 2-8 weeks of HR. Lungs are harvested and assessed for bacterial burdens by plating at the end of each dosing period and 1- 3 months after the end of each dosing period to assess relapse.
All drugs are dosed orally 5 days per week to provide approximate human-equivalent dose (HED) exposures at approved doses. TBAJ-876 is dosed at 1.56, 3.125, and 6.25mg/Kg to mirror NC-009's dose range (25, 50, 100mg).
Results: Dose-dependent efficacy of TBAJ-876 has been observed in RMM studies including faster rates of CFU reductions in lungs and shorter durations needed for relapse-free cures with SPaL relative to BPaL.
Assessing how even shorter durations of SPaL followed by HR extension phases impact bacterial regrowth and relapse in the RMM should enable improved modeling of the NC-009 results and better predict optimal durations of SPaL regimens for Phase 3 studies.
Conclusions: These RMM results highlight the clinical potential for short-duration SPaL regimens and may enable optimized model-informed Phase 3 protocol designs.

OA44-449-15 Exposure-response analysis of bedaquiline as TB preventive therapy in a mouse model of paucibacillary TB

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Background: Effective in both drug-sensitive and rifamycin-resistant tuberculosis (TB), bedaquiline (BDQ) is an attractive option for a pan-TB preventive therapy. BDQ is effective in a mouse model of paucibacillary TB infection [1,2]. However, the concentration-response relationship of BDQ and its active metabolite, bedaquiline-M2 (BDQ-M2) have not been quantified.
Given that the parent-to-metabolite ratios differ drastically in humans compared to mice, identification of individual parent and metabolite contributions is critical to accurately translate between species.
Design/Methods: Plasma concentration data and mouse lung CFU data were acquired from two published studies [1, 2] which included oral (PO), intramuscular (IM), and combination PO/IM routes of administration. PO doses ranged from 2.67-32 mg/kg dosed 5/7 days per week for up to 12 weeks. IM doses included 160 mg/kg of a long-acting formulation as 1-3 injections dosed 4 weeks apart. Pharmacokinetics (PK) and pharmacodynamics (PD) were modeled sequentially in NONMEM 7.5.1.
A concentration-response relationship linking drug concentration to bacterial decline was quantified for BDQ and BDQ-M2.
Results: Because of first-pass metabolism of PO dosing compared to IM dosing, parent-to-metabolite ratios differed making individual contributions of BDQ and BDQ-M2 identifiable. Despite having almost four-fold exposure over BDQ, BDQ-M2 represented only 17.9% of BDQ's effect (measured via area under the effect curve). A sigmoidal Emax relationship best fit the data for both BDQ and BDQ-M2. The EC50 of BDQ was estimated to be 172.9 ng/mL while EC50 of BDQ-M2 was 900.2 ng/mL.
Conclusions: While BDQ-M2 has greater exposure in mice, BDQ contributes more to the bactericidal effect. The EC50 quantified for BDQ is within the range of concentrations in humans at therapeutic doses, suggesting that BDQ monotherapy could be an effective treatment for TB prevention. Accurate quantification of concentration-response is essential for accurate translation and clinical dose recommendations.

OA44-450-15 Clinical predictions for bedaquiline for TB preventive therapy: A translational PKPD modelling study

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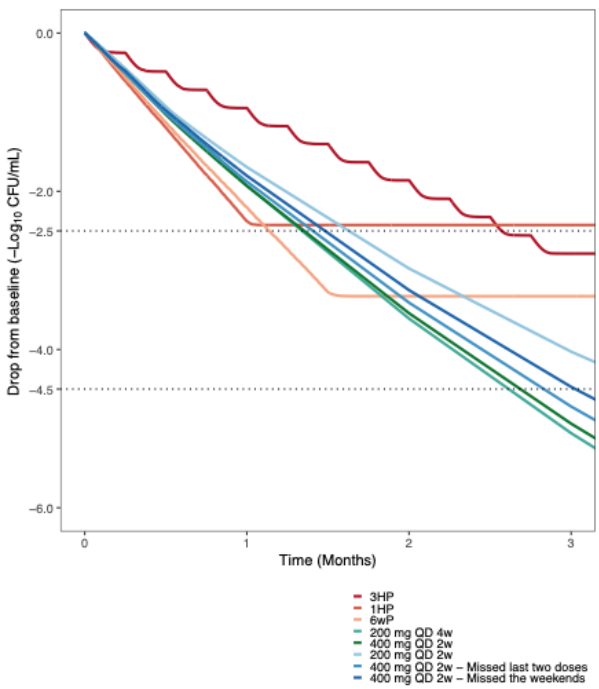
Background: One-quarter of the global population is estimated to be infected with *Mycobacterium tuberculosis* and at risk of progressing to active tuberculosis (TB) disease. Bedaquiline (BDQ) is effective in both drug-susceptible and rifamycin-resistant TB and could serve as preventive therapy regardless of drug susceptibility status, simplifying provision of therapy.
Here, using translational modeling and clinical trial simulation, we provide recommendations on the dose and duration of BDQ as monotherapy for TB preventive therapy.
Design/Methods: Varying doses and durations of BDQ were simulated using a published population pharmacokinetic (PK) model of BDQ in healthy volunteers [1]. The regimens included a dose range from 100-400 mg daily for either two or four weeks.
Adherence scenarios were tested. The simulated PK profiles were linked to a concentration-response relationship derived from a mouse model of paucibacillary TB. The predicted drop in lung colony-forming units (CFU) over time was compared to once-weekly isoniazid-rifapentine for 12 weeks (3HP) [2].



Results: Simulations of daily BDQ 200 mg for 4 weeks and 400 mg for 2 weeks had greater effects on bacterial burden than 3HP. Both regimens achieved a CFU decline of 2.5 $\log_{10}$ in less than 6 weeks, and there was no meaningful difference in the extent of decline with either regimen. Even when missing four of 14 total doses of BDQ, 2.5 log CFU decline was still achieved within 8 weeks and still superior to full adherence 3HP. BDQ concentrations persisted at therapeutic concentrations for over 6 months after the start of treatment.
Conclusions: BDQ monotherapy was superior to 3HP based on translational modeling that included integration of clinical population PK and efficacy data from a validated mouse model of TPT. Daily BDQ at 200 mg for 4 weeks and 400 mg for 2 weeks shows promise as a short-course pan-TB regimen for TPT.

OA44-451-15 Population pharmacokinetics and safety assessment of rifapentine in Chinese children to inform dosing recommendations for latent TB infection

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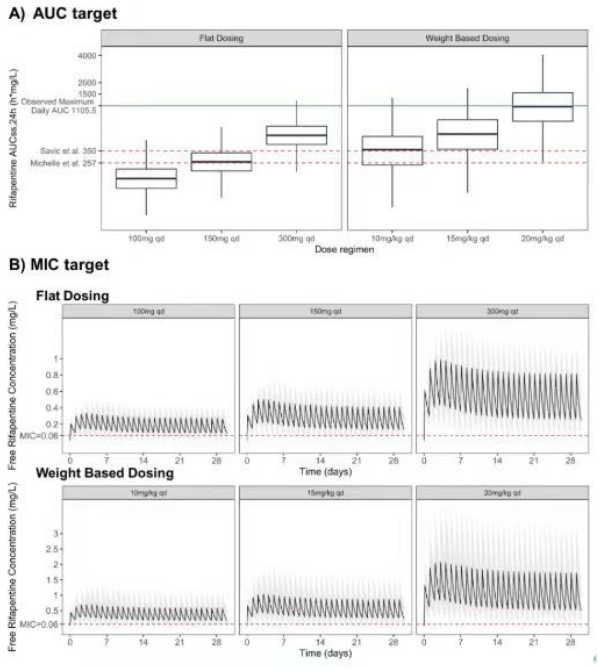
Background: Rifapentine (RFT) and isoniazid daily for one month (1HP regimen) is recommended for children with latent tuberculosis infection (LTBI). Dosing in pediatrics is commonly based on body weight, but this may be unsuitable for rifapentine.
So, the main object of our clinical trial is to develop a population pharmacokinetic-toxicity (PopPK-TX) model of RFT in children, to explore the safety and efficacy of the 1HP regimen, and to propose an optimal dosing algorithm for paediatric LTBI patients.
Design/Methods: An open-label clinical trial was conducted on LTBI subjects below 13 years old. 1HP were prescribed as a preventive regimen. Weight-based isoniazid and rifapentine was administered. Clinic follow-ups were performed and RFT plasma concentrations were monitored weekly.
Results: 36 children were enrolled, median (range) age 4.6 years (0.89-9), weight 16.8kg (8-35). 144 RFT concentration were collected. When simplifying the full autoinduction model, one-compartment model with transit absorption and time-varying clearance could sufficiently describe RFT concentrations and parameters were precisely estimated.
A maximum 70.4% clearance increase due to autoinduction, reaching a plateau by Day 21. An indirect response model with inhibitory effect of RFT on TBIL elimination could capture the observed kinetic profile of TBIL. The estimated IC_{50} and I_{max} for inhibitory effect was 10.8mg/L

and 68.8%. Simulation based on the allometrically scaled model suggested weight-based dosing (15mg/kg) led to underexposure in 32.3% of children below 14.5kg. Plasma RFT in 73% (n=8/11) did not reach the 350 h·mg/L efficacy target. A flat dose of 300mg daily simulated based on the non-allometrically scaled model indicated sufficient exposure (AUC>350 h·mg/L) in all subjects aged 1-10 years. Sensitivity analysis of the allometric scaling model also supported 300mg daily in this age group.



Conclusions: Our study suggested a flat dose of RFT 300mg daily was both safe and effective for LTBI treatment in Chinese children.

OA44-452-15 Association of low rifampicin and isoniazid plasma levels and poor bacteriological response to the standard anti-TB treatment

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Background: Despite the availability of standardized treatment regimens for management of drug sensitive tuberculosis (DS-TB) and good compliance to treatment, a slower response or no response to treatment is observed in certain patients. Low plasma levels of anti-TB drugs is one of the reason for this poor response. There is limited data from India on the occurrence and possible factors associated with low plasma levels of anti TB drugs in TB patients.
Design/Methods: A retrospective study was conducted at a tertiary referral TB hospital of northern India to evaluate the occurrence and possible factors associated with low plasma levels of crucial first-line anti-TB drugs: rifampicin (R) and isoniazid (H) among 75 proven DS-TB patients. The selected patients were compliant to treatment and had received at least three months of standard first-line anti-TB drugs however, with poor bacteriological response.
Results: Out of 75 patients, 64 (85.3%) had low levels of any anti-TB drug. Low plasma concentration of R and H were 59/75 (78.7%) and 30/75 (40%) respectively. On univariate analysis low body mass index (BMI), hypoalbuminemia, bilateral disease on chest x-ray and presence of cavity were found to be significantly associated with low drug levels (Table 1). However, none of the factor was independently significantly associated.
Conclusions: Among DS-TB patients not responding adequately to standard treatment after three months or more, commonly have low plasma levels of anti TB drugs. Certain risk factors like low BMI, hypoalbuminemia, bilateral disease on chest x-ray and presence of cavity may be associated with low plasma drug levels. There is need to identify such patients in the beginning of treatment so that modifiable factors responsible for low plasma drug levels may be addressed. Also, the possibility to increase the R and H dose in patients with these risk factors could be considered.

Variable	Patients with Low levels (n=64)	Patients with Normal levels (n= 11)	P value
Age	**29.5 ± 11.89**	**26.09 ± 11.77**	**0.30**
Sex Males	33 (51.56%)	3 (27.27%)	0.136
Females	31 (48.43%)	8 (72.72%)	
Duration of ATT in months (range)	12 (8-21.2)	11 (6.5-18.2)	0.26
Type of TB- PTB with/ without EPTB	38 (59.38%)	6 (54.54%)	0.5
Only EPTB	27 (42.18%)	5 (45.46%)	
Low BMI Yes (<18.5kg/m2) No	29 (45.31%)	1 (18.18%)	0.04
	35(54.68%)	10 (81.81%)	
Pulmonary- CXR Unilateral	13/38 (34.2%)	5 /6 (83.3%)	0.034
Bilateral	25/38 (65.8%)	1/6 (16.7%)	
Pulmonary- CXR Cavity Yes	30/38 (78.9%)	2/6 (33.3%)	0.038
No	8/38 (21.1%)	4/6 (66.7%)	
Anemia Yes (<13gm/dl in males, <12gm/dl in females) No	36/64 (56.25%)	4/11 (36.36%)	0.221
	28/64 (43.75%)	7/11 (63.63%)	
Hypoalbuminemia Yes (<3.5gm/dl)	31/64 (48.43%)	1/11 (9.09%)	0.0147
No	33/ 64 (51.5%)	10/11 (90.90%)	

Table 1: Characteristics of tuberculosis patients with low and normal drug levels (Univariate Analysis).

OA44-453-15 Model-based precision dosing and remedial dosing recommendations for delayed or missed doses of isoniazid in Chinese people with TB

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Background: Isoniazid has been used as a first-line drug to treat tuberculosis for more than 50 years. However, large inter-individual variability was found in its pharmacokinetics, and effects of non-adherence to isoniazid treatment and corresponding remedy regime remain unclear.

This study aimed to develop a population pharmacokinetics (PPK) model of isoniazid in Chinese patients with TB to provide model-informed precision dosing and explore appropriate remedial dosing regimens for non-adherent patients.

Design/Methods: 1012 isoniazid observations from 736 tuberculosis patients were included. A nonlinear mixed-effects modeling was used to analyze the PPK of isoniazid. Using Monte Carlo simulations to determine optimal dosage regimens and remedial dosing regimens.

Results: A two-compartmental model, including first-order absorption and elimination with allometric scaling, was found to best describe the PK characteristics of isoniazid. A mixture model was used to characterize dual rates of isoniazid elimination. Estimates of apparent clearance in fast and slow eliminators were 28.0 and 11.2 L/h, respectively. The proportion of fast eliminators in the population was estimated to be 40.5%.

Monte Carlo simulations suggested that for slow acetylators, dosage adjustment was not required in patients weighing 35–57 kg, whereas patients weighing 58–70 kg and 71–100 kg would need additional doses of 50 mg and 150 mg of isoniazid (based on 300 mg/day), respectively. For the fast acetylators, INH dosages of 400 mg, 500 mg, and 600 mg were required for the three weight ranges to achieve optimal exposure. For remedial dosing regimens, the missed dose should be taken as soon as possible when the delay does not exceed 12 h, and an additional dose is not needed. On delaying a INH dose exceed 12 h, only need to take the next single dose normally.

Conclusions: PPK modeling and simulation provide valid evidence on the precision dosing and remedial dosing regimen of isoniazid.

OA44-454-15 Alterations of the gut microbiota in patients with different plasma drug exposures of anti-TB medication

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Background: Interindividual variability in drug exposure can affect the treatment outcome and result in toxicity during tuberculosis (TB) treatment. Although the gut microbiota is implicated in drug pharmacokinetics, its impact on anti-TB medication has not yet been investigated. This study sought to elucidate the relationship between gut microbiota and drug exposure among patients with TB.

Design/Methods: In this cohort study, fecal and plasma samples were collected from 99 patients undergoing anti-TB therapy with rifampicin, isoniazid, ethambutol and pyrazinamide. The fecal DNA was extracted, and the V3-hypervariable region of the 16S ribosomal RNA gene was amplified and sequenced. Plasma drug exposures were measured using high-performance liquid chromatography-mass spectrometry (HPLC-MS) and analyzed through noncompartmental analysis using densely sampled pharmacokinetic data.

This study examined variations in gut microbiota diversity and composition among patients stratified into four quartile groups (Q1 through Q4) based on the degree of rifampicin exposure.

Results: Alpha diversity exhibited a significant increase corresponding to drug exposure levels. Beta diversity, assessed using unweighted UniFrac distance metrics, disclosed a substantial divergence in microbial composition across the quartile groups Q1 to Q4. Higher rela-

tive abundance of the genera *Faecalibacterium*, Subdoligranulum, *Alistipes*, *Dialister*, *Coprococcus*, and *Roseburia* characterized the Q4 group and were positively correlated with exposure to the anti-TB drugs rifampicin, isoniazid, ethambutol, and pyrazinamide. Conversely, the genus *Enterococcus* prevailed in the Q1 group and demonstrated an inverse relationship with drug exposure. A random forest prediction model proficiently differentiated individuals in the Q1 group from those in other groups with considerable accuracy.

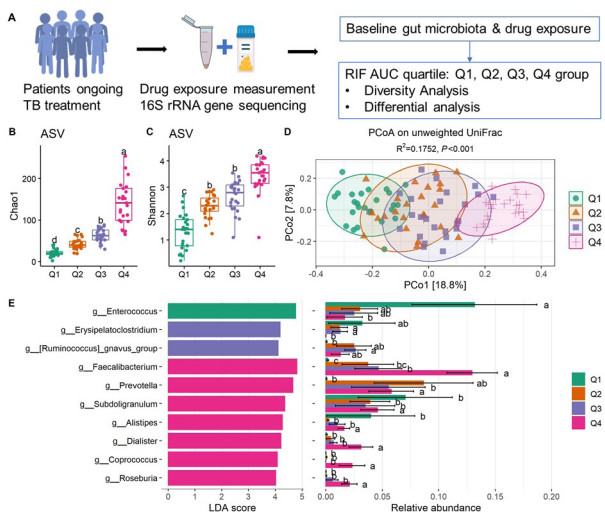

Figure 1. The summary of gut microbiota composition analysis across Q1–Q4 groups. (A) Study design and flow diagram. (B) The Chao index and (C) the Shannon index at the ASV level. (D) Principal coordinate analysis based on the unweighted UniFrac distance metrics. (E) LDA scores and relative abundance for the top 10 different genera.
a, b, c, d: When using the same letter, it signifies an insignificant difference (FDR ≥ 0.05), whereas different letters indicate a significant difference (FDR < 0.05).

Conclusions: This study elucidated a correlation between microbial dysbiosis and diminished exposure to anti-TB medications. These findings indicate that strategies focused on reinstating microbial diversity could enhance drug bioavailability and, thereby, augment the efficacy of TB treatment.

OA44-455-15 Assessing the impact of digital technologies on TB pharmacovigilance in Kyrgyzstan

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Background and challenges to implementation: Active monitoring and ensuring safety are crucial in implementing new short-course tuberculosis treatments, requiring systematic clinical-laboratory monitoring, clinical management, and timely reporting of adverse drug reactions (ADRs). The integration of digital technologies in adverse drug event surveillance and monitoring (aDSM) facilitates implementation.
However, evaluating the outcomes and impacts of digital healthcare is essential to support its safe adoption and establishment.
Intervention or response: We assessed the impact of implementing digital technologies on the frequency of reporting adverse drug reactions among patients receiving tuberculosis treatment in Kyrgyzstan in 2022 and 2023. As part of the Global Fund project, digital technologies were developed and implemented since January 2023 to automate the registration and transmission of adverse drug reaction reports nationwide, from primary healthcare facilities and tuberculosis hospitals where patients receive treatment, to the Department of Pharmaceuticals, and further to the WHO Global Monitoring Center for Drug Safety.
Results/Impact: The number of adverse drug reaction reports from healthcare institutions to the Department of Pharmaceuticals increased by 364.7%, from 170 to 790. Reports from primary healthcare facilities increased by 58%. The number of reports to the WHO Pharmacovigilance Center from Kyrgyzstan increased by 2.4 times from 250 to 598.
Conclusions: The findings highlight the positive impact of integrating digital technologies into the TB pharmacovigilance system in Kyrgyzstan. The significant increase in adverse drug reaction reports indicates improved monitoring and reporting mechanisms facilitated by digital tools. This enhancement is crucial for ensuring the safety and effectiveness of TB treatment regimens.

OA45 One step ahead in TB diagnosis

OA45-456-15 Streamlining TB diagnostics for complete TB detection efforts: A funnel approach

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Background and challenges to implementation: Early and accurate diagnosis of Tuberculosis (TB), a priority action of the End TB strategy, is crucial to effectively eradicate TB. Nigeria adopted the use of World Health Organization (WHO) recommended rapid molecular diagnostics– GeneXpert-4-modular (20 samples daily (5 runs/day), approximately $8/test), Truenat-Duo (8 samples daily (4 runs/day), approximately $16/test) and TB LAMP (70 samples daily (5 runs/day), approximately $6/test), for TB Diagnosis.

However, evaluation gaps and low turn-around-time (TAT) was encountered in-country due to the low throughput of both GeneXpert and Truenat platforms.

To cost-effectively evaluate high volume of samples, increase turn-around-time (TAT) and timely treatment enrolment, KNCV Nigeria under the USAID TB LON 1&2 project and in collaboration with the National TB Program (NTP) and other partners mapped out a strategy (The Funnel Approach) to maximize the available diagnostics in-country.

This study aims to spotlight the achievement from this approach.

Intervention or response: TB LAMP platform, with its high through-put, serves as the 'Wide' entrance of the Funnel while Xpert/Truenat serves as the 'Narrow" exit of the Funnel. TB LAMP platform was introduced for Community-ACF, in Remote facilities and High-burden facilities.

Thus, high influx of samples is analyzed with the TB LAMP platform and only TB LAMP positive samples are analyzed with GeneXpert/Truenat for bacilli quantification and RIF status determination.

Results/Impact: From Feb 2021- Feb 2024, 81 TB LAMP platforms were installed across the14 TB LON 1&2 states (most recent in Feb 2024). 239,991 samples were tested, and 20,238 TB Cases (8%TB Yield) detected, of which 115 were Rifampicin Resistant (from Xpert/Truenat analysis), thus contributing 8% each to the overall samples tested and TB Cases detected.

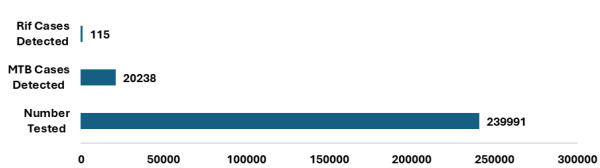

Figure 1. Graph showing the contribution from the TB LAMP platform.

Conclusions: The Funnel Approach provided a seamless sample analysis pathway for effective and efficient TB Diagnosis. Adoption of the Funnel Approach will serve to Cost-effectively maximize TB diagnostics for timely evaluation, improve TAT, and complete diagnosis.

OA45-457-15 Implementation of the simple-one-step (SOS) method for stool-based GeneXpert testing improves access to molecular diagnosis for children in the Karamoja subregion, north-eastern Uganda

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Background and challenges to implementation: The Karamoja subregion has the highest reported burden of TB among children in Uganda. In 2022, 26% of all patients diagnosed with TB were children <14 years compared to the national average of 15%. However, of these, only 20% were tested with a WHO recommended molecular test. To increase access to molecular testing for children with presumptive TB, the MoH/NTLP rolled out stool-based testing using GeneXpert in all nine districts of the Karamoja subregion.

Intervention or response: In August 2023, MoH/NTLP, in collaboration with USAID TIFA (JSI), WHO, and USAID PACT-Karamoja supported cascaded training at regional and health facility levels. 3-5 healthcare workers from each district were sent to the NTLP to attend the regional Training of Trainers course in stool testing using the Simple One Step (SOS) technique.

The regional trainers then cascaded the training to the health facilities. Following the training, health facility teams started transporting stool for GeneXpert testing through the existing specimen transportation system; the required logistics (stool containers and other packaging material) were provided; and a weekly SOS TB testing tracker was used to monitor samples collected and results received at each health facility.

Results/Impact: A total of 27 regional trainers were trained. Subsequently, they trained 399 HCWs across 56 health facilities including 17 motorcycle hub riders (on sample transportation). From October 2023 and March 2024, 918 children were tested by GeneXpert testing using stool. Consequently, 24 (2.6%) children were diagnosed with TB. The proportion of children with bacteriological confirmation of TB increased from 20% in July-September 2023 to 42% in January-March 2024.

Conclusions: Use of stool samples for TB diagnosis was readily integrated into the existing specimen transportation mechanism and resulted in increased molecular testing for TB among children with presumptive TB

OA45-458-15 Mainstreaming TB infection testing within National Health Mission (NHM): Integration of IGRA tests with Public Health Laboratories in Telangana, India

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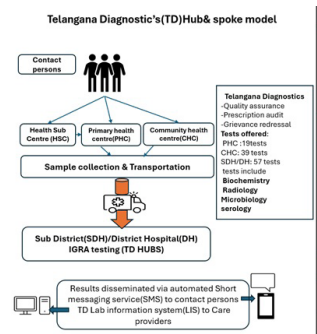
Background and challenges to implementation: The Programmatic Management of TB Preventive Treatment (PMTPT) guidelines, India recommend screening and treating TB infection in contacts of bacteriologically positive TB cases. However, limited availability and high costs of Interferon Gamma Release Assay (IGRA) testing hindered PMTPT implementation under The National TB Elimination Programme (NTEP), creating a barrier to testing and treatment access in Telangana.
To address this challenge, the state leveraged on Telangana Diagnostics (TD) a state flagship program offering free quality diagnostic services under (NHM).
Intervention or response: A hub-and-spoke model was implemented under TD, connecting all primary health centers to district-level testing centers. This network includes 31 NABL-accredited public health diagnostic hubs and 1425 biological sample collection spokes across the state. IGRA testing facilities were integrated with other diagnostic services, with IGRA kits and consumables supplied by the State NTEP team.
TD staff received training in sample collection and IGRA testing, conducted at district-level hubs under microbiologists' supervision. Test results dissemination is automated to care providers and household contact persons through short messaging services (SMS) within 72 hours, enabling early initiation of TB preventive treatment (TPT).
Results/Impact: Between October 2022 and March 2024, a total of 9606 IGRA tests were conducted, yielding 4023 positive results (42%). Among the positive persons, nearly 100% received their test results within 72 hours, and 3782 individuals i.e., >90% of eligible were initiated on TPT within one week.



IGRA Tests performed in TD Hubs (October 22 -March 24)

Time period	Samples Tested. (N)	IGRA Positive N (%)†	IGRA Negative N (%)	Indeterminate N (%)
Oct-Nov 2022	1342	681 (51%)	612 (46%)	49 (4%)
Jan-Mar 2023	2125	970 (46%)	952 (45%)	203 (10%)
April-June 2023	1532	600 (39%)	599 (39%)	333 (22%)
Jul-Sep 2023	1085	432 (40%)	604 (56%)	49 (5%)
Oct-Dec 2024	1513	595 (39%)	829 (55%)	89 (6%)
Jan -Mar 2024	2009	745 (37%)	1124 (56%)	140 (7%)
Total	9606	4023 (42%)	4720 (49%)	863 (9%)

Conclusions: Leveraging existing resources and integrating TB services within the general health system can effectively address many bottlenecks in program implementation. Further research is needed to see how this integration impacts prompt TPT initiation and reduces out of pocket expenses.

OA45-459-15 Leveraging digital technologies to improve turn-around-time tracking and relay of results from GeneXpert testing facilities in a peri-urban district in Uganda

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Background and challenges to implementation: WHO's standard for universal access to rapid tuberculosis diagnostics recommends that all TB testing laboratories monitor their turn-around-time (TAT) preferably using digital systems to ensure early TB-case detection. In Uganda however, there are no nationally streamlined digital measures for tracking TAT.
Intervention or response: We utilized Tinkr's four-step innovation tool: to develop and test a mobile phone application that is linked to LabXpert, a connectivity solution

installed on all GeneXpert machines in Uganda. First, we gained insight on user needs and practices. Second, we brainstormed and conceptualized ideas.
Finally, we developed and tested an application that required one-time manual data in-put and automatically tracked individual samples from collection, pickup, delivery, processing and results dissemination, recorded frequency of facility visits and disseminated SMS results to clinicians who requested for the test.
3 hub-riders and 12 health facilities were purposively selected for the pilot (August-October 2023). Data was visualized on a hub-dashboard and identified gaps addressed using root-cause analysis.
Results/Impact: The application tracked 448 samples with SMS results sent to requesting clinicians in real-time, 17 samples were not delivered to the testing laboratory. In month one, the average TAT was one day from collection to pick-up, 1 day from pick-up to delivery and 6 days from delivery to testing. Root cause analysis indicated that samples were not processed using first in first out basis. This feedback was given to the laboratory personnel and in month two, the average TAT from delivery to testing was reduced to two days. The facilities were visited 3 times each week on average as compared to the daily visits recommended.
Conclusions: Use of digital technologies like mobile applications provides means for accurate real-time TAT and sample referral process tracking, enabling identification and correction of bottlenecks with an opportunity for scale-up and standardization by National TB programs across resource limited settings.

OA45-460-15 An unprecedented sample collection and transportation model to overcome challenges in TB detection in Rajasthan, India

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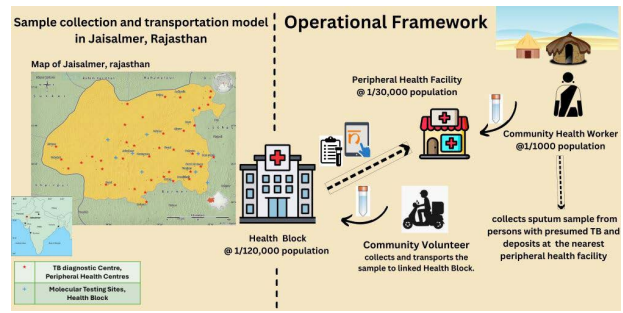
Background and challenges to implementation: Sample collection and transportation systems (SCT) play a critical role in improving access to tuberculosis (TB) testing. In Jaisalmer, Rajasthan which is the golden city of Thar desert (one of the largest hot sub-tropical deserts), the existing sample referral systems for TB is unstructured and requires tailored adaptations. Further, the area faces region-specific challenges of limited health access along interstate and international borders. This study attempts to understand the impact of the Sample Collection and Transportation model conceptualized to improve access for TB testing and early TB detection in Jaisalmer.
Intervention or response: In 2023, an operational framework was designed to map sample transport routes and optimally utilise resources. Nearest peripheral health facilities (HF) were designated as sample collections centres and linked to respective health blocks, each having upfront molecular testing. Community health workers were enlisted as sample collectors and community volunteers transported samples daily to health blocks.
Assessment of the model was done using:
i. Presumptive TB examination rate (PTBER)
ii. Numbers needed to test (NNT)
iii. Average time to diagnosis in 2023 compared to 2022.
R version 4.2.3 was used for analysis using Z test for proportions and Mann Whitney U test.



Results/Impact: There were 16 peripheral HF identified as sample collections centres (40% increase in total facilities for the district). The intervention led to a 44.44% increase in PTBER (1312/100,000 in 2023; 931/100,000 in 2022; $Z = -8.14$, $p < 0.01$) and an 80% increase in NNT from 2022 to 2023 ($Z = 9.15$, $p < 0.01$). Further there was a significant reduction in the average time to diagnosis since 2022 ($p<0.001$).
Conclusions: Implementation of sample collection and transport model significantly impacted early TB detection and improved access to TB testing in difficult topographies of Jaisalmer, indicating urgent replicability of this model in similar settings to accelerate end TB goals.

OA45-461-15 Strengthening equipment maintenance system of NTP Bangladesh by introducing Google sComplain Registration Form: An in-house mechanism to reduce machine downtime

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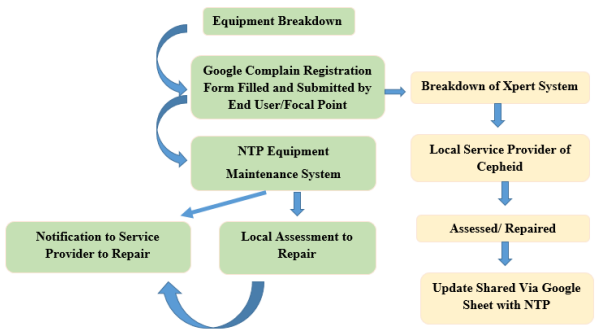
Background and challenges to implementation: National Tuberculosis Control Program (NTP) of Bangladesh has above thousand laboratories starting from microscopy labs to Bio-safety Level 3 labs with varied equipment but poorly managed preventive maintenance system. There was no tracking mechanism for breakdown of equipment like UPS and Xpert modules leading to extended downtime (6-12 months) that had noticeable impact on Xpert functionality. To overcome this situation, NTP Bangladesh introduced an in-house mechanism to notify equipment breakdown event by Google Complain Registration Form, facilitating repair mechanism and reducing machine downtime. The objective of the study is to evaluate the performance and document the lesson learnings.

Intervention or response: A Google Complain Registration Form was developed with interphases to incorporate necessary information required to notify any breakdown aided with a detail written stepwise instruction. The form was circulated via a link among laboratory technicians/end users who were sensitized through local NTP focal points. Upon submission of the form Bio-medical Engineers of NTP compile the notified problems and take necessary steps to repair the machine at the earliest. For Xpert system automatic notification is sent to the local service providers.



Results/Impact: Google form was implemented from June 2022. The turnaround time from breakdown to central notification reduced from ~90 days to 7 days and equipment downtime reduced from 6-12 Months to <2 months. For Xpert system module replacement time improved from 6-8 months to 1 month, for UPS from 6-10 months to <2 months.

Conclusions: The intervention with Google form to streamline the equipment breakdown notification system is a game changer for NTP Bangladesh. Early Notification mechanism initiated a repair cascade reducing machine downtime. However, this mechanism requires continuous monitoring, manual data collection from field for resolved issues, regular communication with service providers for updates. Effective modification of this mechanism will have an impact in strengthening equipment maintenance system of NTP Bangladesh.

OA45-462-15 Single-cell transcriptome sequencing reveals altered peripheral blood immune cells in people with severe TB

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Background: Tuberculosis is a serious global health burden, resulting in millions of deaths each year. Several circulating cell subsets in the peripheral blood are known to modulate the host immune response to Mycobacterium tuberculosis (*Mtb*) infection in different ways.
However, the characteristics and functions of these subsets at different stages of tuberculosis infection have not been well elucidated.

Design/Methods: Peripheral blood immune cells (PBICs) were isolated from healthy donors (HD), individuals with mild tuberculosis (mild TB), and individuals with severe tuberculosis (severe TB). Subsequently, the PBICs were subjected to single-cell RNA sequencing (scRNA-seq) using the 10 × Genomics platform. The metadata of cells was analyzed by unsupervised clustering using the Seurat software package. Pseudotime trajectory analysis was performed using the R package Monocle 3. Cell communication analysis was performed using the R package CellChat.

Results: Cluster analysis based on differential gene expression revealed markers for all major cell types and delineated five major PBIC populations: neutrophil, T cell, monocytes, NK cells, and B cells.
Further analysis showed that PBICs were highly heterogeneous, with significant differences in the same cell subset among the three groups. Cellular communication analysis revealed that CD8 T cells exhibited the highest incoming interaction strength in severe TB patients. The increased CD8 T cell incoming interactions are associated with the MHC-I and LCK pathways, with HLA-(A-E)-CD8A, HLA-(A-E)-CD8B, and LCK-(CD8A+CD8B) being ligand-receptor pairs.

Conclusions: PBICs derived from HD, mild TB patients and severe TB patients were highly heterogeneous, with significant differences in the same cell subset. In severe TB patients, CD8 T cells showed the highest incoming interaction strength, with the main signals being MHC-I and LCK pathways.

OA45-463-15 Impact of integrating private motorbike riders into the National Specimen Referral System in central Uganda

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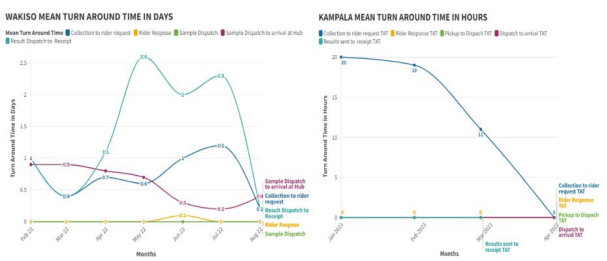
Background and challenges to implementation: In 2012, Uganda set-up a sample transportation system known as the Hub and Spoke model, consisting of dedicated motorbikes as means of transport. The system operates a scheduled transportation limited to 1-2 visits per week per peripheral health facility. While this might be optimal for routine tests and samples with long shelf life, it remains a challenge for unscheduled tests and specimens with short shelf life, and those that require rapid turnaround time (TAT) such as Tuberculosis specimens which require transportation to the testing site within 3 days. This study aimed at piloting the integration of private riders into the existing national sample transportation system.

Intervention or response: The pilot was conduct at 27 selected health facilities in central Uganda from Feb-Aug 2022 in Wakiso district and Jan-Apr 2023 in Kampala district. Private riders operating nearest to the health facilities were selected for Wakiso, while in Kampala, e-riders using Uber app were engaged. Private riders were compensated for their fuel and time for each trip made to and from the peripheral health facility. After 11 months of implementation, we evaluated the impact of private riders on access and timeliness to laboratory referral services.

Results/Impact: turnaround time for all the different parameters monitored was generally one day across the months in both Wakiso and Kampala districts. Over all TAT[DT1] for referred tests reduced from 21 to 13 days across the study period in Wakiso, and from 18 to 6days in Kampala. Average TAT for Genexpert testing reduced from 16 to 8days.



Conclusions: The private rider's approach is feasible and improved uptake of referral laboratory services in both Wakiso and Kampala districts. We recommend NTRLs to complement their existing national TB specimen referral systems with private riders so as to improve on its effectiveness.

OA46 CAD AI in finding the missing people with TB

OA46-464-15 Evaluating the performance of Genki CAD software when using photographs of printed X-ray films

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Background: Computer-aided detection (CAD) software are recommended by the WHO for the interpretation of chest X-ray (CXR) images during TB screening. However, many health facilities in low-income countries still use analog radiography systems and in certain settings, patients may bring printed CXR films to their appointments. In these situations, providers cannot easily use CAD software to support CXR interpretation.

Design/Methods: A DICOM library was constructed using data from an active case finding initiative in Ho Chi Minh City (HCMC), Vietnam. DICOM files were blindly re-read by 10 TB clinicians working at public and private health facilities across HCMC. Then, DICOM files were printed onto X-ray films and photographed using a smartphone camera to create a paired JPEG file. Both DICOM and JPEG files were processed with Genki CAD software version 3.1.1 (DeepTek, India). The average sensitivity and specificity of the human readers was calculated. Abnormality score thresholds corresponding to the sensitivity of the human readers and at 90% sensitivity were selected for each file type and specificities were calculated and compared.

CXR interpretation method	Score	Sensitivity	Specificity	P-Value	
Genki CAD software threshold selected to match human reader sensitivity					
Human readers	N/A	79.0% (75.4-82.2)	84.8% (84.2-85.3)	Ref	N/A
Genki software / DICOM files	0.406	79.3% (66.7-88.8)	95.2% (93.9-96.2)	<0.001	Ref
Genki softawre / JPEG files	0.410	79.3% (66.7-88.8)	92.1% (90.6-93.5)	<0.001	0.538
Genki CAD software threshold selected to achieve as close to 90% sensitivity as possible					
Genki software / DICOM files	0.200	91.4% (81.0-97.1)	89.3% (87.5-90.8)	Ref	
Genki software / JPEG files	0.230	91.4% (81.0-97.1)	81.1% (79.0-83.1)	0.023	

Results: The human readers achieved an average performance of 79.0% sensitivity and 84.8% specificity. At abnormality thresholds calibrated to match this sensitivity, the Genki CAD software using either DICOM or JPEG

files had significantly higher specificity than the TB clinicians. When the abnormality threshold was calibrated to achieve a 90% sensitivity, the Genki CAD software using DICOM files had a significantly higher specificity (89.3% vs 81.1%, p=0.023).

Conclusions: At a clinically relevant threshold, the Genki CAD software had significantly better performance when processing DICOM files. However, the software's performance when processing JPEG files was still significantly better than human readers and met the Target Product Profile criteria for identifying people with suspected TB. Future studies may prospectively asses Genki CAD software performance when using photographs of printed CXR films.

OA46-465-15 Diagnostic accuracy of computer-aided detection (CAD) during community-based active case finding for pulmonary TB in South Africa: Is CAD a useful screening test?

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Background: Limited data describes computer-aided detection (CAD) as a screening tool to detect unreported tuberculosis (TB), including asymptomatic TB, in TB/HIV-endemic communities during community-based active case-finding (ACF). The utility of CAD for detecting unreported probably infectious TB in the community remains unclarified.

Design/Methods: In this case-control study, we pooled individual patient data from persons aged ≥15 years recruited from five prospective, community-based ACF TB studies in South Africa. All included participants had a chest x-ray (CXR) that underwent CAD analysis (CAD4TB v7). CAD accuracy, including in sub-groups, was assessed against a microbiological reference standard (sputum Xpert Ultra and/or culture positivity). CAD performance in detecting probably infectious TB (defined as smear positivity and/or cough aerosol sampling [CASS] positivity and/or cavitary disease on CXR) was also evaluated.

Results: 20,770 individuals were enrolled across all studies, of which 530 (2.6%) had microbiologically-proven TB (53.8% [285/530] were asymptomatic). Cases (TB) and controls (non-TB) were randomly selected in a 2:1 ratio (n=1,439; 501 TB-positive and 938 TB-negative participants). CAD achieved an area under the receiver operating curve (AUC [95% CI]) of 0.83 (0.80-0.85). At fixed sensitivities of 90% and 85% (thresholds: 5 and 10), specificity (95% CI) was 44.9% (42.5%-47.3%) and 54.1% (51.7%-56.5%), respectively. CAD performed worse (AUC) in persons who were living with HIV (0.76 versus 0.85; p=0.004) and asymptomatic (0.79 versus 0.85; p=0.008).

In a sub-analysis, 73/374 (19.0%) participants were probably infectious. CAD sensitivity and specificity (95% CI) in detecting persons with probably infectious TB (threshold: 6) was 100.0% (95.2%-100.0%) and 34.5% (29.4%-40.1%), respectively.

Conclusions: In the setting of ACF of unreported TB in the community, CAD did not meet the WHO screening test target product profile (>90% sensitivity; >70% specificity).

Performance was worse in certain sub-groups. However, CAD detected all probably infectious TB. These data inform community-based ACF strategies aiming to disrupt the TB transmission cycle.

OA46-466-15 Incorporating standalone CAD4TB enabled chest X-ray diagnosis in private sector intervention: Description of lessons learned from private facilities in Lagos, Nigeria

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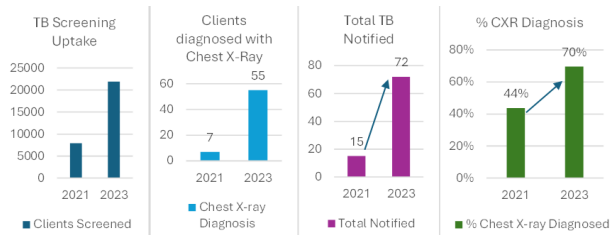
Background and challenges to implementation: Owing to the large number of people visiting the private hospitals for various health reasons, the private sector remains a target for implementing strategic TB case finding interventions. One of such strategic interventions is the use of Computer-Aided Detection for Tuberculosis (CAD4TB) enabled chest X-ray machines in the screening and diagnosis of TB. This study seeks to evaluate the impact of

the use of CAD4TB enabled chest X-ray machines on the screening and diagnosis of TB among patients attending private hospitals.

Intervention or response: Prior to the year 2022, TB screening in all private facilities in Lagos state was being carried out by screening/cough officers. Around mid-2022, Global Fund procured CAD4TB enabled X-ray machines were then installed in two private facilities in the state and are being used to screen all patients attending the facilities. The screening uptake and outcomes in these two facilities were then evaluated before and during the use of the machines for TB screening, i.e. in 2021 and 2023 respectively, with 2022 having a mix of both.

Results/Impact: Data for 2021 and 2023 respectively showed that annual screening uptake by patients increased significantly by 177% from 7913 to 21899, while annual TB notification also increased by 380% from 15 to 72 cases. Also, the proportion of patients diagnosed with Chest X-ray increased from 44% (2021) to 70% (2023), with a total chest X-ray diagnosis of 7 and 55 respectively.



Conclusions: Installation of these machines in the private hospitals helped improve screening uptake as well as other screening outcomes and can be an area of successful collaboration to look into owing to the number of patients that visit private facilities as well as the potential to further drive patients flow to them which is very key in helping to identify TB cases that would have been missed.

OA46-467-15 Programmatic roll out of portable digital chest X-rays and computer-aided detection software for systematic TB screening: Implementation lessons from Kenya

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Background and challenges to implementation: Computer Aided Detection (CAD) software enabled digital chest X-rays (DCXR) offer an opportunity to accelerate TB case-finding. However, for these technologies to be impactful, they must be implemented at full scale in the highest burden countries.

We set out to describe programmatic roll out of eight portable digital X-rays with Computer Aided Detection for TB software version 7 (CAD4TBv7) in Kenya through the *introducing New Tools Project (iNTP)*.

Intervention or response: We used the WHO health systems building blocks to guide the country planning and roll out of CAD-DCXR. Under TB program leadership, a multi-stakeholder CXR Sub-committee was formed that spearheaded the planning, development of systematic TB screening policy and algorithms, threshold score determination, site selection and baseline assessment of the facilities for roll out. Funding from USAID and STOP TB partnership enabled; procurement, hiring of radiographers, capacity building, technical support, and development of an integrated health management information system.

Results/Impact: The CAD-DCXR were placed in eight health facilities based on the at-risk population identified for systematic screening- urban slums populations, high HIV/TB burden areas, fisher folk communities, and refugee populations, and availability of molecular WHO recommended device for follow-on diagnostic testing. A threshold score of 60 used to identify individuals for diagnostic testing.

Between July 2022 to December 2023, a total of 50,293 images were taken, and 4,206 (8%) had a threshold score of ≥60, out of those, 1013 individuals (24.1%) had bacteriologically confirmed TB. 3,538 (7%) and 42,549 (85%) had a score of 40-59, and <40 respectively.

Conclusions: These steps for the inaugural Kenya CAD-DXCR screening implementation serve as a roadmap for other countries kick-starting CAD-CXR roll-out and for country scale up. Multi stakeholder engagement and planning is an important facet. Lessons learnt include the need for iterative CAD threshold score calibration and addressing leakages in the patient pathways.

Number of people who underwent screening for TB using X-ray and CAD/AI (for diagnosis) during this reporting period?	**50293**		
CAD score categories	<40	40-59	≥60
Number of people who underwent screening for TB using X-ray and CAD/AI (for diagnosis) per CAD score category	42549 (85%)	3538 (7%)	4206 (8%)
Investigated	2442 (5.7%)	2439 (68.9%)	2646 (62.9%)
Bacteriologically confirmed (Out of those screened)	108 (0.3%)	139 (3.9%)	1013 (24.1%)
Bacteriologically confirmed (Out of those investigated)	108 (4.4%)	139 (5.7%)	1013 (38.3%)

Table 1: Kenya CAD-DCXR TB screening cascade July 2022 to December 2023.

OA46-468-15 Implementing facility-based artificial intelligence enabled chest X-ray screening as innovative strategy to improving TB case finding in Lagos, Nigeria

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Background and challenges to implementation: Nigeria is first in Africa in Tuberculosis(TB) burden with a 32% TB notification gap. Lagos accounts for estimated 10% of Nigeria's TB burden. Lagos TB Programme placed on treatment:17,276 and 18,546 persons with TB in 2022 and 2023 respectively. However, there has been different innovative approaches and strategies deployed to reduce this notification gap from Y2019-Y2023.
We aimed to close the TB notification gap by increasing TB case finding using facility-based Artificial Intelligence(AI) enabled Chest X-ray systems in Lagos, Nigeria.
Intervention or response: We deployed Global Fund supported 18 facility-based AI enabled CXR Systems to 18 public and private facilities based on OPD attendance, existing CXR Infrastructures and human resources from January 2022-December,2023. Each CXR system has a radiographer, screening Officer and data officer. The radiologist reviews the digital radiographs remotely.
All clients screened using the WHO four-symptoms screening and Computer-Aided Detection(CAD4TB) score and threshold set at ≥45. All identified presumptive TB were evaluated with GeneXpert. The clients unable to produce sputum and bacteriological negative results had their digital Xray films sent to radiologists and medical officers for further review and evaluation. Data were collected using electronic TB registers.
Results/Impact: A total of 95,770 clients were screened, 16,572 (17%) were identified to be presumptive TB. 16,023 (97%) presumptive TB were evaluated and 4,969 (5%- TB yield) were diagnosed as persons with TB and 4,900 were linked to treatment. The NNS and NNT were 19 and 3 respectively. Facility-based CXR intervention account for 14% (4,900/35,822) of the overall TB case notification during the period under review.

Indicators	**Q1 2022**	**Q2 2022**	**Q3 2022**	**Q4 2022**	**Q1 2023**	**Q2 2023**	**Q3 2023**	**Q4 2023**	**Total**
No. of Clients Screened with CAD4TB	3,036	7,212	6,880	13,948	18,024	16,315	17,451	12,904	95,770
Presumptive TB generated	871	1,692	1,433	2,835	2,599	2,030	2,891	2,221	16,572
Presumptive TB Evaluated	783	1,598	1,401	2,790	2,470	2,013	2,780	2,188	16,023
No of Diagnosed persons with TB	237	426	425	659	906	782	892	642	4,969
No of Positive persons with TB notified	234	419	421	643	899	768	882	634	4,900
% TB yield	8%	6%	6%	5%	5%	5%	5%	5%	5%
NNS	13	17	16	21	20	21	20	20	19
NNT	4	4	3	4	3	3	3	3	3

Conclusions: Facility-based AI enabled CXR Intervention being first of its kind in Nigeria and as demonstrated in this assessment showed quality presumptive identification, high TB yield, good NNS/NNT and overall increase contribution to TB case finding. We will recommend its scale- up to bridge the gap in TB case notification in Nigeria.

OA46-469-15 Comparative analysis of TB screening methods: CAD4TB, symptomatic screening, and radiologist assessment in Kenya

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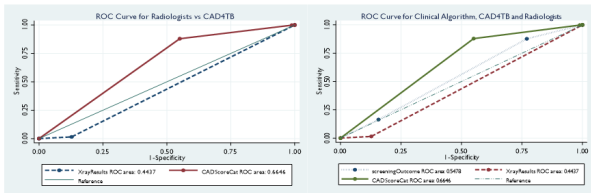
Background and challenges to implementation: Accurate and efficient screening methods are crucial for the early detection and management of tuberculosis (TB). This study aimed to compare the performance of three TB screening approaches: an artificial intelligence-based tool (CAD4TB), symptomatic screening, and radiologist assessment using chest X-rays.

Intervention or response: A total of 4,038 individuals who underwent TB screening, CAD4TB and radiologist assessment were included in the analysis. The performance of CAD4TB and radiologists in detecting TB was evaluated using Receiver Operating Characteristic (ROC) curves.
In a purposively selected subset of 415 individuals who had a threshold of 60, the performance of CAD4TB, radiologists, and symptomatic screening was also compared using ROC analysis. Area under the curve (AUC) values and their 95% confidence intervals were calculated to assess the diagnostic accuracy of each method.
Results/Impact: CAD4TB demonstrated a higher area under the ROC curve (AUC) of 0.66 (95% CI: 0.6516-0.6777) compared to radiologists, who had an AUC of 0.44 (95% CI: 0.4367-0.4508). In the subset of 415 individuals, the performance of CAD4TB, radiologists, and symptomatic screening was compared. CAD4TB showed the highest AUC of 0.7205 (95% CI: 0.6784-0.7625), followed by symptomatic screening with an AUC of 0.5738 (95% CI: 0.5223-0.6254). Radiologists had the lowest AUC of 0.4013 (95% CI: 0.3791-0.4235) in this subset.
Additionally, symptomatic screening demonstrated a higher AUC than radiologists in the subset of 415 individuals.



Conclusions: This study highlights the potential of CAD4TB as a valuable tool for TB screening, outperforming radiologist assessment in both the full dataset and subset analysis. Symptomatic screening also demonstrated promising results, with the highest AUC in the subset analysis. The integration of CAD4TB and symptomatic screening into TB screening algorithms could enhance early detection and improve patient outcomes.

OA46-470-15 Use of CAD-AI to triage ACF campaign participants for clinical consultations and diagnosis of non-bacteriologically confirmed TB in Vietnam

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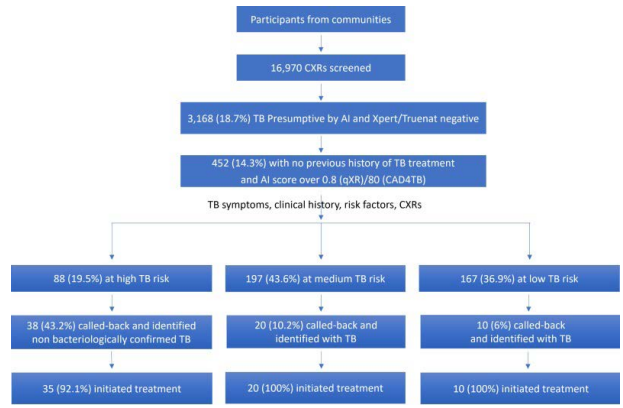
Background and challenges to implementation: The National Tuberculosis (TB) Program recommends clinical consultations for participants of active-case-finding (ACF) in community settings. Health system lacks resources to provide post-campaign evaluation and diagnosis to large numbers of ACF participants.
A strategy to identify high-risk participants for post-campaign follow-up is crucial to find clinically diagnosed cases of TB.
Intervention or response: Computer-Aided Detection Artificial Intelligence (CAD-AI) technologies (qXR and CAD4TB) were integrated into ACF campaigns to identify TB-presumptive Chest X-rays (CXRs) based on AI thresholds (0.4 and 60 respectively). The project utilized AI scores given to individual CXRs to triage the post-campaign clinical consultations in An Giang province. Clinical records of eligible participants (those having CXRs with CAD-AI score from 0.8 (qXR)/80 (CAD4TB), no history of TB, and Xpert/Truenat negative for TB) were electronically sent to national experts for evaluation. Based on risk factors, symptoms, and radiological findings, experts categorized participants into three groups:
1. High TB-risk – considered as clinically diagnosed TB,
2. Medium TB-risk – recommended for further diagnosis and examination, and;
3. Low TB-risk — counseled to self-monitor for any TB-presumptive signs.



Results/Impact: In 2023, 16,970 individuals were screened during community campaigns in An Giang, 3,168 participants (18.7%) of participants had TB-presumptive CXRs and MTB(-) Xpert/Truenat, from which 452 individuals

(14.3%) were prioritized for desk-review per above criteria. Nearly two-thirds of patient charts were evaluated at medium (43.6%) to high (19.5%) risk of TB. Among 88 individuals with high risk, 38 (43.2%) were successfully contacted and diagnosed with non-bacteriologically confirmed TB. Thirty (8.2%) out of 364 individuals in the last two groups were diagnosed with TB. Treatment coverage was 96%, as three cases from the high-risk group refused treatment.

Conclusions: Utilization of an AI score facilitated post-campaign follow-up activities, creating a mechanism to identify non-bacteriologically confirmed TB among ACF participants, and leveraging time and resources to find missing TB cases in the community.

OA46-471-15 Finding the unidentified people with TB in Nigeria: Lessons from KNCV Nigeria TB LON Project multi-pronged intervention approach

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Background and challenges to implementation: Nigeria ranks 6th among the high burden countries for TB and accounts for 6.3% of the gap of unidentified TB cases globally. One key reason for the gap is under diagnosis. To address this, KNCV Nigeria on the USAID-funded TB LON 1 and 2 project adopted a mixed model of community and facility-based strategies and digital solutions to find TB Cases. We present a 4-year result of our multi-pronged interventions.

Intervention or response: Across 14 project implementing states in Nigeria, active TB case finding interventions were deployed in health facilities and communities. These include - Intensified Case finding (ICF) in the public and private health facilities using dedicated screening officers at the service delivery points, Engagement of Patent Medicine Vendors (PMVs), Community Pharmacists (CPs) and Standalone laboratories, Portable Digital chest Xray (PDX) screening with artificial intelligence, Contact investigation, Screening among Nomads, Use of Wellness on Wheels (WoW) Truck, Targeted Community Active Case Finding (ACF) using a TB hotspot analytics system. Real time data reporting was done using COMM CARE Mobile application.

Results/Impact: From April 2020 to December 2023, a total of 36,712,350 adults and children had been screened with 3,130,170 (9%) presumptive TB identified. Of these, 2,954,985 (94%) were evaluated while 221,723 (8%) TB cases were diagnosed and 213,923 (96%) enrolled on treatment. Within this period the treatment coverage in Nigeria steadily increased from 27% in 2020 to 70% in 2023.

Contributions from the various interventions to overall TB case notification of 213,923 were as follows ICF Public-33%, ICF Private -6%, PMV/CPs – 30%, Community ACF-14%, PDX-3%, Nomads-0.3%, Contact investigation-12%, WoW truck-1% and Standalone Lab-0.7%. See figure 1.

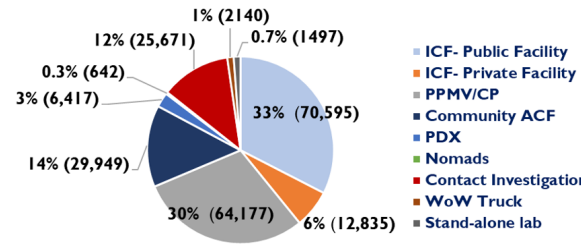

Figure 1. Percentage TB case contribution per intervention.

Conclusions: To find the unidentified TB cases in a high burden country like Nigeria, a multi-pronged approach targeting different populations, communities and settings is critical to leaving no one behind and improving access to patient centred TB services.

OA46-472-15 Use of second-party information for tracking a person with TB to reduce loss to follow-up amidst insecurity in Guma LGA Benue state

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Background and challenges to implementation: Guma local government area (LGA) is engulfed by farmers' and herders' clashes which has led to massive displacement of people into settlements and internally displaced persons camps (IDP), due to frequent attacks people living here continue to move within and outside this locations when they perceive threats, tracking a TB patient for treatment initiation or continuation is difficult leading to lost to follow ups. KNCV targeted the IDP camps and its settlements, provided TB active case findings (ACF) using chest x-ray and artificial intelligence (AI) in the wellness on wheels truck (WOW) and portable digital x-ray (PDX).

Intervention or response: The IDP camps and settlements in Guma were line listed following advocacy, communication, and social mobilization (ACSM) to the authorities. The WOW and PDX were daily deployed to different camps and settlements with security cover from the state. Consenting members including adults and children were screened using chest X-ray with AI and WHO symptoms, presumptive TB were identified and their detailed addresses and phone numbers, including that for a close relative/friend are documented before testing the sputum with the GeneXpert machines in the WOW truck.

Results/Impact: Of the 59 TB patients that were diagnosed, 93% of the patients were tracked either directly or through a second party information of their friends or relatives, in case they moved out before treatment initiation.

Screened	3202
Presumptive Identified	204
Presumptive evaluated	204
TB Cases diagnosed	59
TB cases enrolled on treatment	55
Number needed to test (NNT)	3
Number needed to screen (NNS)	54

Table.1. TB ACF cascade in Guma LGA 11-28 October 2022

Conclusions: Findings from this exercise have shown that the IDP camps and settlements have a highly mobile population with poor means of tracking those who migrate, including diagnosed TB clients, if nothing is done to track these patients, it could lead to spread of TB in other areas and could negate the End TB mandate.

OA47 Epidemiological models: Trends, predictions and policy implications

OA47-473-15 Artificial intelligence-based modelling for predicting drug-resistant TB in Uttar Pradesh, India

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Background and challenges to implementation: Uttar Pradesh (UP) notified 19,093 persons with drug resistant tuberculosis in 2023, which is highest in the country. Machine learning algorithms, a sub-component of the artificial intelligence systems, can analyse population-level data for predictive modelling which can inform evidence-based public health policies. It can help policymakers to prioritize interventions and effectively allocate resources. This study was undertaken to evaluate a machine learning model developed to predict the risk of having drug resistance in notified persons with tuberculosis (PwTB), which will also help to prioritize testing for PwTB without bacteriological confirmation.

Intervention or response: The demographic and clinical information of PwTB in Uttar Pradesh was obtained from January2018-December2023 from Ni-kshay, which is India's digital TB surveillance system. Data on gender, age, weight, facility type, microbiological/ clinical confirmation, diagnosis-to-treatment delay, comorbidity status, and case type was extracted. Preprocessing of data involved anonymizing, handling missing data and outliers, one-hot encoding (for categorical variables), and scaling (for continuous variables). Data was then randomly split for training and testing in a ratio of 80:20. Ridge regression model was then trained and evaluated using accuracy, recall, and F-1 score from the confusion matrix (derived after making predictions on test data).
Results/Impact: Amongst the notified PwTB, the trained model correctly predicted drug resistance with 97.06% accuracy in the test data. The model showed a recall of 100.00%, suggesting that it could correctly identify all positive cases of drug resistance. A high F1-score of 98.42% indicated that the model could achieve high precision while also capturing a high proportion of true positive instances of drug resistance TB.
Conclusions: The machine learning model demonstrates promising accuracy, recall, and precision in predicting drug resistant tuberculosis among notified PwTB. Policymakers can use this model for developing a user interface to prioritize drug susceptibility testing for undiagnosed drug resistance among PwTB, especially in resource-limited settings.

OA47-474-15 Fluoroquinolone resistance prevalence and the use of BPaL vs BPaLM in the absence of drug susceptibility testing

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Background: Fluoroquinolone drug susceptibility testing (DST) coverage among multidrug-resistant/rifampicin-resistant tuberculosis (MDR/RR-TB) cases is around 50% globally. WHO recommends the use of the bedaquiline, pretomanid, linezolid (BPaL) regimen with the additional fluoroquinolone antibiotic moxifloxacin (BPaLM) for initial treatment of MDR/RR-TB, in the absence of fluoroquinolone DST. However, the efficacy of moxifloxacin may be compromised in settings with high fluoroquinolone resistance.
Design/Methods: We adapted a previously developed Markov model to compare the empirical use of BPaLM compared to BPaL for the treatment of MDR/RR-TB. We

obtained fluoroquinolone resistance rates in four high MDR-TB burden countries from WHO surveillance data and incorporated these along with new trial-based treatment efficacy estimates based on fluoroquinolone resistance status. We assessed the cost-effectiveness of empirical use of BPaLM versus BPaL based on the incremental cost per disability-adjusted life year (DALY) averted measured against different levels of willingness to pay thresholds (WTP) and fluoroquinolone resistance prevalence in each country.

Results: In the absence of fluoroquinolone DST, empirical use of BPaLM over BPaL resulted in $41,55, 99, and 262 per DALY averted in India, Philippines, Georgia, and South Africa respectively. At WTP of $140-$400 per DALY averted, BPaLM empirical treatment had ≥ 80% probability of being cost-effective at current levels of fluoroquinolone resistance prevalence in all four countries. In scenario analyses spanning a plausible range of fluoroquinolone resistance (0-60%), BPaLM remained more likely to be cost-effective than BPaL for empirical treatment of MDR/RR-TB even at high rates of FQ resistance.

Conclusions: Our findings from the modelling analyses support the empirical use of the BPaLM regimen over BPaL for the treatment of MDR/RR-TB across a range of plausible fluoroquinolone resistance prevalence, reinforcing recent WHO recommendations.

While our study evaluated empirical treatment strategies, sustained DST scale-up is essential to prevent the development and spread of fluoroquinolone resistance, which has broader implications for future treatment of MDR/RR-TB.

OA47-475-15 Comparative impacts and costs of different strategies for TB active case finding in prisons: A mathematical modelling study

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Background: In Brazil and Peru, tuberculosis (TB) incidence in prisons is over 34 times higher in prisons than in the general population. Prison-based active case-finding may be highly impactful to reduce TB burden. The comparative effectiveness and costs of different strategies, including higher-frequency screening and algorithms utilizing sputum pooling, are unknown.

Design/Methods: Using a dynamic transmission model calibrated for Brazil and Peru, we simulated prison-based entry screening, exit screening, and annual or biannual mass screening over a ten-year period, compared to a base-case scenario with no active case-finding.

We evaluated three algorithms:

1. Chest X-ray followed by Xpert Ultra;
2. Chest X-ray followed by Xpert Ultra with sputum pooling, followed by individual confirmation for positive pools; and,
3. Xpert Ultra with sputum pooling and individual confirmation.

We estimated reductions in prison and population-wide TB incidence and calculated total costs and costs per case averted.

Results: Biannual mass screening with chest X-ray followed by Xpert Ultra was the most impactful intervention. By 2035, it reduced prison TB incidence by 58% (95% UI, 49-67) in Brazil and 59% (49-69) in Peru, and it reduced population TB incidence by 19% (95% UI, 13-27) in Brazil and 16% (10-20) in Peru *(Figure)*. Biannual screening with algorithms involving sputum pooling was more impactful than annual screening with any algorithm. Biannual screening with Xpert Ultra pooling was also more cost-efficient [JA1] than algorithms without pooling, costing approximately $1419 and $760 per case averted in Brazil and Peru, respectively *(Figure)*. Entry and exit screening were more costly and yielded marginal impacts beyond periodic mass screening *(Figure)*.

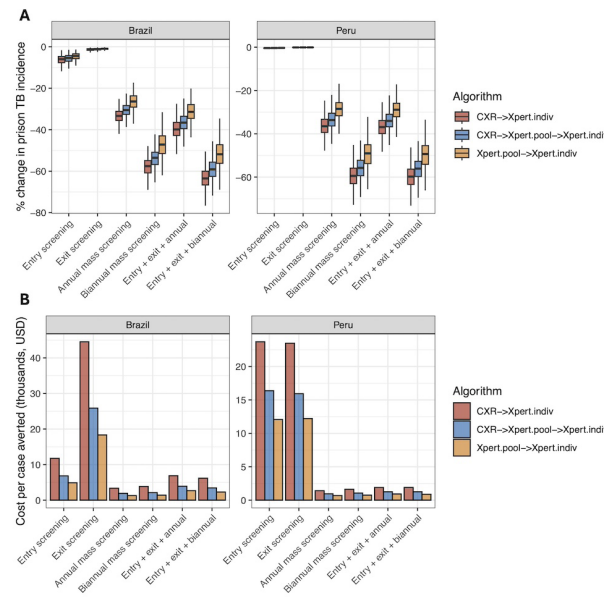

Figure.

Conclusions: More frequent mass screening in prisons may be highly effective in reducing prison and population-wide TB incidence in Brazil and Peru. Strategies incorporating sputum pooling with Xpert Ultra may enable more frequent screening within resource-constrained settings.

OA47-476-15 Epidemiological impact of improving linkage to TB care in South Africa: A modelling study

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Background: Failure of individuals diagnosed with tuberculosis (TB) to link to care, also known as initial loss to follow-up (ILTFU), remains a considerable obstacle to reducing the TB burden in South Africa. Reducing ILTFU is possible through implementation of patient-management systems and hospital-based interventions as demonstrated in the LINKEDin study, a quasi-experimental study implemented in three South African provinces.
Design/Methods: We used a transmission-dynamic model of TB calibrated to epidemiological and programmatic data for TB in South Africa. Based on LINKEDin findings, we assumed country-wide efforts to reduce ILTFU by 50% (25%-75%) five years following implementation.
Additionally, we accounted for varying delays of implementation over the intervention period. We used the model to estimate the number of incident TB cases and deaths over a 13-year time horizon (2023-2035) following implementation of the intervention.
Results: We projected that, under the status quo, there would be 3.7 million incident TB cases (uncertainty interval [UI]: 3.0 – 4.7 million) and 503,524 TB deaths (UI: 309,232 – 754,141), between 2023 and 2035. We estimated that a 50% reduction in ILTFU could avert 49,812 (UI: 21,258 – 84,644) incident TB cases and 21,479 (UI: 9,500 – 32,661) TB deaths over the time horizon.
Secondary analysis demonstrated that implementing simultaneous interventions to reduce other losses across the TB care cascade that could occur between accessing health care services, receiving test results, initiating TB treatment, and successfully completing their treatment, could enhance the impact of interventions to reduce ILTFU.
Conclusions: We estimated moderate reductions in TB incidence and mortality when only reducing ILTFU. Integrated interventions including reduction in ILTFU are required to strengthen TB care across the care cascade, effectively reduce ILTFU, and ultimately improve treatment outcomes for people with TB.

OA47-477-15 Subnational TB burden estimation for Pakistan

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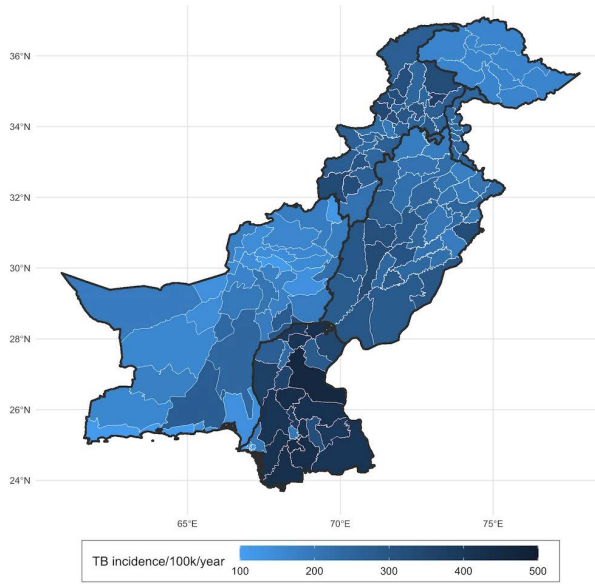
Background: Global tuberculosis (TB) burden estimates are aggregated at the national level, despite the likelihood of uneven distribution across and within regions in the same country. Subnational estimates are crucial to producing informed policies and informing budget allocation at more granular levels.
In collaboration with the National TB Programme (NTP), we applied a simple and transparent tool to estimate the subnational TB burden in Pakistan.
Design/Methods: We tailored the SUBnational Burden Estimation for TB (SUBsET) tool to account for the district-level hierarchy of Pakistan. Districts were assigned weighted scores based on population size, level of urbanisation, households with one room, and food insecurity levels.
Using the 2022 national TB incidence estimate, we first allocated the burden across administrative units based on data from the 2010-11 TB prevalence survey and subsequently refined this distribution to reflect weighted scores specific to each district.
The estimated TB incidence was compared with pulmonary TB notifications in 2022 to calculate the case detection rate (CDR) for each district.
Results: Utilising the updated SUBsET model, we assigned weight scores to 150 districts spanning seven provinces/regions in Pakistan. The estimated TB incidence varied significantly, ranging from 110 (95%CI:80-145) to 462 (95%CI:337-607) per 100,000 inhabitants per year. The provinces bearing the highest burden was Sindh (292; 95%CI:213-384), followed by Khyber Pakhtunkhwa (269; 95%CI:196-354) and Punjab (243; 95%CI:177-320).
The CDR was below 70% in three-quarters of the districts and over-reporting (>100%) was observed in 10 districts, primarily within Punjab, which suggests that individuals with TB may be crossing district lines to access care.
Conclusions: The application of the SUBsET tool through active collaboration with the NTP revealed high heterogeneity in subnational TB incidence in Pakistan, urging a more granular and tailored approach to TB prevention and care.
This approach ensured transparency and acceptance of the findings for wider in-country dissemination.



OA47-478-15 Social and structural determinants of sex differences in TB prevalence: An ecological analysis of high-burden countries

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Background: Tuberculosis (TB) prevalence surveys show that men have a higher disease burden, relative to women, but male-to-female (M:F) ratios vary across settings, from 1.2 in Ethiopia to 4.5 in Viet Nam. We conducted an ecological analysis to assess whether M:F ratios in TB prevalence can be explained by social and structural determinants that drive the TB pandemic and differentially impact men and women.
Design/Methods: We extracted TB prevalence and M:F ratios and collected determinants data for 31 countries with a national TB prevalence survey since 2010. Population and, where possible, sex-specific data were collected, matching country and survey year, for HIV, tobacco use, alcohol consumption, undernutrition (low BMI), diabetes (high glucose), incarceration, education (secondary completion), and human development index (HDI). We conducted univariable and multivariable regression analyses with M:F ratio in bacteriological TB prevalence as the outcome of interest.
Results: In univariate analyses for 24 countries with complete data (13 in Africa, 11 in Asia), lower HIV prevalence and higher tobacco use were strong predictors of higher M:F ratios in TB prevalence ($p \leq 0.05$). Stratifying by continent, higher alcohol consumption was mildly predictive in both continents (p=0.08 in Africa, p=0.17 in Asia), as was higher HDI in Asia (p=0.13) and higher incarcerated population in Africa (p=0.18). In multivariable regression with all population-level determinants, higher tobacco use was the strongest predictor ($p<0.001$), and lower TB prevalence, higher alcohol consumption, lower prevalence of diabetes, and higher secondary education completion were associated with higher M:F ratios ($p<0.05$). No associations were found between M:F ratios in determinants and M:F ratios in TB prevalence.
Conclusions: Social and structural determinants differentially impact men and women and must be addressed to reduce inequities in disease burden.

OA47-479-15 A novel method to estimate TB incidence using the time from subclinical to symptomatic disease

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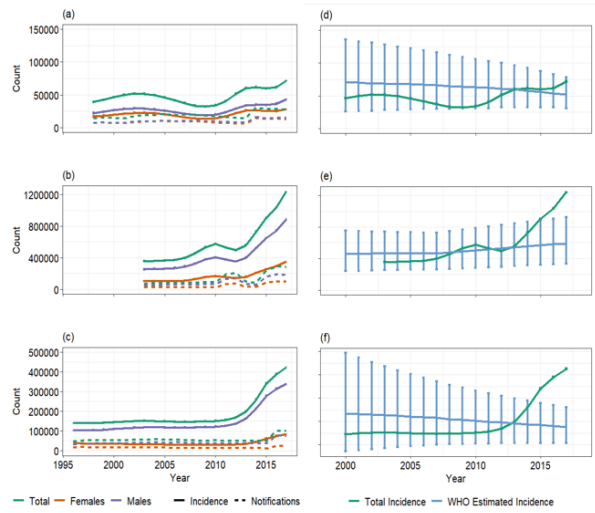
Background: Existing methods to estimate tuberculosis (TB) incidence are time and/or resource intensive. Furthermore, they do not consider the delay between the development of bacteriologically-positive subclinical disease and notification.
We implement a method to estimate sex-stratified TB incidence using notification data and estimates of the time between disease onset and notification.
Design/Methods: We adapt methods developed to estimate HIV incidence by considering notifications to be a convolution of disease duration and incidence of new cases.
We use a sex-specific cure model informed by estimates of TB natural history parameters from Ku et al 2021 for the infectiousness distribution (time from development of bacteriologically-positive subclinical TB disease until notification) to account for underreporting of case notifications and appropriately assign notification data to the time point of onset of disease.
We assume a Poisson distribution for notifications and incidence and use a penalized likelihood prior to smooth estimates.
We estimate total and sex-stratified bacteriologically-positive TB incidence for Vietnam, Cambodia, and The Philippines.
Results: Incidence estimates with 95% credible intervals and notifications are presented in Figure panels (a)-(c). Incidence curves largely follow the shape of notification curves with a lag of about two years.
On average, TB incidence amongst males was 3.8%, 1.3%, and 2.5% higher than females in Vietnam, Cambodia, and The Philippines, respectively.
Our estimates are of similar magnitude to those from the World Health Organization but are not constrained to follow strict trends (Figure panels (d) – (f)).

Figure. Total and sex stratified incidence estimates with 95% Credible Intervals (CrIs) and notifications are shown for (a) Cambodia, (b) Vietnam, and (c) The Philippines. Solid lines represent incidence estimates and dashed lines represent notifications. Panels (d), (e), and (f) show total incidence estimates with 95% CrIs for Cambodia, Vietnam, and The Philippines, respectively, compared to estimates and their 95% confidence intervals produced by the World Health Organization. Note total incidence in graphs in same row are the same estimates.



Conclusions: We propose novel methods to estimate TB incidence that account for the delay between bacteriologically-positive subclinical disease and notification. Additional work is necessary to account for variation in notifications due to programmatic changes that are not reflective of disease dynamics. The global TB burden remains ill-defined and estimates such as these are necessary to assess progress towards TB elimination.

OA47-480-15 Mathematical modelling of asymptomatic TB in the Philippines

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Background and challenges to implementation: The 2016 national tuberculosis (TB) prevalence survey in the Philippines showed a high proportion of subclinical TB, which is defined as having TB bacilli detected but no symptoms; however, there are no existing guidelines yet on its management. Several modelling studies were done to assess the TB transmission dynamics in the country, but the subclinical condition has not been considered in previous models. This study aimed to assess the impact of early detection of subclinical TB on incidence and mortality in the Philippines.

Intervention or response: Using an S-E-I-R framework, we formulated a compartmental model for early TB diagnosis by segregating the infectious "I" compartment into early "I_a" phase (subclinical) and late "I_p" phase (clinical) stages (Figure 1a).

We, then, isolated the infectious compartment by setting assumptions within the subclinical-clinical flow (Figure 1b). This was hand-calibrated to match the following local data observations: TB prevalence was between 1000-1100 per 100,000; TB incidence at 600-700 per 100,000; TB notifications at 300-400 per 100,000; and project contribution from 2019-2022 was at one-tenth of the notified TB cases. The equilibrium point was at t=800, while the assessment period was from year 1900 to 2035.

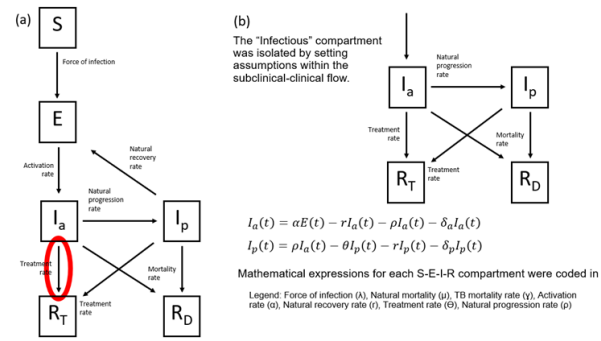

Figure 1. Compartment model of subclinical TB shows the increased flow from I_a to R_t (a). Considering timely management of detected subclinical cases, the infectious compartment was isolated to derive the mathematical formula for each SEIR compartment (b).

Results/Impact: Using the calibrated transmission model, we estimated that TB incidence in 2021-2035 decreases by only 2.1% (651 to 638) while TB mortality drops by 2.7% (165 to 161) if business as usual continues without early detection of subclinical TB. However, if subclinical TB is addressed, the projected TB incidence will significantly decrease by 46.9% (647 to 343) and TB mortality will drastically decline by 86.6% (112 to 15) from 2021 through 2035.

Conclusions: These data suggest that management of subclinical TB would play a significant role in the country's TB elimination goals by 2035. Moreover, this piece of evidence could promote the use of new technologies to detect early stages of TB.

SHORT ORAL ABSTRACT SESSION (OA)

SOA09 Finding the missing children with TB and the care cascade

SOA09-678-15 Impact of integrating TB and orphans and vulnerable children services on TB diagnosis and treatment outcomes in the Rwenzori Region, Uganda

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Background: Orphans and vulnerable children (OVC) are considered at-risk for adverse social, economic, and health outcomes. Data on TB case-finding and treatment among OVC households are limited. We describe impact of integrating community-based TB services with OVC programs in 53 sub-counties of Rwenzori Region, Uganda from October 2022–September 2023.
Design/Methods: We compared TB-related outcomes before and after integration of community-based TB services. Before integration (October 2021–September 2022, baseline), TB screening was passive and clinic-based. During implementation (October 2022-September 2023), trained community-based workers provided comprehensive TB services (screening, specimen collection, referral, diagnostic and treatment follow-up) to OVC beneficiaries (OVC and caregivers).
We compared proportion of beneficiaries screened, diagnosed, and treated for TB before and after program integration using chi-square and Fisher's exact tests.
Results: There were no statistically significant differences in proportion of beneficiaries who were female, HIV-positive, or aged <15 years between baseline (n=17,564) and implementation (n=19,915). While 5,483 (31%) beneficiaries were screened for TB during baseline, a substantially higher proportion (n=19,454; 98%) were screened for TB during implementation (p<0.001).
At baseline, 46 (0.3%) beneficiaries were presumed to have TB, compared to 181 beneficiaries (1%) during implementation (p=0.94). Among those presumed to have TB at baseline, only four (9%) were evaluated, compared to 181 (100%) evaluated during implementation (p<0.001). All four (100%) beneficiaries evaluated at baseline were diagnosed with TB and completed TB treatment, compared to 45 (25%) diagnosed, 43 (96%) completing treatment and two (4%) still on treatment from the implementation period.
Conclusions: TB screening, evaluation and diagnosis increased substantially with OVC program integration and community outreach. Comparing the proportion of clients diagnosed among those evaluated pre- and post-implementation suggests only severe cases were diagnosed at baseline. Leveraging OVC resources can improve TB diagnosis and linkage to care among vulnerable children and their caregivers.

SOA09-679-15 A reduction in the burden of childhood TB: The laboratory perspective to a targeted search for missing cases

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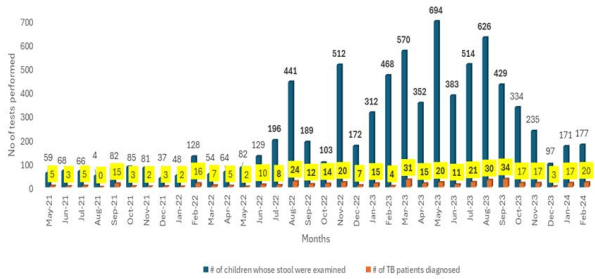
Background and challenges to implementation: TB is an important cause of illness and death in Nigerian children and adolescents. Nigeria notified the highest number of child TB proportion amongst the overall TB notification for 2021 at 6%, far lower than the WHO benchmark of 12 per cent. Huge gaps still exist in estimated childhood TB cases and actual notification. Out of $373 million needed for TB control in Nigeria in 2020, just 31 percent was available to all the implementers of TB control activities in Nigeria (7 percent domestic and 24 percent donor funds) with 69 percent funding gap. The aim of the study is to highlight the importance of funding for paediatric TB.
Intervention or response: Akwa Ibom State was selected for the USAD-funded TB LON 1&2 project Paediatric TB Surge through Jensen and Jensen, based on high TB burden, availability of diagnostic facilities, high TB yield but less than 7% childhood TB and high number of public schools. Trained screeners conducted WHO four symptom screening (W4SS). Stool samples were collected from children aged 14 years and under in the targeted communities, with a repeat visit to collect the samples and transport them to the laboratories for evaluation from those unable to produce samples on the spot. GeneXpert-based stool testing was used for the stool samples collected. The intervention began in July 2022 and continued until September 2023.
Results/Impact: A comparison of 5 quarters of tests performed before funding and five quarters after the funding shows that 1096 tested and 78 positives (7% positivity yield) and 6961 and 266 (4% positivity yield) positives were identified pre- and post-funding. The 188 positive cases identified represent a 241% increase from the previous 5 quarters.



Conclusions: Targeted funding might be essential to finding missing TB cases among children in rural communities. Nigeria can reach its WHO benchmark of 12% through sustainable financing.

SOA09-680-15 Leveraging on World Health Organization's integrated treatment decision algorithms to optimise child TB detection: A multi-states study in Nigeria

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Background: Despite innovative strategies, child TB notification remains low in Nigeria. In 2022, only 35% of the estimated 58,000 children with TB were notified. The study objective was to evaluate the performance, acceptability, feasibility of the 2022 WHO Treatment-Decision Algorithms (TDAs) for pulmonary TB in children and their impact on TB notifications.
Design/Methods: A multi-centre interventional single-arm diagnostic evaluation study recruited children under 10 years with presumptive TB and a sample size of 1,008 (half of it in primary healthcare centres) from November 2023 to March 2024, followed by a two-months follow-up period to ascertain correctness of initial diagnosis. The TDAs are based on clinical criteria and GeneXpert® MTB/RIF/LF-LAM and/or chest X-rays (CXR) where possible. The TDAs were evaluated across 24 facilities (tertiary, secondary and primary levels of care) in 6 states. Regular monitoring and supervisory visits to the research sites by National TB Programme and state-level teams were conducted.
Results: In our interim analysis, based on 733 records with baseline data, the median age was 2.6 years (IQR [1;5.6]), 141/733 (19%) had severe acute malnutrition and 22/733 (3%) were living with HIV. Among the 498/733 (68%) children who had a TB diagnostic test, 17/498 (3%) were positive. Among the 369/733 (50%) participants with a CXR, reports did not show any signs of TB for 175/369 (47%) of them.
Overall, 280/733 (38%) started TB treatment including 9 participants where TDAs' score advised not to, and 39 not starting TB treatment whereas TDAs' score advised otherwise. Questionnaires on acceptability addressed to healthcare providers are currently being administered and TB notification data before and after study implementation are being collected.
Conclusions: The study will end in June 2024, with results on performance, acceptability/feasibility, and impact available soon after. We have already observed that deploying TDAs at all health system levels enhances routine TB screening.

SOA09-681-15 TB preventive treatment for children: Opportunities arising from latest WHO recommendations and dosing updates

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Background and challenges to implementation: Providing treatment for TB infection to prevent TB disease is a critical component of Pillar 1 of the WHO End TB Strategy. Young children are particularly at risk of progressing from infection to disease. The availability of shorter, more child-friendly TB preventive treatment (TPT) regimens for both drug-susceptible (DS-) and multidrug- and rifampicin-resistant (MDR/RR-TB), alongside the availability of child-friendly formulations of relevant TB medicines, can increase TPT uptake in this at-risk population.
Intervention or response: In 2023, WHO convened a guideline development group on TPT where updates to relevant WHO recommendations were discussed. In early 2024, the technical advisory group (TAG) on dosing of TB medicines discussed dosing guidance updates for TPT regimens for children. In 2023, WHO also convened a paediatric drug optimization (PADO) meeting for TB, where priority formulations for development for relevant TPT regimens for children were discussed.
Results/Impact: A regimen of six months of levofloxacin is now strongly recommended for people exposed to MDR/RR-TB of all ages. Dosing guidance is provided with both child-friendly and adult formulations, accounting for different bioavailability of the two formulations. Dosing for the three-month regimen of weekly isoniazid

and rifapentine (3HP) is now provided for people of all ages, including for young children. This is possible thanks to the availability of a child-friendly formulation of rifapentine, which was developed following a PADO-TB meeting in 2020.
While a child friendly fixed-dose combination of isoniazid and rifapentine would further enable 3HP implementation, a standalone rifapentine formulation allows for a higher flexibility across weight bands and indications. Weight bands for this dosing guidance were harmonized across regimens to facilitate implementation in the field.
Conclusions: In light of new scientific evidence that has become available related to TPT in children exposed to DS- or DR-TB, WHO has released updates to support increased efforts for TPT uptake in children.

SOA09-682-15 Experiences of children with multi-drug-resistant TB across TB care journey in Cape Town, South Africa

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Background: Approximately 30,000 children < 15 years of age develop multidrug-resistant tuberculosis (MDR-TB) each year. MDR-TB severely impacts the lives of children from diagnosis and through their treatment journey, yet data documenting their experiences are limited. We describe the experiences of children treated for MDR-TB and their caregivers throughout their MDR-TB journey.
Design/Methods: We conducted a series of three in-depth qualitative interviews (48 interviews in total) with 16 children < 15 years of age treated for MDR-TB and their caregivers between 2020 and 2021 in Cape Town, South Africa. We applied a deductive, thematic analysis to case summaries with illustrative examples from interviews.
Results: Children had negative experiences throughout their MDR-TB journey, from (and prior to) diagnosis, through treatment duration, and beyond treatment completion. Before treatment initiation, children experienced delays in acquiring accurate and timely MDR-TB diagnosis; stating lack of symptom recognition and repeated referrals between health facilities, which led caregivers to seek alternative care. Once diagnosed and on treatment, caregivers experienced challenges with administering MDR-TB medication as children resisted taking their medications due to poor palatability and negative side effects. Caregivers physically forced ingestion which caused emotional discomfort for children and caregivers. Some caregivers reported that, beyond the end of treatment, their children experienced extended physical challenges such as shortness of breath.
Additionally, MDR-TB diagnosis and treatment negatively affected family life, as caregivers adjusted household spending toward foods that facilitated ingestion and mitigated medication side effects. Caregivers also juggled between attending to their children's MDR-TB care and other household priorities.
Conclusions: There are multifactorial challenges experienced by children and their caregivers throughout their MDR-TB journey. Research is needed to develop holistic interventions for child-centered psychosocial support to mitigate the significant negative impact of MDR-TB on children and their caregivers.

SOA09-683-15 Incidence of TB in migrant children in Europe: A systematic review and meta-analysis

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Background: Tuberculosis (TB) represents a major cause of morbidity and mortality in children, with 1.3 million children affected and 214,000 deaths in 2022. Notably, 96% of TB deaths occur in children not accessing TB treatment. Migrant children face an elevated risk of TB due to factors like limited access to healthcare, food insecurity, psychosocial stress compromising the immune response, overcrowded living conditions, and TB exposure during migration. There is a continuous flux of migration in Europe, nevertheless, in recent years, there have been numerous migration events, highlighting the increased need to optimize TB care for this population.

Design/Methods: We searched MEDLINE, OVID, SCOPUS, and the grey literature for studies published before Oct 2023. We included articles evaluating migrant children (0-18 years) for *M.tb* infection (previously known as latent TB infection) or TB, in the European Union / European Economic Area (EU/EEA). The tests used for *M.tb* infection diagnosis were the tuberculin skin test and interferon gamma release assay. The tests used for TB diagnosis were culture, smear, and GeneXpert.
Data extraction and quality assessment were independently performed by two reviewers for each manuscript. We conducted a random-effects meta-analysis to identify pooled incidence estimates for both *M.tb* infection and TB.
Results: Among the 19 articles reporting infection with *M.tb* in migrant children, we found a pooled estimate of 11.1% (95%CI [8.2%-14.4%]). Among the 12 articles reporting on TB in migrant children, we found a pooled incidence estimate of 0.9% (95%CI [0.7%-1.2%]). Heterogeneity was high in the included articles for both pooled estimates.
Conclusions: This systematic review and meta-analysis highlights the significant burden of TB among migrant children in EU/EEA.
There is an urgent need for targeted interventions, policies, and guidelines to mitigate potential morbidity and mortality resulting from *M.tb* infection and TB in this vulnerable population and improve migrant children's overall health outcomes.

SOA09-684-15 Diagnostic capacity for childhood TB before the introduction of treatment decision algorithms at decentralised levels of healthcare in Zambia

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Background: Treatment decision algorithms (TDA) are conditionally recommended by WHO for childhood TB diagnosis pending additional implementation and diagnostic accuracy evidence. Understanding current childhood TB diagnostic capacity at decentralized levels of healthcare is key to document the added value of TDAs and prepare implementation.
Design/Methods: Within the Decide-TB project we conducted a cross-sectional mixed methods assessment in two districts of Copperbelt province, Zambia, each including one hospital and six primary health clinics (PHC) selected based on high <15-year-old outpatient department (OPD) attendance, low childhood TB notification, presence of ≥1 nurse/clinician at PHC, reported availability of Chest x-ray (CXR) machine at a hospital.
A self-administered structured questionnaire assessed Health Care Workers' (HCWs) knowledge, attitudes and practices on childhood TB. Semi-structured observations in each facility described equipment, services provided and patient flow related to childhood TB diagnosis.
Results: Of the 563 participating HCWs, 95% knew that TB is caused by Mycobacterium Tuberculosis, however only 25% knew that children with HIV and severe acute malnutrition are at risk of severe TB. Most HCW (80%) believed that TB screening should be conducted at all facility entry points for children <15 years; 73% believed they were skilled to diagnose TB.
Samples collected for TB examinations were mainly expectorated sputum (87% of facilities), urine (93%) and stool (100%). Each district had a hospital with a functional CXR machine; 60% of the facilities did not conduct microbiological testing onsite; turnaround time for samples sent to the lab was 2-4 weeks.
Few HCWs (<20%) reported having initiated a child on TB treatment in the past 3 months and most treatment decisions (80%) relied on laboratory confirmation.
Conclusions: Before introducing TDAs at decentralized levels of care in Zambia, childhood TB diagnostic capacity may be strengthened through including comprehensive capacity building, adaptations of patient flows, empowerment through clinical mentoring and support supervision.

SOA09-685-15 Innovative, child-friendly solutions for paediatric TB care provision to children and their families affected by TB

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Background and challenges to implementation: Research conducted in 2022 by the Charitable Organization (CO) "TBPeopleUkraine" on the needs of children with TB identified psychological and educational challenges during treatment. These challenges included lack of clear, user-friendly information about TB for children and their parents leading to increased stigma; limited remote edu-

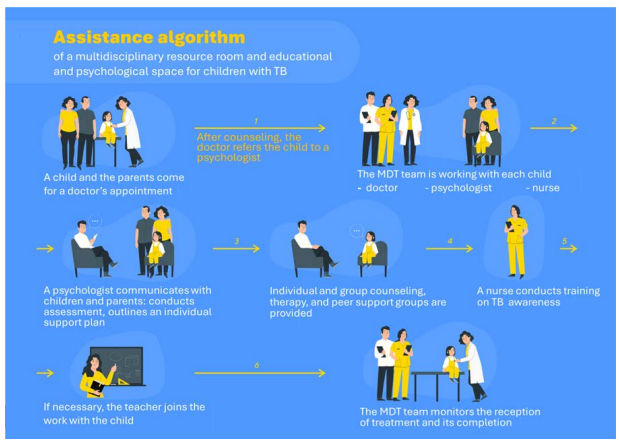
cation options due to war; and general lack of TB awareness. A child's TB diagnosis and treatment creates stress for parents, which can lead to distrust toward doctors and treatment refusal.

Additionally, provision of psychological and other specialized support services provided by healthcare workers was limited.

Intervention or response: Based on these findings, in 2023 STBCEU and CO "TBPeopleUkraine" established multidisciplinary resource rooms in the TB facilities of Kirovohradska and Odeska oblasts. The rooms provided educational and psychological support to children and adolescents undergoing inpatient or outpatient TB/latent TB infection (LTBI) treatment, as well as to their parents. The project developed an operational algorithm, equipped the rooms, hired and trained staff, and established multidisciplinary teams (MDTs) that included skilled psychologists.

Individualized plans for each child/family were developed, incorporating both individual and group psychological counseling, education about TB, help with homework, and distance schooling for children. At the end of 2023, STBCEU expanded the model to 3 additional oblasts.

Results/Impact: Since June 2023, overall, 453 various psychological services were provided, with 154 children and teenagers receiving psychological counseling and 138 children receiving education about TB. While receiving psychological support through the resource rooms, 38 children successfully finished TB treatment. Additionally, 98 parents received psychological and educational support.



Conclusions: STBCEU's innovative, child-focused spaces addressed existing barriers in pediatric TB treatment to help children and their parents reach TB cure. The resource rooms also provided tools to overcome the accompanying social and psychological pressures associated with TB and facilitated TB treatment adherence both in parents and children.

SOA10 Novel diagnostic methods

SOA10-686-15 Democratising M. tuberculosis complex whole genome sequencing: A systematic comparison of automated, user-friendly analysis pipelines with potential for implementation in low-resource settings

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Background: The bioinformatics expertise required to implement *Mycobacterium tuberculosis* complex (MTBC) whole genome sequencing (WGS) widely is least available in low-resource, high-burden settings. The emergence of automated, user-friendly analysis pipelines potentially removes this barrier. We reviewed MTBC WGS analysis pipelines and compared how they classify lineage, predict resistance, estimate relatedness, and reconstruct phylogeny.

Design/Methods: Pipelines were identified through expert consultation and systematic searches of PubMed and GitHub. Included pipelines were publicly available, free to use, could be executed on personal computers, accessed using web portals or limited command-line use and utilised raw fastq files as inputs. We used a test-set of 100 MTBC isolates, enriched for drug-resistance, to evaluate false negative (FNR) and false positive (FPR) rates for resistance prediction for each pipeline, for 13 antitubercular drugs. Lineage classification, relatedness and phylogeny were compared between pipelines.

Results: Eight pipelines fulfilling the eligibility criteria were identified. Lineage classification was consistent for main lineages but varied for sub-lineages. Across all drugs and pipelines, the percentage of isolates classified as 'resistant' or 'susceptible', rather than 'unclassified' or 'failed', ranged from 87%-100%. All pipelines demonstrated FNR ≤5% and ≤11% and FPR ≤ 4% and ≤7% for first first-line drugs and fluoroquinolones respectively. Performance was poorer for linezolid and bedaquiline. Four pipelines reported relatedness, with similarity in the proportion of isolates clustered at 5 and 12 SNP thresholds, though the number of clusters varied. Phylogenetic reconstructions differed across 5 pipelines.

Conclusions: Several user-friendly MTBC WGS analysis pipelines are currently available, with unique strengths and weaknesses. All pipelines predicted resistance to first-line drugs and fluoroquinolones with high accuracy. Discrepancies in resistance prediction may reflect differences in genome assembly, mutation catalogues or phenotypic error. Discordance in lineage classification, relatedness and phylogeny are challenging to adjudicate without reference standards, suggesting a need for consensus and standardisation in these domains.

SOA10-687-15 Deploying host transcriptional markers for diagnosis of TB

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Background: The need to accurately diagnose and manage tuberculosis (TB) cannot be more emphasized. We evaluated a panel of human transcriptomic markers for ability to diagnose Latent TB Infection (LTBI) and active TB (ATB) disease distinguishing them from healthy controls (HC) and other respiratory disease (ORDs) participants respectively.
Design/Methods: Cases presenting with TB-like symptoms were enrolled at healthcare facilities in Blantyre, Malawi. ATB disease was confirmed by sputum MGIT culture, and sputum bacterial load was measured using TB-Molecular Bacterial Load Assay (TB-MBLA).
Household contacts of the ATB confirmed index cases and HIV negative healthy controls (HC) were tested for LTBI using QuantiFERON-TB Gold Plus Interferon gamma release assay (IGRA). Host gene expression in whole blood was quantified using reverse transcriptase quantitative polymerase chain reaction (RT-qPCR) assay. Spearman's rho correlation and logistic regression modelling were used to assess the association between the variables.
Results: A total of 243 participants-143 presumptive cases with TB-like symptoms, 49 TB-exposed (TBExp) household-contacts and 51 HC were included in the evaluation. ATB was confirmed in 43% (61/143) presumptive cases and 57% (82/143) were ORDs. Host genes: *GBP5, DUSP3, CD64, BATF2, GBP6, C1QB, GAS6, KLF2, NEMF, ASUN*, and *DHX29* expression was significantly higher among ATB- than ORDs- and LTBI- participants. *CD64* achieved the highest accuracy for distinguishing ATB from ORDs with 96.5% AUC, 90.2% sensitivity and 95.1% specificity. Assay diagnostic performances weren't affected by either HIV co-infection or presence of LTBI among ORDs participants. 51% (25/49) TBExp individuals tested positive by IGRA, and were denoted as LTBI individuals, and 73% (37/59) HC were IGRA-negative. Gene expression was suppressed among LTBI cases compared to HC. *ZNF296* and *KLF2* performed best in distinguishing people with LTBI from HC.
Conclusions: The results demonstrate the potential of host gene expression as biomarkers for early and accurate diagnosis of latent- and active-TB.

SOA10-688-15 Detection of M. tuberculosis from exhaled bio-aerosol particles of people with pulmonary TB: A proof-of-concept study

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Background: Detection of *Mycobacterium tuberculosis* (MTB) in bioaerosol derived from active pulmonary tuberculosis (TB) patients has a potential to be an alternative diagnostic for presumed TB patients who cannot expectorate sputum. However, few diagnostic studies related to MTB bioaerosol detection have been performed. In this proof of concept study, we assessed the efficacy of the bio-aerosol particle collection method to capture MTB using a face mask fitted with non-woven filter for the diagnosis of TB.
Design/Methods: A mask-like filter holder (3D mask) with water-soluble gelatin filter (GF) and polypropylene filter (PPF) was prepared separately. The bacteriologically confirmed active TB patients wore the 3D mask with GF or PPF within three days after anti-TB treatment.
Those GF and PPF filters were collected after two and eight hours, respectively. DNA was extracted from these filter samples and subsequently tested by TB-LAMP (Eiken).
Results: Filter samples were collected from 57 and 20 patients with and without active pulmonary TB, respectively. The GF and PPF sensitivity was 76.2% (95% Confidence Interval (CI), 60.5–87.9) and 83.3% (95% CI, 68.6–93.0), respectively. The specificity of both methods was 100% (95% CI, 83.2–100). In the sputum smear-positive TB patients, the GF and PPF sensitivity was 90.9% (95% CI, 70.8–98.9) and 88.9% (95% CI 65.3–98.6), respectively.
Over 50% of patients diagnosed with non-sputum samples, including suction phlegm, gastric lavage, and bronchial lavage fluid, were positive for both filter samples (GF: 55.6%, 95% CI 21.2–86.3, PPF: 50.0%, 95% CI 18.7–81.3).
Conclusions: The 3D mask filter sampling method for exhaled bioaerosol particles containing MTB bacilli will be useful for the diagnosing TB. This approach could be an alternative non-invasive diagnostic tool for the presumed TB patients without appropriate sputum specimen.

SOA10-689-15 Evaluation of Truenat isoniazid and fluoroquinolone drug resistance assays in people with rifampicin-resistant TB: A prospective diagnostic accuracy study in Georgia

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Background: Rapid molecular drug-susceptibility tests (DST) are critical to close the diagnostic gap in care for people with drug-resistant tuberculosis (TB). Isoniazid (INH) and Fluoroquinolone (FQ) resistance is of high priority, and the World Health Organization (WHO) target product profiles (TPP) recommend a minimum sensitivity of 90% and specificity of 98% compared to phenotypic DST (pDST).
Design/Methods: This prospective diagnostic accuracy study evaluates the Truenat MTB-INH and MTB-FQ prototype assays (Bigtec Private Limited/Molbio Diagnostics, India) for detecting resistance to INH and FQ in patients with confirmed rifampicin-resistant TB in Georgia using pDST for INH and moxifloxacin or levofloxacin as primary reference standard. Invalid and indeterminate index test results underwent single repetition.
Results: The accuracy analyses for INH and FQ resistance detection included 100 (86.2%) and 103 (88.8%) of the 116 participants who were enrolled in the study between June 2022 - January 2024 and had valid index test and pDST results.
The MTB-INH assay exhibited 100% sensitivity (97/97, 95% CI 96.3-100.0) and 100% specificity (3/3, 95% CI 29.2-100.0). The MTB-FQ assay showed 82.5% sensitivity (33/40, 95% CI 67.2-92.7) and 98.4% specificity (62/63, 95% CI 91.5-100.0).
Repeat testing was required for 22.4% (n=26, 95% CI 15.2-31.1) and 14.7 % (n=17, 95% CI 8.8-22.4) of samples on the MTB-INH and MTB-FQ assays respectively. 86.4% (19/22) of final indeterminate results were on samples with Xpert MTB Ultra very low/low semi-quantitative grade.

	Isoniazid (0.1mg/L) (N=100)	Fluoroquinolones (LFX 1.0 mg/L, MFX 0.25mg/L) (N=103)	Moxifloxacin (1.0mg/L) (N=103)
Resistance prevalence (%) (95%CI)	97.0% (91.5-99.4)	38.8% (29.4-48.9)	24.3% (16.4-33.7)
Sensitivity (%) (95%CI)	100.0% (96.3-100.0)	82.5% (67.2-92.7)	84.0% (63.9-95.5)
Specificity (%) (95%CI)	100.0% (29.2-100.0)	98.4% (91.5-100.0)	83.3% (73.2-90.8)
TP	97	33	21
FP	0	1	13
FN	0	7	4
TN	3	62	65
PPV (%) (95%CI)	100.0% (96.3-100.0)	97.1% (84.7-99.9)	61.8% (43.6-77.8)
NPV (%) (95%CI)	100.0% (29.2-100.0)	89.9% (80.2-95.8)	94.2% (85.8-98.4)

Table 1. Diagnostic Accuracy of Molbio Truenat MTB-INH and MTB-FQ assays compared with pDST.

Conclusions: The MTB-INH assay met the WHO's TPP targets for INH resistance detection, demonstrating high sensitivity and specificity. In contrast, MTB-FQ, exhibited lower sensitivity, albeit high specificity, as compared to published sensitivity data on Xpert MTB/XDR (82.5% [67.2-92.7] vs. 94.0% [95% CI 90.0-96.0]) and did not meet TPP sensitivity targets. Most indeterminate results were observed in paucibacillary samples, suggesting the need for lowering the limit of detection to improve clinical sensitivity.

SOA10-690-15 A rapid, low-cost lab-in-tube assay for diagnosing TB from respiratory samples to blood

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Background: Rapid portable assays to diagnose tuberculosis (TB) are needed to improve diagnosis and treatment and reduce transmission, but current tests are not suitable for patients in resource-limited settings with high TB burden.
Design/Methods: We report a low complexity, lab-in-tube system read by an integrated, handheld device that detects *Mycobacterium tuberculosis* (*Mtb*) DNA in blood and respiratory samples from a variety of clinical settings. This microprocessor-controlled device employs an LCD

user interface to control assay performance, automate assay analysis, and provide results in a simple readout. This point-of-care single-tube assay has single-nucleotide specificity and utilizes reagents lyophilized onto low-cost cellulose discs and DNA enrichment membranes to enhance assay sensitivity, without conventional DNA isolation procedures.

Results: Our results indicate that this approach can detect adult and pediatric TB, including PTB and EPTB cases, with high sensitivity and specificity when using serum, saliva or sputum as the diagnostic specimen, suggesting this approach has strong potential as a POC test for TB diagnosis in resource limited settings underserved by current methods. In a pediatric serum cohort from the Dominican Republic, our assay detected pulmonary and extrapulmonary tuberculosis with high sensitivity versus culture and GeneXpert MTB/RIF results (81% vs. 55% and 68%) and good specificity (94%) and were highly predictive of clinical response to treatment. Assay results were available within one hour using noninvasive patient saliva (73% sensitivity, 100% specificity) and sputum (100% sensitivity, 90% specificity) using a DNA isolation-free, one-step sample processing method.

Conclusions: Our results indicate that a user-friendly POC TB diagnostic assay system can analyze serum, saliva, and sputum samples for robust diagnosis of PTB and EPTB in non-clinical settings. Assay performance met WHO target product profile criteria for new nonsputum tuberculosis diagnostics.

SOA10-691-15 Nanopore sequencing for TB in Kyrgyzstan: A validation study

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Background: Genome sequencing has been used mainly in large institutes, but recent innovations, such as the portable and low-cost MinION sequencers (Oxford Nanopore Technologies, ONT), enable sequencing close to point-of-care. ONT recently developed a targeted next generation sequencing (tNGS) assay for the detection of (drug resistant, DR) tuberculosis (TB). We aimed to assess the performance of this assay in the hands of trained laboratory staff in Kyrgyzstan, where nanopore sequencing had just been introduced.

Design/Methods: We subjected a random selection of 82 smear-positive sputum samples to sequencing. Sixty samples were from an archived collection, 22 were clinical samples collected in 2024. DNA was extracted using the GenoLyse kit (Hain Lifescience), followed by ethanol precipitation. Nanopore sequencing was done using the early-access ONT tNGS TB assay on a MinION sequencer using the OND-CUST-KIT amplification kit, the SQK-RBK110.96 rapid barcoding kit, and the wf-tb-amr (v2.0.0-alpha.3) EPI2ME analysis workflow. Results were compared with those obtained previously using the Deeplex Myc-TB amplification kit (GenoScreen) and sequencing on a MiSeq platform (Illumina).

Results: Out of 82 samples, six had indeterminate results for some anti-TB drugs on the ONT tNGS assay and were excluded from the analysis. All high confidence-graded mutations associated with resistance to the main drugs were concordant between the two tNGS assays for 56 samples. Twenty samples showed discordance with different levels of frequency of sequence variants.

Among 76 samples, the concordance was 100% for isoniazid, rifampicin, amikacin, and kanamycin; 98.6% for fluoroquinolones, capreomycin, and linezolid, 96.0% for bedaquiline, clofazimine, ethambutol and streptomycin; 93.4% for pyrazinamide, and 92.1% for ethionamide.

Conclusions: While data collection is still ongoing, we found high concordance between the ONT and GenoScreen tNGS assays for high-confidence-graded mutations. Our findings support WHO's recommendation to use the assays for the detection of DR-TB.

SOA10-692-15 Differences in distributions of antimicrobial susceptibility of M. tuberculosis by geographical groups and resistance class

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Background: The global challenge of tuberculosis (TB) is exacerbated by multidrug-resistant TB (MDR/RR-TB), with multifactorial differences in TB prevention and care between countries. The impact of local differences in drug-resistance selection pressure can potentially be observed by analysing distributions of minimum inhibitory concentrations (MICs), unveiling insights into transmission patterns and resistance evolution.

Using the Bedaquiline-Drug-Resistance-Emergence-Assessment-in-MDR-TB (DREAM) database (Kaniga et al. 2022, JCM), we analysed MICs tested to a standard protocol across ten countries to explore geographical influences on the evolution of bacterial resistance.

Design/Methods: We adapted methods from an award-winning study of surveillance data, cleaned 66,107 MIC values from 5,509 MDR/RR-TB isolates, and generated cumulative plots of the number of isolates per MIC value. Cumulative plots enabled comparison between groups (WHO regions, continents, countries, resistance classes), and the distribution spread was quantified using an index

summarising the maximum difference across groups per MIC value. Global and country-level data for MDR-TB for five countries (South Africa, Pakistan, Thailand, Lithuania, USA) were collected from the WHO, with lineage information, to compare with the MIC plots generated to explore reasons for variance observed.

Results: We observed clear MIC distribution differences for all groups, and the index revealed that bedaquiline and clofazimine had the biggest range in MIC distributions when stratified by country, followed by fluoroquinolones (moxifloxacin, levofloxacin, ofloxacin).

Among the five countries examined, Pakistan and South Africa showed high proportions of isolates with elevated MIC values for bedaquiline, consistent with WHO data indicating a higher percentage of MDR/RR patients receiving bedaquiline-containing regimens in these nations from 2017-2021.

Conclusions: Our research shows clear variations in MIC distributions across different countries and resistance classes and provides evidence of distinct resistance dynamics per country, with an exploration of country-level mechanisms. This adds to an expanding body of evidence on country differences in MDR-TB and supports further country-specific policy development.

SOA10-693-15 Multi-platform approaches to identify blood-based host protein diagnostic signatures for paediatric TB

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Background: Every year one million children are estimated to develop tuberculosis (TB) disease and nearly a quarter of a million children die from TB, almost all undiagnosed and under 5 years of age. This represents one of the top ten global causes of under-five mortality and highlights the urgent need for improved TB diagnostics in children. A non-sputum-based, host-derived protein test could revolutionize TB diagnosis and anti-tubercular treatment management and substantially reduce this burden.

Design/Methods: To identify blood-based host protein diagnostic signatures we analysed serum from 544 children recruited for suspected TB in South Africa, Malawi, and Kenya with and without HIV infection.

The levels of 55 proteins, identified from pilot experiments and/ or the literature, were measured by Luminex analysis. Proteomic profiling was performed in a subset of cases from the same cohort using the high-plex SomaScan 1.3K assay.

Logistic regression models were used identify sparce protein signatures that could accurately discriminate TB from unlikely TB cases. The protein signature was further validated in an independent cohort.

Results: Proteins found to be significantly differentially abundant from both datasets were combined and patients were randomly assigned to training (80%) and test (20%) sets. Logistic regression variable selection identified a four-protein signature with a combined AUC of 87.7% (95% CI: 82.9%-91.2%), irrespective of HIV status. The signature was evaluated by site and found to perform best in the Kenyan (95.4%) and South African (86.8%) cohort when compared to Malawi (83.2%). When the four-protein signature was further validated in an independent cohort of 592 children recruited from the same countries the combined AUC was 90.6% (95% CI: 86.6%-94.6%).

Conclusions: Host-based proteins biomarkers of TB infection are useful for diagnostic development. We have identified a new four-protein blood-based signature for pediatric TB, irrespective of HIV infection.

SOA10-694-15 Individualised whole-genome-sequencing-guided treatment for drug-resistant TB

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Background: The global burden of drug-resistant tuberculosis (DR-TB) remains a significant public health challenge. We assessed whether individualized treatment approaches using comprehensive resistance profiling by whole-genome sequencing (WGS) may allow for improved culture-negative survival at 6 months post-treatment initiation.

Design/Methods: We conducted a randomized controlled trial to compare the impact of WGS-guided treatment to a standard of care TB regimen (based on current national DR-TB guidelines) in adult participants with rifampicin-resistant TB, irrespective of HIV status. Patients were followed-up monthly for 6 months, then every two-months for 6 months after treatment completion.

Results: We enrolled 205 participants between May 2017 and December 2022: 103 (50%) in the control arm and 102 (50%) in the intervention arm. The median age of participants was 35 years, 84 (41%) were female, and 145 (71%) were living with HIV infection, 127 (62%) of whom were receiving ART at the time of TB diagnosis. Culture-negative survival at 6 months post-treatment initiation occurred in 93 (91%) [95%CI: 83%,96%] of participants

in the WGS arm and 95 (92%) [95%CI: 85%,96%)] in the SOC arm (p=0.8). The median time to a WGS-guided regimen was 74 (IQR: 60,107) days, and 66/100 (66%) participants required a WGS-informed change in their regimen. Of these, 40/66 (60%) had at least one drug added to their regimen, and 20/66 (40%) had at least one drug discontinued. In a subgroup of 14 (17%) participants who received a WGS-guided regimen within 8 weeks of treatment initiation, 14 (100%) participants achieved culture-negative survival at 6 months post-treatment initiation.

Conclusions: Whole genomic sequencing did not improve rates of culture-negative survival at 6 months post-treatment initiation. The relatively long time to a culture-based WGS result may have limited this strategy's impact. Further research is required to assess the potential benefit of a timeously implemented direct sputum sequencing strategy to guide treatment.

SOA10-695-15 Unlocking latent TB: Investigating molecular and immunological biomarkers for diagnosis

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Background: A quarter of the world's population is estimated to play host to *Mycobacterium tuberculosis* (Mtb) in the form of Latent TB infection (LTBI) without any clinical manifestation of active disease. The diagnosis of LTBI can be performed using either the Tuberculin skin test (TST) or IFN-γ release assay (IGRA), which are either subjective or expensive.

The objective of the present study was to identify transcriptomic and circulating small non-coding RNAs (sncRNAs) based biomarkers and their correlation with immunological markers for diagnosis of LTBI cohort.

Design/Methods: Around 80 household contacts (HHCs) of bacteriologically confirmed active pulmonary TB cases (drug-sensitive and drug-resistant) were recruited for the study. Whole blood and sera samples were collected from the subjects. Chest X-ray (CXR)/GeneXpert was used to rule out active TB in the HHCs. The HHCs were screened using QuantiFERON-TB Gold Plus (QFT-Plus) to perform IGRA and categorize LTBI and uninfected cohorts. Total RNA extracted from whole blood was used to quantitate expression levels of six genes known to be associated with LTBI. For each individual, small RNA libraries were prepared using sera samples. These libraries were sequenced using Illumina HiSeq and differentially expressed miRNAs were identified using DeSeq analysis [fold change (≥/≤2) and p-value (<0.05)].

Results: *FCGR1B*, *GBP1* and *GBP5* transcripts differentiated LTBI from uninfected among HHCs using the Livak method. ML and ROC (Receiver Operator Characteristic) analysis validated this transcript signature to have a specificity of 72.7%. DeSeq analysis identified a set of five miRNAs, which distinguish LTBI cases from uninfected among the HHCs.

Conclusions: In this study, we assessed the potential of a quantitative transcript signature and circulating sncRNAs to diagnose LTBI among HHCs of a high-TB burden population. The study identified a transcript and sncRNA signature that can be used as a biomarker for rapid screening of large populations.

PRINTED POSTER SESSION (PP)

PP27 Spectrum of lung health across the life course

PP27-1043-15 Pulmonary function test of paediatric patients diagnosed with COVID-19 infection: A meta-analysis

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Background: COVID-19 infection has affected the pediatric population but the severity of lung injury is still inconclusive. This study aimed to determine the pulmonary function of pediatric patients with a history of COVID-19.
Design/Methods: This was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.
This study included all published studies reported that evaluated pulmonary function in pediatric patients after COVID-19 infection. Fixed effects meta-analysis was used to pool reported mean values for pulmonary function test findings.
Results: Seven cohort studies were included in the systematic review and six were pooled in the meta-analysis. Sample size ranged from 16 to 589 patients (total of 841 patients). Median age ranged between 6.8 to 15.8 years old. Majority have asymptomatic to moderate infection, with only one study reporting severe infection with pneumonia.
Pulmonary function tests were taken 4 weeks to 6 months (average of 3 months) post-discharge, showing normal oxygen saturations and diffusing capacity of the lungs for carbon monoxide (DLCO).
Pooled spirometry results showed: FEV1% is equal to 101.5% (92.0% to 111.0%), FVC% is equal to 100.9% (91.3 to 110.5%), FEV1/FVC ratio is equal to 93.7% (85.7% to 101.8%). All studies are homogenous (I2=0%).
Conclusions: Pulmonary function assessed using spirometry, oxygen saturations, and DLCO remains normal three months after COVID-19 infection. Further studies are recommended to determine if lung function during early stage of infection predicts significant lung injury caused by COVID-19.

PP27-1042-15 Impact of SARS-CoV-2 viral load on restrictive spirometry patterns in mild COVID-19 recovered middle-aged individuals: A six month prospective study

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Background and challenges to implementation: Long term respiratory complications of COVID-19 is a subject of great concern, specially in middle aged individuals. Many studies have reported altered respiratory patterns in COVID-19 recovered individuals and most of them were from severe to critically ill.
This study was aimed to see the impact of SARS-CoV-2 viral load during mild COVID-19 disease on pulmonary functions of middle-aged population after 6-8 months post recovery.
Intervention or response: This follow up study included 300 (100 healthy control and 200 COVID-19 recovered) individuals between age 30-60 of either gender. Mild-moderate COVID-19 individuals were recruited between a period of 6-8 months after COVID-19 infection. Spirometry was performed with MIR-Spirolab-III and its association was compared with SARS-CoV-2 viral loads during time of active infection.
Results/Impact: The mean age of the participants was 43 years with 60% male and 40% female. We observed ~70% of the participants were experiencing complications including shortness of breath (12%), body aches (13%), recurrent cough (10%), recurrent respiratory infections (9%) and fatigue (33%).
In our study, 66/200 (33.3%) of COVID-19 recovered individuals were having restrictive spirometry patterns while 4 (2%) had obstructive pattern (p=<0.001). viral load <20 CT value was associated with severity of disease (p= 0.031) and restrictive respiratory patterns in spirometry (p<0.001).
Conclusions: Long term impact of mild-moderate COVID-19 leads to high frequency of restrictive respiratory patterns with more prominent in male patients. There was a strong association observed with viral loads. It might be a major cause of post COVID-19 respiratory complications.

PP27-1050-15 Effectiveness evaluation of the group intervention to improve health and well-being of people after COVID-19 in South Africa

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Background: Most COVID-19 patients recover completely, but some continue to suffer symptoms months after the acute infection, impacting their daily activities and quality of life.
This study aimed at evaluating the effectiveness of the context-specific group intervention for patients with post-COVID-19 symptoms in Johannesburg, South Africa.
Design/Methods: We designed and piloted an 8-week support and rehabilitation group program (CoPilot) between July-December 2023. Pre- and post-intervention evaluation was done by questionnaires on post-COVID-19 symptoms, quality of life using EQ-5D-5L, short Warwick-Edinburgh Mental Wellbeing Scale, Fatigue Severity Scale, Epworth Sleepiness Scale (ESS), and functional capacity by one-minute sit-to-stand test and lung function test by spirometry.
Results: A total of 68 participants were enrolled and divided into seven groups. Median age was 39 years (IQR: 31-48) and the majority (72%) were female. Half of the participants were employed and 71% were single or divorced.
Mean duration of post-COVID-19 symptoms was 25.5-months, 12% of participants reporting hospitalization due to COVID-19. Quality of life (8.9 vs 6.4) and mental well-being scores (26.7 vs 32.1) improved significantly after the intervention.
Mean number of post-COVID-19 symptoms decreased from 11.4 to 5.4. Participants also reported a significant improvement in severity of fatigue symptoms (33 vs 20) and sleepiness scores (19.8 vs 7.9).
Functional capacity significantly improved (number of sit-to-stand 19.90 vs 22.25), however there was no significant difference on spirometry pre- and post-intervention.
Conclusions: This targeted group rehabilitation intervention for patients affected by post-COVID-19 complications demonstrated potential in improving overall health and well-being.

PP27-1044-15 Grading obstructive lung impairment from unlabeled flow-volume spirometry curves

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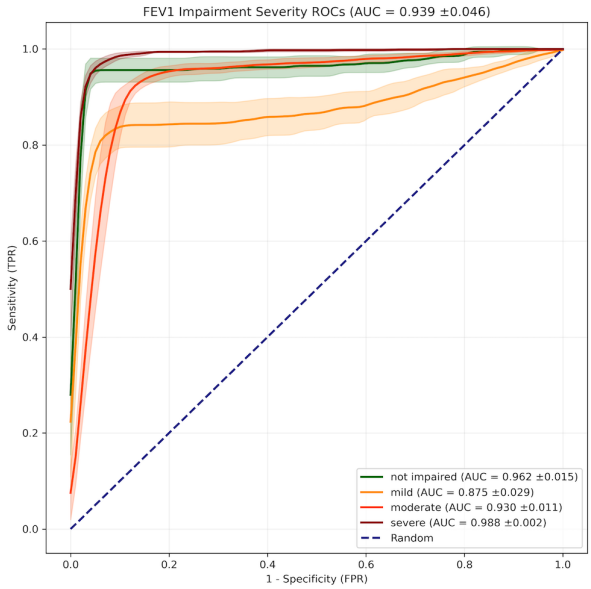
Background: Spirometry, a diagnostic tool for assessing lung function, is challenging to interpret and compare since commonly used guidelines for evaluating acceptability of curves heavily rely on qualitative features. Reported outcomes are thus prone to operator bias and require constant review by highly trained personnel, limiting the applicability of spirometry in low-resource settings where such personnel are scarce.
Despite the challenges, spirometry remains important to quantify lung function recovery in patients with chronic lung diseases, including post-TB lung disease.
Design/Methods: Clinical and spirometry data was collected as part of the TB-Sequel cohort study, following patients recovering from tuberculosis infection in four sub-Saharan countries over five years. The captured impairment severities (34.5% not impaired, 28.8% mild, 29.2% moderate, 7.5% severe) are informed by 5700 spirometry sessions obtained from 1141 patients. Expert-reviewed outcomes as provided by the study per ATS/ERS guidelines were converted to z-scores and used as target labels. We developed a time-series convolutional neural network capable of predicting FEV1 z-scores according to the 2012 GLI 'other' reference standard from raw spirometry session recordings.
Our approach combines information from several flow-volume curves without individual expert labelling across sessions. We augmented these with patient demographics and time to peak expiration flow as an effort proxy.
Results: We trained our network under a 9-fold cross-validation scheme and report performance on a 10% test set withheld from training. The network learned to predict z-scores from raw spirograms with mean squared error of 0.0883 (SD ±0.0068).
Figure 1 shows the AUC for predicting spirometry outcome categories based on conversion of continuous scores into severity likelihoods as reciprocal distances

from the corresponding centroids. The combined area under receiving operator characteristics curve was 0.939 (SD ±0.046).



Conclusions: Our approach accurately classifies lung-function impairment from raw, unlabeled spirometry session recordings, reducing the need for human expert quality control in lung health assessment.

PP27-1045-15 Fractional exhaled nitric oxide (FeNO) levels and adverse outcomes of people with stable post-infectious bronchiectasis in Lung Center of The Philippines

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Background: This study aims to determine FeNO levels among patients with mild, moderate, and severe post infectious bronchiectasis based on Bronchiectasis Radiologically Indexed Computed Tomography Score (BRICS) and to compare FeNO levels with the adverse outcomes of patients.
Design/Methods: The study utilized an analytic cross-sectional design which includes adult patients diagnosed with post infectious bronchiectasis. The population was classified as mild, moderate, and severe according to BRICS. FeNO levels were determined and correlated with the adverse outcomes in terms of exacerbation.
Results: A total of 98 patients with stable post infectious bronchiectasis were included. Variables such as gender, age, history of atopy, smoking status, comorbidities, type of treatment modality, mMRC dyspnea scale, BRICS severity do not appear to be substantial determinants of FeNO levels. A high FeNO levels exhibited a significantly higher mean height than low FeNO levels (p = 0.047). Analysis revealed that high FeNO levels are positively correlated with the number of hospitalizations due to exacerbation. (p= 0.001). Both FeNO levels (p= 0.001) and mMRC scores (p= 0.021) have a significant correlation with the number of hospitalizations due to exacerbations. Furthermore, on subanalysis, a higher mMRC dyspnea scale is positively correlated with severe bronchiectasis based on BRICS severity (p= 0.001).
Conclusions: High FeNO levels among patients with stable post-infectious bronchiectasis predict hospitalization due to exacerbation, and those patients who have frequent hospitalization appear to have poorer functional capacity based on mMRC dyspnea score. Increased mMRC dyspnea score was noted on higher BRICS severity. It can be surmised that the severity of the chronic structural damage in post-infectious bronchiectasis does not translate to greater airway inflammation as measured by FeNO levels. FeNO level is unaffected by patients' gender, age, comorbidities, smoking history, BRICS and treatment modality among patients with stable post infectious bronchiectasis.

PP27-1046-15 Is HIV-1 infection a risk factor for lung cancer initiation and progression in Uganda and Tanzania?

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Background: Due to immunosuppression, the risk of developing malignancies in individuals with Human Immunodeficiency Virus (HIV) increases compared to non–HIV-infected individuals. In 2022, HIV prevalence was 5.8% in Uganda, and (4.8%) in Tanzania. As the number living with HIV infection increases, non-communicable diseases, including cancer are expected to rise accordingly. We aimed to assess the epidemiology of lung cancer in Uganda and Tanzania and clarify the role of HIV-1 infection as a risk factor for lung cancer initiation and progression.
Design/Methods: Individuals ≥ 18 years with biopsy-proven lung cancer were enrolled in the study. Disease free and AIDS-defining malignancies controls matched for age, gender, smoking status and residence were identified for each lung cancer patient enrolled. Chi-square test was used to assess differences in mortality by HIV status.
Results: Within two years, we have screened 268 potential lung cancer cases; 114 (42.5%) have been biopsy-confirmed. The median age (Inter quartile range) was 60 (51 to 67). The majority were females, 69 (60.5%), 21 (28.6%) smokers, and only 8 (7%) were HIV positive. The major-

ity were adenocarcinoma 64 (67.4%) and presented with stage III and stage IV disease in 78 (86.7%). For disease progression, 53 patients were assessed; for those who were HIV-negative, 15 (41.7%) were responding to treatment, 3 (8.4%) were not responding to treatment, and 18 (50%) died. While those who were HIV positive, 1 (14.3%) responded to treatment, and 6 (85.7%) died. The difference in mortality stratified by HIV status was statistically significant (P <0.001).

Conclusions: There was increased in diagnosis of lung cancer cases in Tanzania and Uganda, but only 7% were HIV positive. Majority were females non smokers, and presented at stage III and IV. Prognosis was very poor as majority died, and mortality was higher among lung cancer patients with HIV.

PP27-1048-15 Longitudinal analysis of prevalence and risk factors of cavitary lung disease in people with drug-resistant TB

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Background: Tuberculosis (TB), with cavitary disease on chest radiograph, is associated with increased infectiousness, delayed TB culture conversion, worse treatment outcomes, post-tuberculous lung disease, and diminished long-term quality of life. The impact of advances in diagnostic and therapeutic strategies on the prevalence of cavitation in patients with multidrug-resistant TB (MDR-TB) remains inadequately understood. We evaluated the prevalence, temporal trends, and risk factors of cavitation in people with drug-resistant tuberculosis.

Design/Methods: We performed a retrospective review of the clinical, microbiological, and radiological records of 604 patients with MDR-TB enrolled in 5 clinical studies conducted between 2009-2023 in Durban, South Africa. Prevalence of cavitary disease was estimated and its association with risk factors was calculated using multivariable log binomial regression.

Results: A total of 592 (98%) patients had pre-treatment chest X-rays with recorded cavitation results. The median (interquartile range) of the cohort was 35 (28-42) years, and 49% were female. In total, 307 (52%) patients had cavitary disease, and among those with data on disease distribution (n=471), 180 (38%) and 93 (20%) had unilateral and bilateral cavitary disease respectively. There was no temporal trend observed for cavitary disease from 2009-2023 (p=0.9192). Presence of cavitary disease was positively associated with a positive smear result (adjusted risk ratio [aRR]: 1.30; 95% confidence interval [CI]: 1.11-1.54). Cavitation was less prevalent in PLWH not on ART (aRR: 0.64; 95% CI: 0.42-0.96) and PLWH on ART (aRR: 0.76; 95% CI: 0.64-0.89) compared to HIV-uninfected individuals.

Conclusions: The high prevalence of cavitary disease remains a significant radiographic presentation of DR-TB and is concerning, given the known associations between cavitary TB and heightened infectiousness and the risk of post-TB lung disease.

PP27-1047-15 Cough peak versus spirometry for the early detection of lung impairment in a cohort of people with pulmonary TB in South Africa and Zambia

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Background: Spirometry is essential for the accurate diagnosis of respiratory disease but is often unavailable or underutilized (if available) in primary care settings. We assessed the sensitivity and specificity of cough peak flow (CPF) and physical capacity as screening tools for pulmonary impairment during or after TB treatment.

Design/Methods: We used data from participants (≥15years) recruited between 10/2022-04/2024 in Zambia and South Africa as part of ongoing TB cohorts in IeDEA-SA.

During scheduled visits, trained health workers assessed CPF and physical capacity (6-minute walk test distance / 6MWTD and 1-minute Sit-to-Stand Test repetitions / STSR) and conducted spirometry. Sensitivity and specificity of CPF, physical capacity (6MWD;STSR;distance denaturation index), and dyspnoea score after 6MWT were compared to spirometry.

Results: Out of 472 assessments, 377 (80%) included usable FEV1/FVC pairs and CPF. At treatment initiation, median age was 35.6years (IQR 28.0-44.0), with 71% (n=266) male and 43% (n=160) living with HIV. Two-thirds of assessments were at 8 weeks after treatment initiation, 32% at treatment completion, and 5% at 6-months post-treatment.

Among the assessments, 35% had CPF<240L/min, 49% had 6MWD<400m, 63% had STSR<19.5, and 41/352 (12%) had mBORG≥3. Based on standardised lung function reference values, 30% had obstructive, 26% had restrictive, and 6% had mixed disease (Figure).
CPF was positively correlated with FEV1 (Pearson's r=0.540, p<0.001), FVC (r=0.368, p<0.001), and FEV1/FVC (r=0.149, p=0.004) from spirometry. Sensitivity of CPF and physical scores was low (4-50%), but specificity was higher (37-84%), while the combination of CPF/6MWD/mBORG had a specificity of 84% (95%CI;90-97) to identify abnormal spirometry. Tools performed consistently across visit and impairment types, with some variations noted by country.

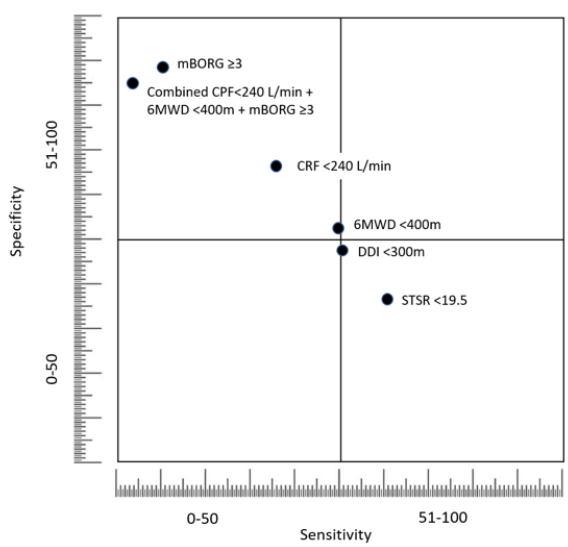

Figure 1. Accuracy of tools to identify abnormal spirometry (FEV1 or FEV1/FVC < <LLN, i.e., the Z-score <−1.64 in patients during and after treatment for pulmonary TB (n=377).
DDI distance denaturation index according to (Lewandowska et al., 2023); 6-minute walk test distance/6MWTD; 1-minute Sit-to-Stand Test repetitions/STSR; CPF cough peak flow; mBORG modified Borg dyspnoea score.

Conclusions: Despite the poor sensitivity to identify abnormal spirometry, CPF, 6WMD and mBORG could be used to screen out people who are unlikely to have lung impairment. Our findings highlight the need for screening tools to identify pulmonary impairment when spirometry is unavailable.

PP27-1049-15 Longitudinal changes in prevalence and risk factors for extensive lung disease in people with drug-resistant TB

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Background: Drug-resistant tuberculosis (DR-TB) remains a major public health threat and a significant cause of mortality and morbidity worldwide. The extent to which significant advances in therapeutic and diagnostic approaches have impacted presentation of extensive lung disease in patients with DR-TB is poorly understood.
We aimed to evaluate the prevalence, temporal trends, and risk factors for extensive lung disease in people with drug-resistant tuberculosis.
Design/Methods: We conducted a retrospective chart review, of adult DR-TB participants previously enrolled across 5 clinical studies conducted between 2009-2023 at the CAPRISA Springfield clinical research site in KwaZulu-Natal, South Africa. Clinical management of DR-TB was based on current South African National Drug Resistant TB guidelines. Prevalence of extensive lung disease at treatment start was estimated in 4-year time intervals. Multivariable log binomial regression was used to measure association between extensive lung disease and time interval, age, gender, TB history, HIV status (positive on treatment, positive no treatment, and negative) and AFB smear result.
Results: In total, 966 DR-TB participants were enrolled, of whom 945 (98%) had baseline chest radiographs. Median (interquartile range) age was 35 (29-43) years, and 51% were female. Overall, prevalence of extensive lung disease was 49.2% (n=465), progressively decreasing from 68.3% in 2009-2012 to 46.2% in 2019-2023. Presence of extensive lung disease was positively associated with previous TB disease (adjusted risk ratio [aRR]: 1.20; 95% confidence interval [CI]: 1.03-1.40) and positive smear (aRR: 1.61; 95% CI: 1.40-1.86). No association between presence of extensive lung disease and HIV status was observed.
Conclusions: There has been a progressive decline in the prevalence of extensive lung disease in this TB/HIV hyperendemic setting. Nonetheless, the ongoing high prevalence (46.2%) of extensive lung involvement is concerning for its potential to necessitate empiric treatment extension, and the associated risk of post-TB lung disease.

PP30 HIV and comorbidities: Undernutrition

PP30-1069-15 The TB-HEART study: Determining the burden and natural history of cardiac pathology among persons with pulmonary TB living with and without HIV in Zambia

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Background: Cardiovascular Diseases (CVD) increasingly contribute to disease burden in sub-Saharan Africa (SSA), where tuberculosis (TB) and HIV prevalence remain high. Recent data suggest that pulmonary tuberculosis (PTB) is associated with increased CVD morbidity, but the prevalence and mechanisms of cardiac disease in PTB remain poorly understood. The TB HEART study aims to a) determine the prevalence and b) describe the natural history of cardiac pathology among participants with and without PTB, stratified by HIV status in Lusaka, Zambia.

Design/Methods: Participants with bacteriologically proven PTB, consecutively recruited from an outpatient setting, undergo detailed clinical and functional assessments including point-of-care and standard two-dimensional (2D) echocardiography, which are repeated at completion of TB treatment. The target sample size is 250 participants with PTB, living with and without HIV, matched to comparator participants on a 2:1 ratio.

Our primary outcome is prevalence of cardiac pathology defined as left ventricular ejection fraction percentage (LVEF(%)) <49% and/or pericardial effusion >2 centimetres in depth. We present data on participants who have undergone baseline 2D-echocardiography.

Results: Since November 1st 2023, we have recruited 83 participants with PTB with a mean age of 34.8±11.2 years of whom 58/83 (69.9%) are male and 22/83 (26.5%) are living with HIV and with a mean LVEF(%) of 61.9 (57.1-67.8).

Among participants with PTB, 10/83 (12.1%) had cardiac pathology (eight with LVEF(%) <49% only, and two with pericardial effusion >2cm only) - baseline characteristics are described in table 1. All comparator participants to date are female and HIV-negative, and none had evidence of cardiac pathology.

	All participants	HIV-positive	HIV-negative
N (%)	83 (100)	22 (26.5)	61 (73.5)
Cardiac pathology (LVEF <49% and/or pericardial effusion >2cm) , N (%)	10 (12.1)	2 (9.1)	8 (9.6)
Semiquantitative MTB Xpert High or Medium, N (%)	5 (50)	0	5 (62.5)
Semiquantitative MTB Xpert Low or Very low, N (%)	5 (50)	2 (100)	3 (37.5)
History of smoking, N (%)	39 (46.9)	8 (36.3)	31 (50.8)
Body Mass Index (mean, SD)	19 (±3.7)	20.1 (±4.9)	18.7 (±3.2)
Heart rate at presentation, in beats/min (mean ±SD)	109 (±17.4)	104 (±18.5)	111 (±16.8)
Systolic blood pressure at presentation, in mmHg (mean ±SD)	105 (±16.7)	107.2 (±16.8)	104.9 (±16.7)
Distance achieved in six-minute walk test, in metres (median ±IQR)	315 (210-420)	270 (165-420)	330 (225-420)

Conclusions: Our preliminary results demonstrate a higher than expected prevalence of cardiac pathology among participants with PTB living with and without HIV, which ranges from 1-7% in autopsy studies and case series. The most commonly encountered cardiac pathology was impaired LVEF followed by pericardial effusion >2cm in depth.

PP30-1072-15 TB yield from TB-diabetes bidirectional activities in twelve primary healthcare centres in the FCT, Nigeria

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Background and challenges to implementation: Tuberculosis and Diabetes (DM) are two diseases of major public health importance in Nigeria. Despite the huge burden of both diseases in the country, 40% (250,000) of estimated incident TB cases were missed in 2022 alone. At a prevalence of 4.3%, over 6 million adult Nigerians aged 20-79 years are diabetic. In the Federal Capital Territory (FCT) TB is endemic, and the burden of DM is high, and increasing. This study describes TB and DM yield during a phased implementation of a TB-Diabetes bidirectional activities in 12 Primary Healthcare Centres (PHCs) in the FCT of Nigeria.

Intervention or response: PHCs were identified and mapped, leveraged PHCs from Nigeria Package of Essential Non-communicable Diseases intervention (N-PEN)

sites in the FCT. Standard operating procedure on the conduct of the TB-Diabetes bidirectional activities in the 12 PHCs was conceptualized, developed and capacity of healthcare providers built on TB-Diabetes activities and how to perform side test for suspected DM patients. Modality for bi-directional patients screening, sample referrals, testing and treatment was instituted. Consumables for free Diabetes testing was provided.

Results/Impact: Within 10weeks, 16,201 OPD attendees were screened for both TB and Diabetes from across the 12 PHCs. 1,169 patients with suspected pre-diabetes or diabetes were identified, of which 143 (12%) patients were confirmed with DM and enrolled on care. 1,204 Presumptives TB cases were identified. 1,187 (99%) Presumptives TB cases were tested with 103 (9%) patients confirmed with TB and started on TB treatment. 36 patients were notified with TB-Diabetes co-morbid conditions and were managed accordingly.

Conclusions: National TB and NCD programmes can scale up intervention such as this to diabetes and nutritional clinics across the country to ensure that the additional TB & DM yield among this vulnerable subpopulation is not missed. Implementation in PHCs can help strengthen the uptake of integrated TB and DM services at PHCs.

PP30-1073-15 Prevalence and factors associated with comorbidity diabetes mellitus and TB in Burundi

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Background and challenges to implementation: Tuberculosis (TB) and Diabetes Mellitus (DM) are major public health challenges globally. People living with TB are at high DM risk and people living with DM are at high TB risk. Screening for DM among people with TB improves outcomes. Similarly, active TB case finding among people with DM improves TB notification rates. WHO recommends screening for DM among people living with TB but Burundi has not implemented this guidance. The prevalence of DM in Burundi is 4.1%. We carried out a survey to investigate the prevalence of DM among people living with TB and characterized factors associated with co-diagnosis in Burundi.

Intervention or response: A cross-sectional survey conducted in 2 Diagnostic TB and Treatment Unity (DTU) in Bujumbura from 1st April to 30th September 2023. Adult patients with all forms of TB not known to have DM were screened for DM using fasting blood glucose. Data were collected using a standardized questionnaire. STATA 15 software was used for analysis. A logistic regression analysis was performed to identify factors associated with DM among persons with TB.

Results/Impact: Among 324 recruited, 78.40 % were men, mean age 35.03, 52.47% from urban areas, 48.77% unmarried, 32.41% with secondary education, 30.56% unemployed. The prevalence of DM was 6.79 % and the prevalence of prediabetes was 9.57%. The associated factors with diabetes identified were: family history of diabetes aOR =33.21 (95%CI: 10.34-106.64), officials aOR =5.51 (95%CI:1.03-29.54), unemployed aOR =4.90 (95%CI: 1.43-16.84), and no tobacco consumption aOR =0.23 (95%CI: 0.07-0.72).

	Comorbidity TB/DM				Comorbidity TB/DM		
Associated factors	aOR	[IC : 95%]	P-value	Associated factors	aOR	[IC : 95%]	P-value
Occupation status				Family history of DM			
Others	1			No	1		
Students	0,80	[0,07 -8,57]	0,85	Yes	33,21	[10,34-106,64]	<0,001
Officials	5,51	[1,03-29,54]	0,04	Tobacco			
unemployed	4,90	[1,43-16,84]	0,01	Yes	1		
				No	0,23	[0,07- 0,72]	0,01

Conclusions: The prevalence of DM among TB patients was higher than the estimated prevalence of diabetes in Burundi among the general population. Family history of DM, occupation and tobacco consumption were significantly associated with DM. Systematic screening for DM among TB patients in DTU may improve TB/DM outcomes in Burundi.

PP30-1076-15 Preliminary results from piloting integrated TB, mental health, and substance use disorder services in Nigeria

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Background and challenges to implementation: Fragmented service delivery hinders coverage and access to care, duplicates efforts, takes up scarce resources, and further weakens the fragile health system in Nigeria. There is programmatic and proof-of-concept evidence that integrating other programs such as HIV and diabetes with TB is feasible and productive in Nigeria. A mental health treatment gap of > 80% and a high burden of depression among TB patients (46%) in Nigeria underscore an urgent need for integrated service delivery (ISD) of TB and mental health (MH).

Thus, the TB REACH wave 10 pilot project by RedAid Nigeria (July 2023-September 2024) aims to expand coverage and access to person-centered, quality comprehensive TB, MH and substance use disorder (SD) care through the ISD model in three states.

Intervention or response: Our interventions include: advocacy visits for stakeholder buy-in; development of integrated HMIS tools; Capacity building using the WHO mhGAP; integrated screening for TB/depression/SD in communities and facilities including psychiatric hospitals; further evaluation for presumptive TB cases and management of confirmed TB cases; provision of basic psychotherapy and brief counseling by lay counselors in the community, and GHCWs/doctors at the facility for identified cases of depression and SD respectively; supportive referral of severe cases of depression and SD; and continuous monitoring and supportive supervision

Results/Impact: From July 2023-February 2024, total of 52,026 persons were screened across project facilities and communities. 9605(18%) presumptive TB cases were identified, of which 8235(86%) were evaluated for TB. 607(7%) TB cases were confirmed and 550(91%) placed on treatment. Persons with depression and SD were 4271 and 2672 respectively of which TB/depression co-morbidity was 248(41%) and TB/SD co-morbidity was 101(17%). 2318 and 1449 were provided with basic psychotherapy and brief counseling respectively

Conclusions: Integrated service delivery of TB/MH/SD, has the potential to mutually contribute to improving case detection and management of TB and other health conditions, MH/SD.

PP30-1074-15 Addressing mental health issues in people with drug-resistant TB: Results of pilot intervention during the war in Ukraine

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Background and challenges to implementation: Evidence shows the prevalence of depression is much higher among patients with TB and this, in turn, may adversely affect patients' adherence to treatment. Situation both for TB prevalence and for depression among general population has worsened with the full-scaled russian invasion.

Intervention or response: In September 2021, Alliance launched the intervention in three regions of Ukraine aimed at properly addressing depression issues in DR-TB patients. Medical professionals or social workers screen all DR-TB patients, using patient health questionnaire (PHQ) 2/9 at the TB treatment beginning. Screening-negative patients repeat testing after 2 months of treatment. All screening-positive patients are referred to psychologist. In case of confirmed depression treatment is administered based on the depression severity: treatment with antidepressants, cognitive-behavioral therapy (CBT) or combined treatment. CBT lasts for 12 weeks with treatment follow-up in 4th and 8th week of the treatment. Therapy with antidepressants lasts for 6 months with treatment follow-up in 4th and 24th week.

Results/Impact: According to programmatic data concerning patients who were screened with PHQ2/9, 499 out of 1389 had depression. Therapy with antidepressants (Escitalopram or Dulixetine) was administered to 15 (3.1%), CBT - to 122 (25.1%) and combined treatment - to 349 (71.8%) patients.

Proportion of patients with depression has decreased after the war start, this phenomenon needs further investigation.

	2021		2022		2023		Total	
Screened with PHQ2/9	201	92.2	595	90.6	593	86.3	1389	88.9
Screening-positive	107		227		194		528	
Depression confirmed	94	46.8	215	36.1	190	32.0	499	35.9
Treatment administered	86		210		190		486	
Treatment completed	69		169	80.5	96	50.5	414	85.3
Patients' condition improved	69	80.2	87	41.4	96	50.5	252	51.9
Died	11		23		20		54	
LTFU	6		18		9		33	
Treatment continuation	0		0		65		65	

As of the beginning of 2024, 414 (85.3%) patients have completed treatment for depression; successful result is registered in all of them.

Conclusions: Proper addressing of mental health problems can improve the status of DR-TB patients and prevent them from TB treatment interruption. Despite the population migration caused by the war this intervention helped retain a large number of DR-TB patients in treatment.
Evidence demonstrated from this project has shaped national-level intervention of mental health service package for TB/DR-TB patients and has been scaled-up to the entire government control territories of Ukraine.

PP30-1077-15 Implementation of bi-directional screening for TB and mental disorders in the TB and mental health programs in Nigeria: Comparative analysis

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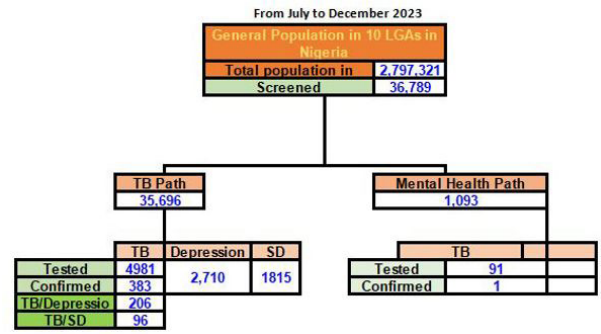
Background and challenges to implementation: Nigeria, one of the 30 high TB burden countries, also grapples with a significant prevalence of mental disorders, including depression and substance use disorders (SD). With 7 million reported cases of depression in 2015, coupled with the rising concern of substance use disorders, there's a pressing need for integrated healthcare solutions. RedAid Nigeria, with funding from the Stop TB Partnership, is currently implementing a pilot project aimed at integrating services for TB, depression, and SD. Project period is July 2023 to September 2024.
Intervention or response: Activities include bi-directional screening, linkage to care, and management using the existing TB program pathways in the community and in health facilities and Mental health pathway in psychiatric hospitals and mental health departments of tertiary facilities. The screening tools include the TB symptoms checklist, the Patient Health Questionnaire-9 (PHQ-9), and the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST). Patients are managed by health workers and lay counsellors. Data on screening, referral, and management are meticulously collected using registers and electronic platforms.
Results/Impact: Out of 36,789 individuals screened, 35,696 underwent screening for TB, depression, and SD within the TB pathway to yield 383 TB, 2710 depression, and 1815 SD cases. 54% of the TB cases were depressed, while 25% had SD. Conversely, screening 1,093 mental health patients in the mental health pathway identified 91 presumptive TB cases and 1 confirmed TB case.



Conclusions: These preliminary findings underscore the critical importance of integrating mental health services into TB programs, given the high prevalence of depression and SD among TB patients.
However, the relatively lower yield of TB cases in mental health settings suggests that TB screening may not be as crucial in these contexts compared to populations with higher TB risk.
These findings provide valuable insights for addressing the intertwined challenges of TB and mental health in Nigeria's healthcare landscape.

PP30-1070-15 Integrated model for TB active case finding in India: Opportunistic screening for BMI as a nutritional-screening biomarker and its association with TB microbiological confirmations

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Background and challenges to implementation: Undernourishment is an established risk-factor for TB, from progression of infection to Disease, treatment outcomes to relapse. According to the India TB Report 2023, each BMI unit decrease raises TB risk by 14% and quadruples relapse likelihood. At confirmatory diagnosis, 80% women & 67% men showed severe chronic undernutrition.[1]
While the Government of India implements a comprehensive nutritional care program for individuals diagnosed with active TB, an opportunity exists for Public Health to strengthen its efforts through BMI screening of Key & Vulnerable Populations (KVPs) at-risk for TB. The BMI serves as standardized tool that can be easily used in low-cost resource settings.
Intervention or response: William J Clinton Foundation (WJCF-India) under the Global Fund grant, employs an integrated camp approach to TB-Active Case Finding with opportunistic BMI screening and AI-enabled CXR at a community level. As per program design, targeted activities conducted, in partnership with frontline healthworkers, help mobilize KVPs to the camp.

This integrated approach has dual advantages for BMI score <=18.5: (1)Microbiologically Confirmed (MBC) individuals can be assessed for effective treatment protocols and prioritized for timely differentiated-TB care (2) Individuals who are not diagnosed with TB, can be subsequently counselled for improving nutritional status and reducing potential risk for developing active TB.

Results/Impact: After BMI measurements at ACF camps, beneficiaries were categorized into three cohorts, and their TB burden per 100,000 screened was assessed. The 'Undernourished cohort' (BMI ≤ 18.5) exhibited the highest TB burden of 1,306; followed by the 'Normal cohort' (BMI > 18.5 & < 30) with 296; and with lowest contribution from the 'Obese cohort' (BMI ≥ 30) with 145.

ACF Beneficiary Cohort	# Beneficiaries Screened	# CXR (% of screened)	# TB Suggestive by AI (% of CXRs taken)	# Microbiologically Tested (% of TB Presumptive)	Total Microbiologically Confirmed (% of tested)
All beneficiaries	104,589	93,748 (89.7%)	12,482 (13.3%)	16,938 (40.5%)	436 (2.6%)
BMI <=18.5 Undernourished	14,156 (13.5%)	12,722 (89.9%)	3,150 (24.8%)	2,728 (35.9%)	185 (6.8%)
BMI>18.5 & <30 Normal	79,374 (75.9%)	71,060 (89.5%)	8,606 (12.1%)	12,553 (41.1%)	235 (1.9%)
BMI>=30 Obese	11,059 (10.6%)	9,966 (90.1%)	726 (7.3%)	1,657 (45.4%)	16 (1.0%)

[1]Padmapriyadarsini C, Shobana M, Lakshmi M, Beena T, Swaminathan S. Undernutrition & tuberculosis in India: Situation analysis & the way forward. Indian J Med Res. 2016 Jul;144(1):11-20. doi: 10.4103/0971-5916.193278. PMID: 27834321; PMCID: PMC5116882

Conclusions: The higher tuberculosis burden among undernourished populations than normal BMI populations underscores importance of incorporating BMI measurements into TB ACF camps. This facilitates early detection, enabling timely interventions to mitigate disease progression, improve treatment outcomes, and reduce risk of relapse

PP30-1075-15 Temporal trends of QFT-Plus test results among participants in a large preventive treatment trial implemented in 3 high HIV- and TB-burden settings

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Background: Novel tools are needed to monitor response to TPT. As a secondary analysis of the WHIP3TB trial, we evaluated longitudinal variations of QuantiFERON-Plus (QFT-plus) in people living with HIV (PLHIV), as well the potential impact of different TPT regimens administered on participant´s immune response.

Design/Methods: Participants in Mozambique, Ethiopia and South Africa were randomly assigned to one of three groups: i) a single-round of rifapentine–isoniazid for 3 months (3HP); ii) annual rifapentine–isoniazid rounds for 2 years (p3HP); iii) daily isoniazid for 6 months (6H). QTF-Plus testing was conducted at baseline and month 12 (M12) for all participants and at month 24 (M24) for the 3HP and p3HP arms. Results were categorized as positive/negative/indeterminate and evaluated using the numerical results. A conversion was defined as testing positive following a previously negative test, and a reversion when the opposite occurred.

Results: From enrolment to M12, 7.8% (176/2248) of participants with paired test experienced a conversion in their QFT-Plus test results, with no-significant differences by study arm (7.8%-3HP vs 8.3%-6H). Reversions occurred in 7.1% of participants during the first year (7.0%-3HP vs 7.9%-6H). During the second year, reversions were similar in the 3HP arm (no TPT administered) vs p3HP arm (2.3% vs 3.1%, respectively).

By contrast, the proportion of conversions was lower among individuals who received TPT vs those no longer on TPT (1.8%-p3HP vs 7.0%-3HP, p =0.03).
Conclusions: The occurrence of QTF-Plus reversions was similar regardless of the TPT regimen to which they were assigned. In the second study year, when 50% of participants were assigned to the 3HP arm and 50% were not assigned to a course of TPT, QTF-Plus kinetics did not seem to be useful for monitoring TPT responses. This analysis suggests a potential effect of 3HP in preventing QFT-Plus conversion.

PP30-1071-15 Diabetes among people with TB in Bengaluru is alarming: Time to tackle it efficiently

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Background and challenges to implementation: Tuberculosis (TB) remains a major health challenge in India, with the country bearing the highest global burden. Coexisting with this epidemic is the surge in diabetes mellitus (DM) cases, earning India the title of „Diabetes Capital."
This study investigates the association between TB and DM focusing on the feasibility and outcomes of screening TB patients for diabetes. It also explores the challenges and opportunities for integrated care of TB-DM comorbidities.
Intervention or response: During January to April 2022, a cross-sectional study was conducted in 32 tuberculosis units in the BBMP district of Bengaluru, Karnataka, India. Data were collected from TB laboratory registers and through interviews with National Tuberculosis Elimination Program (NTEP) healthcare providers.
The study assessed the implementation of diabetes screening, challenges in the process, and suggestions for improvement.
Results/Impact: The Quantitative data revealed that of the 17,052 presumptive TB cases examined, 41% knew their diabetes status, and 14.61% were found to be diabetic. Of the diagnosed TB patients, 25.2% were both TB and DM-positive. Qualitatively, healthcare providers highlighted operational challenges related to the timing of blood sugar testing and the need for referral to higher-level facilities.
They also emphasized the importance of generating awareness among communities and training healthcare workers for on-the-spot diabetes screening.
Conclusions: The findings highlight the urgent need for improved screening of TB patients for diabetes, timely initiation of anti-diabetic treatment, and comprehensive healthcare services under one roof. Advocacy, communication, and social mobilization strategies should be intensified to create awareness of TB-DM comorbidities in the general population.

PP22 Lung health over the continuum of care

PP22-1010-15 Development of a software support system for targeted treatment of non-small cell lung cancer utilising genetic mutation analysis data

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Background: This study presents the development of a software support system aimed at improving targeted treatment outcomes in non-small cell lung cancer (NSCLC) by utilizing genetic mutation analysis data. The software integrates Next-generation sequencing (NGS) analysis to predict treatment responses and provide personalized treatment recommendations.
Design/Methods: The sources of data used for building the software support system, including reputable databases such as PubMed, HGMD, COSMIC, ClinicalTrials.gov, and OncoKB. These sources offer critical information on cancer gene mutations, targeted therapies, clinical trials, and treatment responses, which are essential for creating a comprehensive database and training the AI model. The incorporation of guidelines from organizations like the NCCN and the Vietnam Ministry of Health further enhances the accuracy and relevance of the database. A multi-center retrospective cohort study conducted at the National Lung Hospital and National Cancer Hospital from January 2019 to June 2023 formed the basis for software-supported treatment recommendations for NSCLC patients with EGFR mutations.
Results: The results demonstrate the effectiveness of the text classification algorithm in identifying cancer-related articles and the superior performance of the PubMed BERT model in extracting and categorizing keywords to build the database (a Recall (sensitivity) score of 98.12%). The study highlights the potential of leveraging genetic mutation analysis data and AI technology to optimize treatment strategies and improve outcomes for NSCLC patients.

The study revealed that among the 109 patients with EGFR mutations identified through NGS analysis, 72% showed partial responsiveness, 0.9% showed full responsiveness, 15.6% were stable, and 17.4% showed disease progression. The overall response rate (ORR) was 67.0%, and the disease control rate (DCR) was 82.6%.

Conclusions: The software support system developed in this study holds promise for enhancing personalized treatment approaches in NSCLC by leveraging genetic mutation analysis data to guide targeted therapies and improve the treatment outcome for patients.

PP22-1002-15 Prevalence of non-TB cardiopulmonary condition among people with presumptive TB in Nigeria: A call for integrated care

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Background and challenges to implementation: The Global Fund's PPM TB project in Nigeria provides complimentary chest X-rays for TB Presumptive cases that meet some criteria. In Ebonyi State, Caritas Nigeria implementing the GF PPM partnered with X-ray diagnostic centers to offer these services. The primary objective is to identify TB-suggestive cases for further investigation and treatment. However, it was observed that a significant proportion of detected abnormalities were non-TB conditions. The reports were given to the patient but the lack of a structured referral system hindered proper follow-up for these non-TB cases.

This study aims to highlight the pattern of non-TB conditions among the TB presumptive cases emphasizing the urgent need to establish a clear referral pathway for their management.

Intervention or response: A retrospective analysis was conducted on chest X-ray records of presumptive TB cases from January 2022 to December 2023 within the scope of the project in Ebonyi State, Nigeria. The Radiologist's reports and impressions were analyzed to assess the observed radiological patterns. Efforts were also made to track some recent non-TB abnormalities and provide them with referral options

Results/Impact: A review of 1,089 chest X-rays reports, showed that 468 (43%) had normal findings. while abnormalities were identified in 621 (57%) of the X-rays. Among those identified with abnormalities, only 26% were suggestive of tuberculosis (TB), while the vast majority, 74%, were suggestive of various other cardiopulmonary conditions. The table contains a detailed breakdown of the abnormalities.

Abnormal Chest X-ray = 621 (57%)		
Radiologist report	Total Number	%
TB Suggestive	163	26%
Hypertensive Cardio Vascular Changes and Cardiomegaly	196	32%
COPD	87	14%
Pneumonia	76	12%
Congestive Cardiac Failure	65	10%
Post -Primary TB	33	5%
Lung lesion	3	0%

Conclusions: Establishing a referral pathway and linkage for non-TB conditions is a proactive approach that will strengthen the healthcare system and provide integrated personalized care for identified presumptive TB cases, which aligns with the principles of patient-centered healthcare delivery.

PP22-1005-15 Results from AI-enabled mobile X-ray for integrated TB, CVDs, and CRDs screening in rural communities in Nigeria

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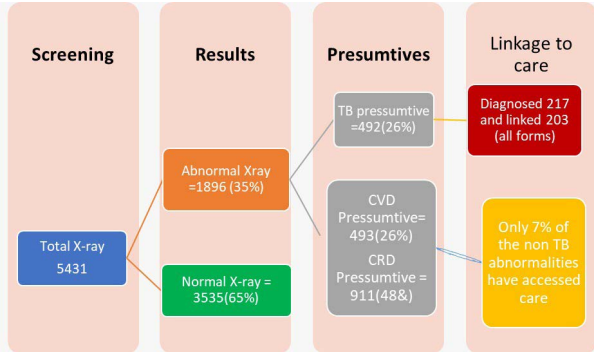
Background and challenges to implementation: The prevalence of non-communicable diseases such as cardiovascular diseases (CVD) and chronic respiratory diseases (CRD) is rising significantly in many countries with high tuberculosis (TB) burden, contributing to high rates of mortality and morbidity. Access to essential diagnostic services remains limited, especially in remote rural communities. Caritas Nigeria implemented a TB REACH project to provide integrated service delivery for TB, CVD, and CRD in rural communities using AI-enabled mobile X-rays.

Intervention or response: The project was implemented in Ebonyi and Nasarawa states of Nigeria. After stakeholder mapping and engagement, capacity building was done for a specialized team, and AI-enabled mobile X-ray was deployed to provide comprehensive lung health screening. During outreach events, chest X-rays (CXR)

were interpreted by qXRv3 onsite. Sputum samples were collected from people with presumptive TB while people with presumptive CVD/CRD were referred to the nearest specialized treatment center.

Results/Impact: Outreach activities from June 2023 to February 2024: Screened 5,431 people with digital CXR and 1,896 (35%) had abnormalities identified of which 492 (26%) were TB presumptive, 493 (26%) CVD presumptive and 911 (48%) are CRD presumptive. While 203 (94%) of people with TB were successfully linked to treatment, only 7% of people with NCDs were successfully linked to care at the treatment centers.

The early engagement of all relevant stakeholders especially community level, and the involvement of community members in the outreach activities, improved acceptance and uptake. Early engagement with cardiopulmonary departments facilitated a smooth referral process for non-TB cases but challenges such as distance to the treatment center and financial constraints hindered access to care.



Conclusions: The high rate of detected abnormalities through CXR screening highlights the critical need for integrated healthcare delivery systems in rural areas, and the power of mobile CXR with AI to reach remote communities. Addressing the challenges of linking people with NCDs to care is important when planning future interventions

PP22-1004-15 Post-TB treatment follow-up: A key intervention to enable continuum of TB care in Himachal Pradesh, India

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Background and challenges to implementation: Providing last-mile TB services is crucial for early diagnosis and breaking the chain of transmission in difficult topographies of hilly state of Himachal Pradesh, India. Person with a history of successful treatment of TB (PwTB) are at risk for developing the disease again in high-burden settings (203/100,000 for 2023).

Therefore, post-TB treatment follow-up in the form of door-to-door survey was initiated by the state for provision of last-mile TB care. The study aims to assess the impact of post-treatment follow-up on continuum of TB care for persons with a history of TB.

Intervention or response: The post-TB treatment follow-up was carried out for eligible persons with a history of TB for every 6,12,18, and 24 months from August 2023 to February 2024. Data for post-treatment follow-up was extracted from 'Ni-kshay' (web-based India's national TB reporting system). Community health officers carried out door-to-door verbal symptom screening and the presumptive persons were tested for TB. The data was extracted from Ni-kshay and parameters- i) coverage ii) presumptive TB diagnosed among those tested iii) TB diagnosed iv) demographic and clinical characteristics of persons diagnosed with TB were analysed using MS Excel.

Results/Impact: History of successful outcomes of TB eligible for post-TB treatment follow-up were 32,004 of which 85% (27203) underwent door-to-door screening. In them, 21% (5712) were found to be symptomatic for TB and were offered Chest X-ray and smear microscopy. Recurrent TB diagnosed was 2.4% and all were put on treatment. Except for age and gender, clinical characteristics such as presence of diabetes and history of smoking showed a significant association with TB recurrence ($p<0.05$).

Conclusions: Post-TB treatment follow-up among persons with a history of TB disease is an effective intervention to enable continuum of TB care and needs to be replicated for disruption of TB transmission in the community in similar hard-to-reach settings.

PP22-1003-15 Implementation of post-TB lung disease screening and pulmonary rehabilitation in Kenya: Experience from Nairobi County, Kenya

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Background and challenges to implementation: In 2023, Kenya notified 97,126 TB cases with Nairobi County contributing to 13.4% (13,050) of the notified cases . While no Kenya specific data is available, observations from other TB endemic settings, have reported that a significant proportion(up to 65% in one study) of people who complete anti-TB treatment have post-TB pulmonary complications that negatively affect their quality of life.
Intervention or response: With support from GF, NTP Kenya in collaboration with Respiratory Society of Kenya was supported to expand the effort to provide appropriate care to people with post TB lung disease (PTLD) by implementing a set of interventions in Nairobi. Service availability and readiness Assessment was conducted in 73 out of 262 health facilities that provide TB services . Training of 30 health care workers from 18 selected health facilities was conducted on how to do the assessment of PTLD. Six facilities were identified to be used as PTLD rehabilitation clinics. Physiotherapists, nutritionist, psychologist, social worker, and clinicians from these sites were trained on management of PTLD. Tools were provided and screening started in January 2024. A need for pulmonary rehabilitation was identified when the person was unable to walk more than 400 m in six minutes.
Results/Impact: From January – March 2024, a total of 880 patients (518 during treatment and 362 after completion of treatment) were screened for PTLD. Of the 518 patients on TB treatment screened, 19% (98) screened positive and 37% (36) referred for pulmonary rehabilitation (PR). The 362 patients screened after completion of TB treatment yielded 30% (107) with PTLD and 63% (67) referred for PR.
Conclusions: A significant number of patients suffer from PTLD at the end of TB treatment. There is a need to raise awareness on PTLD. Measures to prevent PTLD such as early diagnosis of TB should be promoted and those who develop given appropriate care including PR.

PP22-1000-15 Achieving excellence in liquid oxygen infrastructure in Vietnam: Learning by doing

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Background and challenges to implementation: Vietnam has a medical liquid oxygen (LOX) market, but hospital-based infrastructure to store LOX and supply wards was primarily limited to urban and provincial hospitals pre-COVID-19. In response, the USAID-funded EpiC project, in collaboration with the Ministry of Health's Infrastructure and Medical Device Administration (IMDA), identified hospitals to boost access to LOX infrastructure in 23 urban, peri-urban, and rural communities in two phases between 2021 and 2024.
Intervention or response: USAID and EpiC implemented strategic changes between the two phases to boost systems quality and sustainability.

	Phase I	Phase II
Assessment and Design	Both phases: IMDA specifies the criteria for selection of facilities to invest in LOX infrastructure (also approved by USAID). IMDA also provides guidance during the preparation process for design, investment, and reporting on progress to the Ministry of Health.	
Implementation period	September 2021 to August 2022	July 2022 to July 2024
Focal site management level	1 central, 2 provincial, 10 district in 4 peri-urban and one urban province	1 provincial, 9 district in 6 remote/ rural provinces
USAID-provided equipment	13 cryogenic tanks and regulators and 14 vaporizers. 11 piping networks with 450 total outlets	10 cryogenic tanks, vaporizers, and regulators 10 piping networks with 512 total outlets
Technical training approach	Installation-vendor provided training concurrent with installation	Two e-learning courses before installation and one-day onsite training led by installation vendor with technical oversight; creation of a detailed technical sustainability plan for each hospital
Procurement support	Extensive training and ad-hoc coaching	A comprehensive training program led by a Social Health Insurance (SHI) expert covering procurement bidding regulations and providing step-by-step guidance for creating customized procurement plans
Technical oversight	Project staff	Third-party vendor and project staff
Provided oxygen	The initial plan was one fill at finalization, later filled 12 systems an additional time	Plan to fill at finalization and up to four more refills at each site, up to 50 refills

Results/Impact: Initial Phase I implementation timelines were unrealistic for procurement and installation. Phase II's duration has allowed for improved planning and technical assistance. With requests for additional training for Phase I sites, the project developed two eLearning courses for focal and additional sites in need. To date, 64 sites in

four provinces registered relevant staff in project eLearning courses; 680 completed the introduction to medical oxygen course, and 585 completed the safety and regulations for LOX systems course.
Installation quality in Phase I was not satisfactory, requiring technical fixes through a reinspection process, hence a new installation vendor was contracted for Phase II. An external oversight firm manages stringent quality control provisions for installation, and monitors site-based technical training efforts.
As of March 2024, only 53.8% (7/13) of Phase I sites can procure LOX using their own budgets. In Phase II, an SHI procurement expert will complete detailed sustainability plans with each hospital, and the project will fund additional oxygen fills to allow time to accrue sufficient data to justify bidding needs.
Conclusions: Phase II efforts drew from Phase I lessons and led to several positive impacts, including enhanced capacity strengthening and coaching on procurement. Additional time for implementation was critical to prepare training and sustainability tools that will boost the impact of donor investments.

PP22-1006-15 Respiratory health risk assessment of exposure in market wood workers and workshops in Mombele/Kinshasa, the Democratic Republic of the Congo

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Background: Wood dust is responsible for respiratory problems. The objective of our study was to assess the health and respiratory function of wood professionals in Mombele market.
Design/Methods: A cross-sectional descriptive survey was conducted from May 1 to June 31, 2019 at the Mombele wood market. The study looked at workers who were randomly recruited from sawmills and wood working shops in this market and included in the study on the basis of inclusion criteria. A physical examination and pulmonary function tests were performed using a portable SP10 spirometer. The prevalence of clinical manifestations was assessed.
Results: All examined subjects were male with a mean age of 38.43 ±11.99 years and a mean of 23.7±7.3 years at first exposure. Machinists represented 67.68 % and carpenters 32.32 %. The average seniority at the post was 14.87 year s, 94% did not wear personal protective equipm ent, 49.49% smoked and with an average seniori ty of 10.4±8.1 years.
The prevalence of clinical conditions and sympt oms was 60.6%. Longstanding employment and smoking worsen respiratory symptoms. Lung function disturbances were significantly more frequent in professionals who had worked for more than 5 years (decline in FEV1 and Tiffeneau Index, TI, $p < 0.05$) compared to those who had worked for less than 5 years. In smokers, only FEV1 was affected, not TI.
Conclusions: This study revealed a high prevalence of clinical respiratory manifestations among Mombele's woodworkers, underscoring the need for technical and medical preventive measures.

PP22-1001-15 Successfully treated isoniazid-resistant people with TB in Karnataka, India: How are they doing post treatment?

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Background: According to the National Drug Resistance Survey of 2014-16, India, Isoniazid (INH) resistant TB is prevalent, accounting for 11% of new people with TB (PwTB) and 25% of previously treated PwTB. In 2021, 82% of INH mono/poly resistant PwTB achieved successful treatment outcome in Karnataka. Evaluating treatment success necessitates consideration of mortality, recurrence, and patient-reported disease post-treatment completion. This study aimed to assess the long-term clinical well-being of successfully treated INH mono/poly resistant PwTB one to three years after treatment completion, and to identify genetic mutations associated with unsuccessful outcomes.
Design/Methods: A cross-sectional retrospective cohort analysis was conducted on INH mono/poly resistant PwTB diagnosed and successfully treated between January 2019 and December 2021 under the National Tuberculosis Elimination Program (NTEP) in Karnataka. PwTB data was retrieved from Ni-kshay, the NTEP's web-enabled patient management system. Follow-up involved house visits to obtain information on TB recurrence and current health status, as per standardized protocols from July to December 2022. The association between post-treatment outcomes and genetic mutations was examined.
Results: Out of 2801 INH mono/poly resistant PwTB, 2613 (93%) were visited, with 2307 (88%) reporting good health, 94 (4%) experiencing TB recurrence, and 212 (8%) died post-treatment. Amplified drug resistance was observed in 19% of people with recurrent. Mortality was higher among males (10%) and those aged over 45 years (24%), while recurrence was more prevalent among individuals aged 16-45 years (5.2%). Among PwTB with KatG MUT1 mutation, 9% died and 3% experienced TB recurrence, while for those with InhA MUT1 mutation, 6% died and 2% had recurrent TB.

Mutation Band (Mutation loci)	Died		Recurrent TB		TB free		Total (1319)
	No.	%	No.	%	No.	%	
kat G MUT1 (S315T1)	77	9%	27	3%	715	87%	819
inh A MUT1 (C15T)	29	6%	7	2%	423	92%	459
Other mutations *	2	5%	1	2%	38	93%	41

*Other mutations include kat G MUT2 (S315T2), inh A MUT2 (A16G), inh A MUT3A (TBC), inh A MUT3B (TBA).

Table. Comparison of mutation bands (mutation loci) with outcome.

Conclusions: Post treatment follow up of INH mono/ poly resistant PwTB is essential to diagnose recurrence early and to promote long term survival. Further research on genetic mutations and alternate treatment regimens is warranted to sustain successful treatment outcomes.

PP22-1009-15 Unraveling medical practitioner's hesitancy for TB preventive treatment

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Background and challenges to implementation: Hesitancy among medical practitioners globally, impedes TB preventive treatment (TPT) scale-up. India's National TB Programme (NTP-India) focused on mentoring doctors with training sessions, workshops, online learning modules, and tailored informational materials to address this.
Intervention or response: NTP-India adopted a scientific and systematic approach including:
i) in-depth interview of pulmonologists and medical practitioners (n=33),
ii) qualitative data analysis of interviews and identified 15 themes, which stratified into technical/programmatic and misconceptions/ apprehensions (Table),

	Technical	Programmatic
Misconception	Mechanism of action of TPT is not clear; ATT is not effective for dormant bacilli.	Fear of diverting resources.
	Ruling out active TB is not possible.	Adherence of TPT is poor.
	Risk of flaring active disease.	IGRA is very costly.
	Protective effect of TPT and its duration.	
	Effect of TPT for end TB target other than incidence.	
Apprehension	WHO declared health emergency in 1993; why TPT needed after 30 years?	Alcoholics and TPT is a concern.
	Emergence of drug resistance.	Environmental and host factor must be addressed before TPT
	Risk of intolerance and toxicity.	Poor programmatic condition
	Guidelines for repeat TPT in case of reinfection in high-risk group is not available	

Table: Stratification of hesitancy for TPT among doctors in misconceptions and apprehension between technical and programmatic nature, based on interviews.

iii) literature review of evidence from WHO/national guidelines, global, Indian studies/data to counter misconception/apprehensions,
iv) collation of diverse TPT experiences from states/projects utilized,
v) tailored training materials/modules targeting doctors from medical colleges and private providers disseminated/debated through medical college task force mechanisms and associations.
Results/Impact: The systematic collation of local misconceptions and apprehensions, along with an extensive review of research studies and programmatic data, has increased the pool of senior expert facilitators who advocate and cross-mentor the medical fraternity on TPT strategy in India. While the efforts are on, the approach taken by NTP-India serves as a model for other high-burden countries to address provider hesitancy.
Conclusions: Achieving, unlearning and re-learning' among medical practitioners is a lengthy process. Targeted communication strategies have proven effective. NTP-India's approach highlights the importance of scientific rigor and systematic interventions in addressing provider hesitancy globally.

PP22-1008-15 The impact of BCG vaccination status on TB meningitis severity in Cape Town

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Background: There was global BCG vaccine supply shortage in 2015 which resulted in a marked increase in the number of TBM cases. It is unknown whether shortage also impacted on TBM disease severity. We aimed to describe the severity of TBM disease in children diagnosed with and without BCG vaccination in South Africa.
Design/Methods: A retrospective (1985-2015) and prospective (2019-2020) hospital-based observational cohort study in Tygerberg Hospital in Cape Town, South Africa. All children >3 months-13 years admitted with definite or probable TBM were enrolled. Proof of BCG administration was either documentation of BCG administration or the presence of a BCG scar. Severity of disease was based on clinical TBM stage I-VI, and microbiological confirmation.
Results: In total, 518 children with TBM were included in the study, median age 24 months (IQR 14.7-38.9), HIV exposed 30% and infected 10%. Of the 480 TBM children in the retrospective study, 183/480 (38%) were not BCG-vaccinated, while in the prospective study of 38 consecutive TBM children, 18/38 (47%) did not receive BCG.
In both cohorts, non-BCG vaccination was associated with increased TBM disease severity i.e. clinically advanced TBM stage (odds ratio (OR) 2.50: 95% confidence

interval (95%CI) 1.53-4.10; p<0.01), depressed level of consciousness, GCS<15 (OR 2.45: 95% CI 1.50-4.01; p<0.01) and cranial nerve palsy (OR 1.65: 95% CI 1.10-2.47; p<0.01) in the retrospective study, and hemiparesis (OR 6.07: 95% CI 1.49-24.76; p<0.01) and extraneural mycobacteriological confirmation as evidence of disseminated TB (OR 6.14: 95% CI 1.10-32.21; p=0.03) in the prospective study. Furthermore, in the retrospective study BCG vaccination was associated with raised intracranial pressure (OR 0.62: 95% CI 0.39-0.99; p=0.04).
Conclusions: Our data shows that children who are BCG unvaccinated are at a higher risk of more severe TBM disease. BCG stock needs to be procured in order to prevent the severity of TBM.

PP23 Strategies for improved child TB identification: Experiences from Nigeria

PP23-1019-15 Improving childhood TB case detection using targeted facility- and community-based intervention during Childhood TB Testing Week in North Central Nigeria

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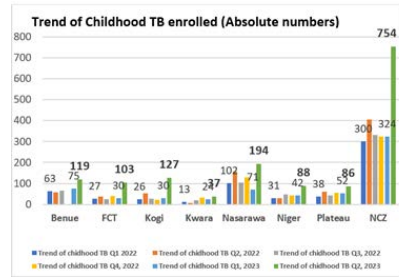
Background and challenges to implementation: Nigeria faces a significant burden of childhood Tuberculosis (TB), ranking third globally with an estimated 83,000 cases in 2022. However, only 25% childhood treatment coverage was achieved, contributing 7% to total notification during the same period. The under-diagnosis of TB in children under 5 years is a major challenge due to its paucibacillary nature, with only 30%-40% of cases confirmed bacteriologically. This intervention aimed to enhance childhood TB detection in the North Central Nigerian states through dedicated facility- and community-based approaches.
Intervention or response: The Nigerian TB Programme set aside a week for targeted active screening and diagnosis for children called the 'child testing week' to coincide with Children's Day week in May. Childhood healthcare and community settings, such as nutrition clinics, pediatric outpatient clinics, HIV clinics, Qur'anic/Almajiri schools, and orphanages were mapped, identified and engaged. Clinician awareness creation for use of diagnostic algorithms in children for TB screening, utilization of stool for laboratory diagnosis, enhanced use of Chest X-ray (including digital) for diagnosis, and contact tracing were all carried out at the identified places.
Results/Impact: 93,787 children were reached, with 85,059 (91%) screened, 17,819 (21%) identified as children with presumptive TB , and 399 (3%) diagnosed with TB alongside 440 adult TB patients. Among the diagnosed children, 117 (29%) were confirmed with rapid molecular tests, 13 (11%) with stool samples, 139 (35%) through chest X-ray, and 5 (1%) via other clinical means, all of whom were promptly enrolled in treatment.



% Contribution of Childhood TB		
States	Q1 2023	Q2 2023
Benue	5	7
FCT	4	12
Kogi	2	9
Kwara	5	9
Nasarawa	5	12
Niger	2	4
Plateau	5	8
North Central Zone	4	8

Conclusions: This intervention resulted in a significant increase from 40% to 350% in individual childhood TB detection rates/contribution across the respective states, and a 100% increase for the North Central Zone in Q2 2023
compared to Q1 2023. It is recommended to institutionalize similar targeted interventions quarterly or biannually to sustain and improve childhood TB detection rates.

PP23-1015-15 National Childhood TB Testing Week in Sokoto State Nigeria: Resolve to innovatively find the missing children with TB

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Background and challenges to implementation: Nigeria bears the 5th highest burden for childhood TB globally with an estimated 57,480 expected annual incident childhood TB cases. The country achieved 37% of the UNHLM 2018-2023 target for childhood TB. Aside, diagnostic challenges coupled with capacity issues among health care providers, the passive nature of finding TB among children might have contributed to the low TB case detection among this vulnerable population. Between 22nd -28th May 2023 national childhood TB testing week was conceptualized and conducted to help find actively TB among children. This study presents the outcome of this intervention in Sokoto state.

Intervention or response: The National TB programme with support from partners identified and mapped out congregate children focused setting likely hotspot for TB among children in the state such as nutritional clinics, orphanages, formal and informal schools. Capacity of health care providers were built on how to leverage on community command structures to reach street children and conduct advocacies to focal persons in identified TB hotspots.
They were also trained and equipped with necessary and appropriate tools for screening, referral, sample transport and linkage to care.
Results/Impact: In one week, 41,162 children were screened, out of which 30% (12,216) were identified as presumptive TB. 87% (10,569) had Xpert MTB/RIF assay and 8% (829) of children were diagnosed and placed on treatment. This accounted for 40% (829) of the total 2,050 childhood TB cases notified in the state between April-June 2023. Reverse contact tracing to finding missing adult with TB was a missed opportunity.
Conclusions: The programme will seek to routinize this intervention and strengthen sample referral mechanism to ensure that all identified children with presumptive TB are tested.
To address the gap in childhood TB, TB programmes should be intentional and pro-actively engage potential hotspots where children with presume TB can be screened, tested, and treated within the communities.

PP23-1014-15 Impact of WHO recommended diagnostic algorithm on increased childhood TB case finding in public private mix intervention, Lagos USAID TB LON 3 project experience

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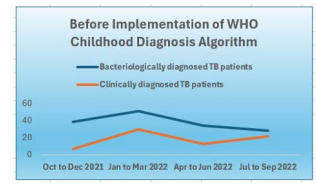
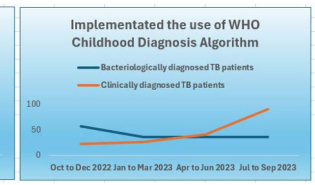
Background: Tuberculosis (TB) remains a significant public health challenge globally, with Nigeria ranking 6th among the countries with the highest burden of the disease and the third highest burden of childhood Tuberculosis globally. This continues to impact the lives and development of millions of children and adolescents.
Challenges in overcoming low notification particularly among children who contribute an estimated 12% of the national TB burden include under-diagnosis of TB and the paucibacillary nature of TB in children, even where current bacteriologic diagnostic methods are available. Lagos, Nigeria's largest economic hub, is densely populated, with a high prevalence of TB. The urban environment exacerbates the spread of TB, especially among children living in overcrowded and impoverished communities. Private healthcare sector plays a significant role in healthcare delivery in Lagos and Nigeria at large, and it is where about 60-70% of Nigerians access health care delivery.
Design/Methods: A retrospective study of engaged private health facilities in 18 LGAs in Lagos that were trained on the use of WHO recommended-diagnostic-algorithm for childhood TB diagnosis as adapted by the National TB Program. Childhood TB diagnosis data before and after implementing WHO-diagnostic-Algorithm were analyzed to determine intervention-impact.

	Private Public Mix	Bacteriologically diagnosed TB patients	Clinically diagnosed TB patients	Total TB cases diagnosed (All forms)		Private Public Mix	Bacteriologically diagnosed TB patients	Clinically diagnosed TB patients	Total TB cases diagnosed (All forms)
Before Implementation of WHO Childhood Diagnosis Algorithm	Oct to Dec 2021	39	7	49	WHO Childhood Diagnosis Algorithm Implemented	Oct to Dec 2022	57	23	82
	Jan to Mar 2022	51	30	81		Jan to Mar 2023	36	26	60
	Apr to Jun 2022	34	13	49		Apr to Jun 2023	36	41	76
	Jul to Sep 2022	28	22	52		Jul to Sep 2023	36	90	126
Total		152	72	231	Total		165	180	344





Results: One year data of the engaged private facilities before the use of the WHO recommended diagnostic algorithm for childhood TB diagnosis were compared with the one-year data of the engaged private facilities after the use of the WHO recommended diagnostic algorithm for childhood TB diagnosis. The data showed increased in TB case finding (49% relative increase).
Similarly, an increase of over 150% was seen in the number of clinically diagnosed cases of children in the same period.
Conclusions: The use of WHO-recommended diagnostic algorithms through training and supportive supervision of health care workers in private-public-mix improved case notification and this can be scaled up to increasing TB case detection among children.

PP23-1011-15 Implementation of the WHO treatment decision algorithm doubled childhood TB case finding in the private sector intervention in Lagos state, Nigeria

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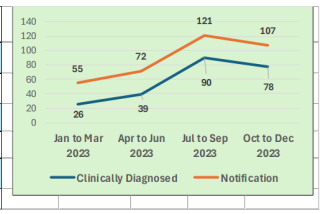
Background and challenges to implementation: Nigeria currently ranks 1st in Africa and 6th globally among the 30 high TB burden countries in the world. In 2022, Nigeria only notified 20,411 (29%) childhood TB cases out of expected 69,000. This also represent just 7% of the overall case notification for 2022. It is for this reason that the National TB and Leprosy Control Program (NTBLCP), adopted the WHO treatment decision algorithm (WHO TDA) for TB diagnosis among children, which uses a scoring system to make clinical diagnosis of TB. This study seeks to evaluate the impact of the use of this algorithm on TB case findings among children in selected private hospitals in Lagos state.
Intervention or response: Following its deployment in May 2023, the WHO TDA was disseminated to high burden private facilities under the TB LON-3 project in Lagos state between May and June 2023, and elaborate capacity building was provided to the clinicians in these facilities on its use. The trend of TB case finding among children (between the ages of 0 – 14 years) six months before and after the dissemination of the algorithm were then evaluated to assess its impact.
Results/Impact: The trend of childhood TB case finding/notification before and after the dissemination of the WHO treatment decision algorithm shows a 100% increase in childhood TB cases notified (from 107 to 214 cases), a 190% increase in the clinically diagnosed cases (from 54 to 157), and an increase in TB yield from 4% to 7% respectively. See illustration below:

	Jan to Jun 2023	Jul to Dec 2023
Clients Screened	106055	88949
Presumptive Evaluated	2594	3090
Cases Diagnosed	114	219
Cases Clinically Diagnosed	54	157
Cases Notified	107	214
TB yield	4%	7%



Conclusions: In the wake of the many challenges faced by healthcare providers in the diagnosis of TB in children ranging from screening, presumptive identification, and sputum/stool sample collection for GeneXpert, the use of the WHO treatment decision algorithm by clinicians will go a long way in addressing many of these challenges and ensure improved childhood TB notification.

PP23-1012-15 Improving childhood TB diagnosis in rural settings in Nigeria: Utility of a diagnostic algorithm

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Background and challenges to implementation: TB diagnosis in children has remained a challenge. Due to the difficulty in obtaining spontaneously expectorated sputum and other respiratory specimens, chest Xray (CXR) is relied upon to aid TB diagnosis in children. However, access to CXR is a challenge in rural communities. To address this, KNCV Nigeria operationalized the use of the WHO algorithm on Diagnosis and Treatment of Child TB adapted by the NTP and shares her experience.
Intervention or response: KNCV Nigeria TB LON introduced the use of the adapted WHO diagnostic algorithm with a scoring system for childhood TB in public and private facilities supported on the project. Two diagnostic algorithms were introduced:
1. Where CXR is available, and;
2. Where there is no CXR.
TB Focal persons (FPs), clinicians and health care workers (HCWs) were trained on the use of the algorithms and the scoring systems. In rural facilities with no CXR, emphasis was on the diagnostic algorithm 1, Where there is no CXR. Copies of the algorithms were made available for easy reference

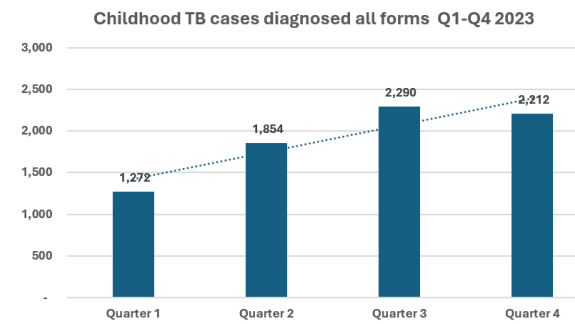

Figure 1. Quarterly diagnosis of childhood TB cases in 2023.

Results/Impact: Diagnostic algorithm was accepted as a tool to aid diagnosis of childhood TB among TB FPs, Clinicians and other HCWs. Across 14 implementing states, in 2023, a total of 192,388 presumptive Childhood TB were identified and evaluated, Of these, 7,628 Childhood TB cases were diagnosed giving a TB yield of 4%. Disaggregating by Quarter (Q), childhood TB cases diagnosed

were 1,272 in Q1, 1,854 in Q2, 2,290 in Q3 and 2,212 in Q4. See figure 1. This represents a 46%, 80%, and 74% quarterly increase in the number of childhood TB cases diagnosed compared to Q1.

Conclusions: The practice of a diagnostic algorithm with a scoring system easily used by general HCWs in peripheral facilities improves childhood TB diagnosis especially in rural settings without access to Xray and can be replicated in similar settings.

PP23-1018-15 Impact of the National TB Testing Week on childhood TB notification in Osun State, South-West Nigeria

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Background and challenges to implementation: In Nigeria, childhood tuberculosis (TB) notification stood at 7% in 2022. In Osun state, childhood TB notification has been low hovering between 4% to 5% in the past five years. This study demonstrates the impact of the national TB testing week for children conducted in Osun state, Nigeria in Q2 2023.

Intervention or response: The State TB programme (STP) in collaboration with other TB stakeholders in the state facilitated the weeklong activity. Private and public primary schools and Alma Jiri cluster house/environment in the communities across all 30 local government areas were mapped for TB outreaches. Advocacy visits were conducted to the stakeholders in these settings sensitizing them of the exercise. During the outreach, the STP team disseminated key TB messages and children were screened for TB. Children presumed to have TB had their sputum or stool collected and moved to the laboratory for testing using the Xpert MTB/RIF assay. Confirmed TB cases were started on appropriate TB treatment and contact tracing initiated. Data was aggregated from the NTP tools used for documentation and the quarterly surveillance and analysed using Excel.

Results/Impact: According to figure 1, prior to Q2 2023, proportion of childhood TB among total cases ranged from 3% (150) to 5% (305). However, in Q2 2023 when the intervention took place, the proportion of childhood TB rose to 8% (514). In Q3 and Q4 2023, childhood TB accounted for 6% (440) and 5% (319) respectively. The sharp increase in childhood TB in Q2 2023 can be attributed to the testing week intervention.

Conclusions: The dedicated national TB testing week focusing on children has demonstrated the potentials of increasing childhood TB notifications. This intervention should be conducted routinely.

PP23-1016-15 The journey of the VEDUTA study: Evaluation of WHO TB treatment decision algorithms in Nigeria

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Background and challenges to implementation: Following World Health Organization's expression of interest for external validation of new Treatment Decision Algorithms (TDAs) for pulmonary tuberculosis (PTB) in children under 10 years with presumptive TB, the National TB Programme (NTP) of Nigeria adapted the TDA4Child generic protocol and conducted VEDUTA study with an additional objective to improve TB detection.

Intervention or response: The study was implemented in 24 selected healthcare facilities across 6 states. Half of the sites were primary healthcare centres selected to support a policy of task shifting child TB diagnosis to other clinicians aside doctors.

Prior to study launch, the NTP trained healthcare workers (HCWs) on the study procedures and on the two TDAs (with or without chest X-Ray (CXR). Both TDAs include clinical criteria and GeneXpert® MTB/RIF testing or LF-LAM where applicable.

Additionally, user-friendly posters of the TDAs and case report forms were printed and distributed to all sites.

Regular supervision/monitoring visits to the research sites by NTP and state-level teams were conducted. Social media (WhatsApp) groups were created to share experience and updates from the sites on enrolments and challenges.

Results/Impact: The capacity of 36 HCWs was built, and this boosted their confidence to screen for TB. Advocacy to health authorities facilitated cooperation and broadened access to CXR.

Sustained mentoring of on-site teams boosted screening and accrual of children <10 years with presumptive TB with anticipated positive impact on TB notifications. The successful utilization of the TDAs and data collection tools during the study led to TB detection through reverse contact tracing in adults.

Challenges persisted with access to GeneXpert® in some facilities underscoring the need for a strengthened specimen referral system.

Conclusions: The VEDUTA study institutionalized routine systematic screening and strengthened TB case finding. Scale-up of the TDAs in Nigeria, depending on VEDUTA's results, would enhance early TB detection and help avoid missed opportunities.

PP23-1013-15 Implementation of the treatment decision algorithm to improve diagnosis of TB in children in Kaduna State, north-west Nigeria

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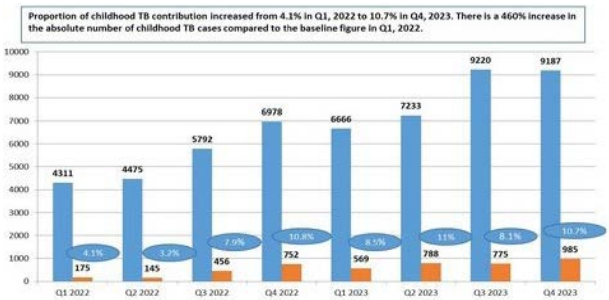
Background and challenges to implementation: Nigeria grapples with a substantial burden of tuberculosis (TB), ranking highest in Africa and sixth globally.
Despite notable strides in TB notification rates, the percentage of childhood TB cases remains low at 7%, falling short of national and global targets. In March 2022, the World Health Organization (WHO) released updated guidelines and an operational handbook for managing TB in children, emphasizing integrated treatment decision algorithms (TDAs) to enhance TB detection in pediatric patients. Kaduna State, with a notably low proportion of childhood TB cases, undertook this intervention to showcase the effectiveness of the WHO scoring algorithm in bolstering TB case identification.
Intervention or response: The National Childhood TB technical working group designated Kaduna State for piloting the algorithm's implementation. Health facilities were purposefully chosen, and healthcare workers underwent specialized training on how to use the algorithm.
The State TB program utilized regular coordination meetings to train local government supervisors across the 23 local government areas on the algorithm's usage, while also mentoring DOT providers and healthcare workers at nutrition clinics.
Funding from the Global Fund supported free chest X-rays (CXRs) where available, with additional deployment of mobile digital CXRs equipped with artificial intelligence in government-procured mobile diagnostic trucks during integrated outreaches. Data were aggregated from national tools and analyzed.

Results/Impact:



Conclusions: This initiative yielded a significant increase in both absolute numbers and proportional contributions of childhood TB cases reported in Q1 2023, surpassing baseline data. We advocate for targeted interventions leveraging the WHO algorithm and CXRs across all healthcare settings to enhance childhood TB detection and management.

PP23-1017-15 Leaving no child behind: Optimising strategies for Childhood TB case finding in Nigeria

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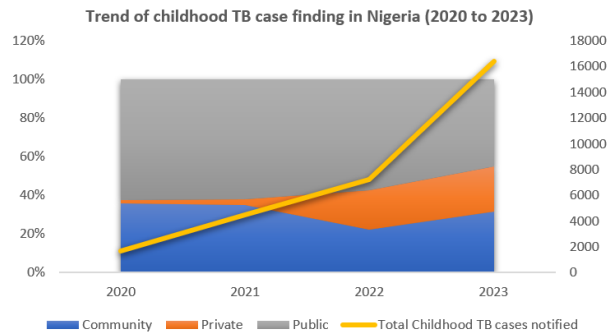
Background and challenges to implementation: Childhood TB case finding remains one of the major challenges for Nigeria despite the country's progress in ending TB. Improving childhood TB diagnosis and treatment is one of the core objectives of the USAID-funded TB LON 1,2 &3 projects in Nigeria. The impact of the project interventions on the trend of childhood TB notification is assessed.
Intervention or response: The TB LON projects deployed a mix of facility and community-based interventions aimed at improving childhood TB case finding. These included deployment of TB screening officers to hospital service delivery points for children in public and private facilities, contact tracing, engagement of patent medicine vendors, and community outreaches targeted at finding children within hotspot communities routinely and during special TB campaigns like the World TB Day and National testing weeks. They also adopted and scaled up the use of stool for bacteriological diagnosis of TB in children and strengthened linkage to diagnosis and treatment.
Results/Impact: The LON projects from inception (Apr 2020) to Dec 2023 notified a cumulative 31,529 childhood TB cases, representing 8% of all forms of TB cases notified within the period. Of the childhood TB cases notified, 63% were diagnosed bacteriologically (including 11% via

stool GeneXpert). Childhood TB cases notified annually by the projects increased by > 350% from 4,473 in 2021 to 16,428 in 2023, while the proportion of childhood TB cases contributed from private facilities and community interventions increased from less than 40% in 2020 to as high as 55% in 2023. A monthly data trend analysis showed significant spikes in childhood TB case finding in the months of the special TB ACF campaigns.



Conclusions: Improving childhood TB case finding requires a shift in the focus of interventions from the public facility to private facilities and community, and an optimization of strategies for childhood TB case finding.

PP23-1020-15 Improving childhood TB detection through the implementation of a designated childhood TB screening officer: A case study at State Hospital Ikire, Osun State, Nigeria

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Background and challenges to implementation: The World Health Organization (WHO) estimates that children account for approximately 12% to 15% of total TB case notifications, with higher rates in regions with a high TB burden. However, in Osun state, Nigeria, only 6% of TB cases are notified in children, falling short of global benchmarks. Many childhood TB cases remain undiagnosed due to inadequate prioritization and attention. This study aimed to enhance the early detection of TB cases in children by appointing a designated screening officer(SO) to thoroughly screen pediatric patients for TB symptoms. State Hospital Ikire, with support from the Institute of Human Virology Nigeria (IHVN) and USAID, provided a suitable framework for such intervention within a healthcare facility in Osun State, Nigeria.

Intervention or response: The study was prospectively carried out to demonstrate the impact of a designated screening officer in improving childhood TB case finding in a secondary healthcare facility, from January 2023 to December 2023. Screening officer was trained on the childhood TB screening algorithm. The SO, was assigned to pediatric service delivery points in the facility. Tuberculosis screening services were provided, symptomatic children were evaluated using sputum, stool and Chest-XRAY. The positive TB cases were linked to treatment.

Results/Impact: A total of 25,430 clients were screened. Children who accounted for 56% of the total screened. The 55% of the 1,644 presumptive identified and evaluated were children, while the 42% of the 129 TB cases notified were children. The numbers needed to screen (NNS) for adult and children are 149 and 264 respectively, and the number needed to test (NNT) is 10 for adult and 17 for children.

FACILITY (Jan.2023 - Dec.2023)	Screened	Presumptive	Presumptive evaluated	TB cases	Enrolled	% Contribution
State Hospital Ikire (Adult)	11174	737	737	75	75	58%
State Hospital Ikire (Childhood)	14256	907	907	54	54	42%
Total	25430	1644	1644	129	129	100

Conclusions: The 42% childhood TB case contribution in the facility has shown that a greater percentage of the missing TB cases are among the children, hence more resources and commitment should be devoted to case finding in the children.

PP29 From screening to treatment: Enhancing the capabilities

PP29-1067-15 Healthcare providers' knowledge, attitudes, and perceptions of using targeted next-generation sequencing on stool to diagnose drug-resistant TB in Eswatini

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Background: Challenges in diagnosing drug-resistant TB (DR-TB) have contributed to a diagnostic gap that targeted sequencing (TS) on stool has the potential to improve. TS may be faster and more economical for diagnosing DR-TB compared to traditional methods. Eswatini, a low-resource, high MDR-TB burden setting, has implemented TS amplicon kits on sputum specimens, but it is unclear how clinicians perceive TS and its potential use on stool.
We assessed clinicians' knowledge, attitudes, and perceptions of using TS on stool to diagnose DR-TB.
Design/Methods: This was an exploratory, nationally representative, qualitative study investigating clinicians' perceptions of TS on stool for TB diagnosis. We interviewed nine doctors, eight nurses, and the DR-TB director for the National TB Control Program. Semi-structured interviews were analyzed by directed thematic analysis.
Results: Most providers are aware of the use of stool as a specimen for diagnosing TB in pediatric cases, although there is less awareness regarding its use for sequencing. Stool-based testing is viewed as essential for diagnosing TB and DR-TB in children, providing an alternative where traditional methods may fail, and offering quicker results due to easier specimen collection.
Providers anticipate potential confusion and resistance among patients regarding stool-based diagnosis and there are mixed perceptions among providers about their peers' acceptance of stool-based testing for DR-TB.
Providers feel there's insufficient information about sequencing on stool and desire more comprehensive training before implementation.
Despite these challenges, providers see the potential benefits of stool-based testing for pediatric DR-TB diagnosis and express interest in expanding its use to diagnose adults.

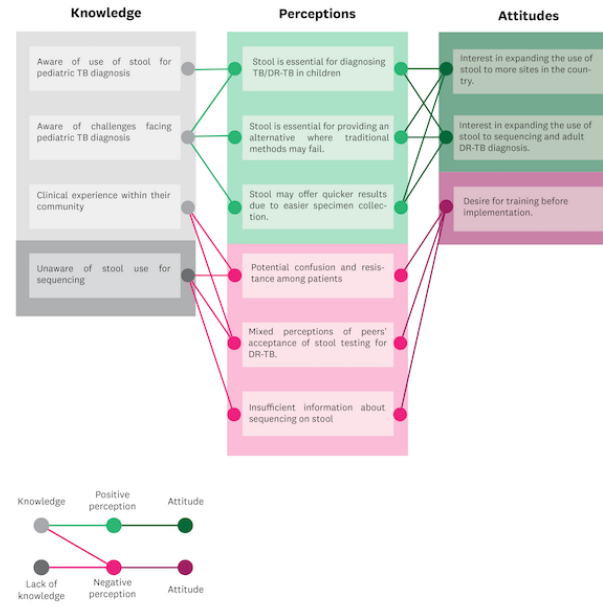

Figure 1. DRTB healthcare providers' knowledge attitudes and perceptions of using targeted sequencing on stool for DRTB diagnosis. Nodes and lines represent connections between knowledge, perceptions, and attitudes. Light grey nodes represent knowledge held by clinicians, while dark grey nodes represent a lack of knowledge. Light green nodes and connections represent positive perceptions, while light pink nodes and connections represent negative perceptions. Dark green and maroon connections and nodes represent attitudes shaped by positive or negative perceptions.

Conclusions: While providers recognize the potential benefits of sequencing on stool, they are concerned about patient acceptance and a lack of information regarding effectiveness.
Addressing these specific concerns will be crucial for implementing stool-based testing for TB diagnosis in pediatric and adult populations.

PP29-1064-15 The potential outlook of artificial intelligence in active TB detection: Achievements demonstrated through the implementation of PDX-CAD in remote communities in Anambra State

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Background: In the contemporary era of digitalization, artificial intelligence (AI) has been extensively explored for its practical applications in the field of medicine. These applications encompass a range of functionalities, such as image processing, disease diagnosis, and predictive analytics, demonstrating significant success and promise within the medical domain. Challenges still exist in the coverage of potable digital X-ray with computer-aided detection (PDX-CAD).
This study is aimed at evaluating the potential and outlook of artificial intelligence in active tuberculosis case detection and its achievements demonstrated through the implementation of PDX-CAD in remote communities in Anambra state.

Design/Methods: As part of a USAID-funded initiative, KNCV Nigeria is conducting tuberculosis (TB) screening in Anambra, employing the PDX-CAD system. Individuals scoring ≥50 are identified as presumptive cases and undergo further evaluation with diverse diagnostic tools to confirm TB. Data from September 2022 to January 2024, sourced from KNCV Nigeria's intervention database, was analyzed for metrics including persons screened, presumptive cases identified, and diagnosed TB cases, using descriptive statistical methods.
Results: A total of 16,059 clients were screened for TB using PDX-CAD, with a 14% (2243) presumptive yield and 100% evaluation rate. Clients diagnosed to have TB are 16% (366).
Conclusions: The outcomes reveal a notable achievement with a 14% presumptive yield and a 16% TB yield, underscoring the effectiveness of PDX-CAD as a TB screening tool. The deployment of more of this tool will further narrow the gap in identifying missing TB cases.

PP29-1065-15 Evaluation of VinBrain DrAid CAD software performance for TB detection on digital chest X-ray images

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Background: In 2021, the World Health Organization (WHO) released new guidelines which recommended the use of three computer-aided detection (CAD) software platforms for the interpretation of chest X-ray (CXR) images during TB screening. Since then, new CAD software platforms have come to market. We conducted an independent, retrospective evaluation of the FDA-approved DrAid CAD software platform (VinBrain, Vietnam).
Design/Methods: A test library containing 1,466 DICOM files was compiled from a community-based TB screening initiative in Vietnam. The library was blindly re-read by 10 TB clinicians from public and private TB treatment facilities in Ho Chi Minh City and also processed using the DrAid and INSIGHT CXR (Lunit, South Korea) CAD software.
The DrAid CAD software's performance was compared to the average performance of the human readers and the WHO-recommended INSIGHT CXR CAD software using an abnormality score threshold which matched the human reader sensitivity and a second threshold corresponding to 90% sensitivity.
Results: The human readers achieved an average sensitivity and specificity of 79.0% and 84.8% respectively. At a score threshold of 0.530, the DrAid CAD software achieved roughly the same sensitivity and a significantly higher specificity of 94.0% (p<0.001).
At a score threshold of 0.205, the DrAid CAD software achieved a sensitivity of approximately 90% and a specificity of 81.5%.
This performance was again significantly better than the human readers (p<0.001), and equivalent to the INSIGHT CXR CAD software with an abnormality score threshold calibrated to the same sensitivity (p=0.847).

	Score Threshold	Sensitivity (95% CI)	Specificity (95% CI)	P-Values	
Human Readers	N/A	79.0% (75.4%-82.2%)	84.8% (84.2%-85.3%)	Ref	N/A
DrAid CAD Software	0.530	79.3% (66.7%-88.8%)	94.0% (92.7%-95.2%)	<0.001	N/A
	0.205	89.7% (78.8%-96.1%)	81.5% (79.4%-83.5%)	<0.001	0.847
INSIGHT CXR CAD Software	0.340	89.7% (78.8%-96.1%)	82.4% (80.3%-84.4%)	N/A	Ref

Table.

Conclusions: DrAid CAD software outperforms human readers in Vietnam, has equivalent performance to a WHO-recommended CAD software platform, and meets the Target Product Profile criteria for a community-based referral test for identifying people with suspected TB.
Future studies may prospectively evaluate the performance of this platform during a community- and facility-based TB screening initiatives.

PP29-1062-15 AI-powered chest X-ray screening and point-of-care applications for TB household contact tracing at rural health facilities in Maharashtra

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Background and challenges to implementation: Ashakalp Healthcare Association, in partnership with STOP TB partnership, assists Community Health Workers (CHWs) in conducting TB Household Contact (HHC) screening in Osmanabad district, Maharashtra, (part of Niti Aayog's Aspirational Blocks Programme).
With promising evidence, Artificial Intelligence (AI) has proved to aid in flagging potential TB cases for further evaluation, thereby assisting CHWs in managing and controlling the spread of TB within at-risk populations.

Intervention or response: The Qure.ai's qXR and Qure application were deployed at 11 secondary health facilities to triage and track presumptive TB patients. A total of 1,738 patients were screened using Chest X-Ray and CAD as part of the active and contact screening strategy from these facilities between July 2023 and March 2024.
Following the National TB Elimination Programme protocol, sputum samples were collected from presumptive TB patients, analysed using smear test and GeneXpert, and treatment was initiated for confirmed TB-positive patients based on microbiological confirmation or clinical evaluation by chest physician.
Results/Impact: This retrospective analysis included chest X-rays from 1738 patients, with 266 patients (15.3%) flagged as presumptive TB due to radiological signs. Further, based on data availability, information on sputum collection was available for 226 (85%) patients. Among these cases, 45 (20%) were confirmed as TB positives, with diagnoses distributed between microbiological (53.3%) and clinical (46.6%) assessments.
The positive predictive value of qXR in identifying true TB positives with 95% confidence interval is found to be 0.20 (0.15, 0.27).Here 13% in mentioned as a percentage of total patients (1738) where as confirmed cases is a percentage of sputum collected individuals.
Conclusions: This study demonstrates the utility of AI by CHWs, to access real-time patient data and facilitate HHC screening among contacts with follow-up. Additionally, qXR AI serves as a clinical aid to chest physicians for interpreting chest X-rays, identifying potential TB cases, and assisting in diagnosis.

PP29-1063-15 Ultraportable X-ray with CAD: Transitioning from pilot to national scale up in Uzbekistan

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Background and challenges to implementation: Over the past decade, Uzbekistan has made significant strides in reducing TB incidence and mortality rates. However, the country continues to face challenges with high rates of MDR-TB. The key to treating effectively and preventing its spread is early and accurate diagnosis.
Traditional diagnostic methods often fall short, particularly in remote areas with limited healthcare infrastructure and expertise.

Intervention or response: To bridge the gap between estimated and notified TB cases, widened due to COVID-19, Uzbekistan NTP prioritized the implementation of modern screening methods, ACF activities, and improved access to WRDs. In October 2022, NTP launched TB screening using two ultraportable X-ray machines (PDX) combined with Computer-Aided Detection (CAD) systems. This initiative, supported by USAID's TIFA project, marks a substantial advancement in TB case detection, particularly in underserved settings. The portability of PDX and the CAD analytical capabilities facilitate the identification of individuals likely to have TB.
Results/Impact: Following the pilot's success, which screened 980 individuals and identified 13 TB cases, NTP with Global Fund support, is expanding the use of PDX with CAD nationwide, deploying from 2023 additional 15 systems. This method has proven more efficient, sensitive, and specific than traditional X-ray screening without CAD, identifying 42 confirmed TB cases among 14 000 individuals screened. The increase in detection rate is attributed to intensified screening and outreach programs targeting high-risk and underserved populations.

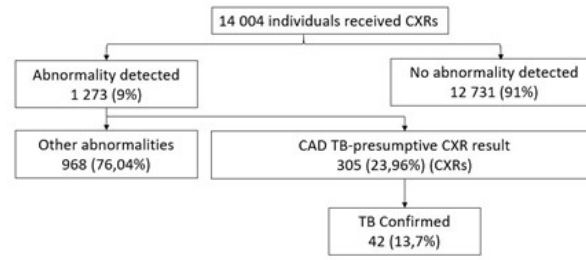

Figure. Evaluate TB-vulnerable populations by respiratory symptoms and TB risks.

Conclusions: The promising pilot results have led to a new Global Fund funding request, including an additional 28 PDX with CAD. The adoption of PDX with CAD has not only expanded Uzbekistan's screening and diagnostic capabilities but also enhanced accessibility and optimized the diagnostic process. This expansion is a critical step toward improving TB prevention and care in the country, aiming to increase the TB treatment coverage rate and close the gap between estimated and notified TB cases.

PP29-1068-15 Knowledge, attitudes, and practices of artisanal and small-scale miners regarding TB, human immunodeficiency virus, and silicosis in Zimbabwe

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Background and challenges to implementation: In Zimbabwe, ASMs have a high prevalence of tuberculosis (TB), human immunodeficiency virus (HIV), and silicosis. Previous studies on ASMs utilized program data, and it was not possible to understand reasons for the high prevalence of these comorbidities. Common morbidities include TB, silicosis, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), sexually transmitted infections (STIs), malaria, malnutrition, and mercury neurotoxicity.

The study aimed to inform targeted interventions to address this triple burden among the artisanal and small-scale mining population.

Intervention or response: We conducted a cross-sectional study on a sample of 625 ASMs to investigate the knowledge, attitudes, and practices of ASMs regarding TB, HIV, and silicosis.

What is particularly concerning is the high proportion of young people who are affected. Silicosis or silica dust exposure poses a lifetime three- to four-fold increased risk of TB infection, while the risk of TB in patients with HIV and silicosis is in excess of 15-fold.

Results/Impact: Artisanal and small-scale miners were knowledgeable, (80%), that TB is a curable disease and that they had a higher risk of TB compared to the general population, (87%). However, they were less likely to know that HIV increases the risk of TB disease, (52%), with only (35%) who perceived the risk of TB infection to be high among ASMs.

Almost 50% cited lack of money to pay for medical fees, followed by barriers such as long distances to clinics. ASMs had positive attitudes about seeking healthcare services whenever they are unwell and accessing TB, HIV, silicosis screening and testing.

Conclusions: Effective control of TB, silicosis, and HIV among ASMs requires addressing the identified knowledge gaps and barriers that are faced by ASMs in accessing personal protective equipment and healthcare services. This will require multisector collaboration and the involvement of ASMs in co-designing a package of healthcare services that are tailored for them.

PP25 COVID-19

PP25-1034-15 Differentiated service delivery for TB services during COVID-19 in Lusaka and Livingstone, Zambia

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Background: During COVID-19, the Ministry of Health approved differentiated service delivery of anti-TB treatment (ATT) to decongest facilities and assure continuity of care amid COVID-related health services disruptions.

Design/Methods: We offered client-centered DSD ATT from February to September 2022 to clients with drug-susceptible TB in five health facilities. Services included multi-month dispensing and phone or home visits to reduce in-person clinic visits while assessing adherence and side effects at six points during their six months of ATT. Clients returned to clinics at months two and five for smear microscopy. For comparison, we assessed historical treatment outcomes from the five facilities from February–September 2018.

Results: Of 1579 TB clients enrolling in ATT and offered DSD, 970 (61%) elected to receive DSD ATT. Of these, 276 (29%) were HIV-positive, 651 (67%) were male, and 917 (94%) had pulmonary TB. DSD reduced in-clinic visits for ATT from seven under traditional models to two in DSD. Successful phone/home visit outreach fluctuated across the six outreach time points from 615 (63%) to 832 (86%) clients reached. Throughout ATT, 225 (23%) clients reported any adverse event (AE) with a total of 958 AE reported. Of 200 AE receiving a clinical review, 190 (95%) were mild or moderate. During clinic visits at months two and five, 7/887 (1%) and 4/815 (0.5 %) clients were smear positive, respectively. Treatment outcomes were 808 (83%) treated successfully [325 (34%) cured, 483 (50%) completed treatment], 47 (4%) lost to follow-up, 41 (4%) not evaluated and 47 (7%) died. In 2018, 84% of clients on ATT were treated successfully at the same facilities.

Conclusions: This DSD model ensured robust adherence and adverse event screening while achieving treatment outcomes similar to historical performance. However, remote follow-up can be challenging; monitoring responsiveness to DSD approaches may enable adjustments to service delivery.

PP25-1027-15 Analysis of COVID-19 mortality, incidence, and vaccination incompleteness in the state of São Paulo (2020-2024)

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Background: Vaccination is a strategy to contain the progression of COVID-19 cases and deaths. Delay in vaccine procurement by the political sphere and the infodemic of fake news may have influenced vaccine adherence, causing repercussions in case incidence and mortality. The study aimed to identify areas with spatial association of COVID-19 case incidence and mortality rates, as well as vaccination incompleteness in the state of São Paulo, Brazil.
Design/Methods: An ecological study conducted in the state of São Paulo, Brazil, comprised COVID-19 incidence and mortality rates from 2020 to 2024, calculated from cases, deaths, and vaccine doses administered, obtained from the Ministry of Health's Coronavirus Panel. The Getis-Ord GI* technique was used to identify areas with spatial association, with clusters of high (Hotspots) and low (Coldspots) intensity.
Results: COVID-19 incidence rates (A), mortality (B) and vaccination incompleteness (C) in São Paulo are depicted in Figure 1.

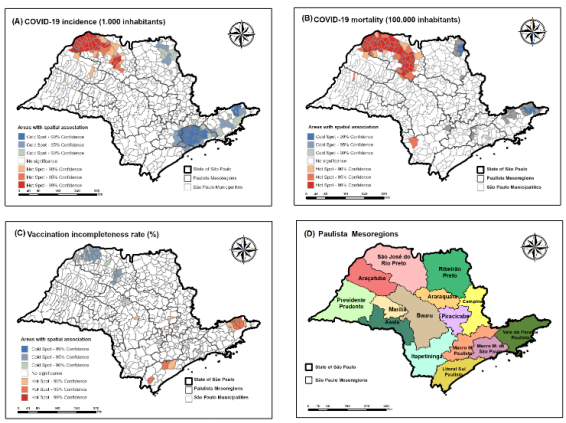

Figure 1. Clusters of COVID-19 cases, mortality and vaccination incompleteness in the state of São Paulo, Brazil, 2020-2024.

Areas with high incidence and mortality have low vaccination incompleteness, while regions with low incidence and mortality have high vaccination incompleteness.
Conclusions: Identifying priority areas for COVID-19 cases is necessary to develop educational actions on COVID-19 protection measures in these priority locations, supporting discussions and formulations of actions focused on these areas. Regarding vaccination coverage, vaccination campaigns and awareness among the population are necessary, considering the impact of the pandemic in these areas.

PP25-1031-15 Modelling the economic burden of TB in Myanmar: A comparative study of pre-COVID-19, COVID-19 and post-coup eras (2018-2022)

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Background: Myanmar, among the top thirty countries burdened with tuberculosis (TB) and multi-drug resistant (MDR) TB, had made significant strides in TB reduction until 2019. However, the emergence of the COVID-19 pandemic in 2020, followed by a military coup in 2021 and 2022, reversed these achievements. Thousands of TB cases were missed during 2020-2022, likely resulting in a substantial economic burden, which this study aims to examine.
Design/Methods: A decision tree model simulated TB progression annually from 2018 to 2022. Model parameters were sourced from World Health Organization reports and literature. Costs were calculated from the patient perspective.
Results: Patients' economic burden of TB peaked in 2022 at US$1.8 billion, followed by US$1.7 billion in 2021, US$1 billion in 2020, and US$789 million in 2018, with the lowest burden of US$743 million in 2019. Missed TB cases and productivity loss constituted the largest proportion of the economic burden. TB burden accounted for 2.9% of gross domestic product (GDP) in 2022 and 2021, 1.4% in 2020, 1% in 2019, and 1.1% in 2018.
Conclusions: The study underscores the detrimental impact of COVID-19 and political turmoil on the economic burden of TB in Myanmar. Efforts to mitigate the burden should focus on locating and treating missed TB cases, particularly among displaced persons and those in conflict zones. Strategies include international partnerships with local organizations, cross-border aid delivery, and advocacy to ensure safe access to healthcare in conflict-affected areas.

PP25-1028-15 A community-driven digital movement to bolster COVID-19 vaccine uptake in Karachi, Pakistan: An overview of Jeelo Dobara (Live Life Again)

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Background and challenges to implementation: In Pakistan, vaccine hesitancy is fueled by endemic misinformation, lack of awareness, and limited access. Initial COVID-19 vaccine drives may not have meaningfully engaged marginalised urban communities with low formal literacy and access to quality services. Mass media campaigns focused on improving medical knowledge to promote uptake without addressing communal concerns and social barriers to vaccination.
Intervention or response: IRD's *Jeelo Dobara* (Live Life Again) leveraged immersive community engagement and interactive social media to enhance vaccine uptake in three of Karachi's low-uptake districts. IRD developed a volunteer grassroots leaders group to bridge digital efforts with on-ground activities, utilising Theater of the Oppressed (TO) performances, COVID-19 awareness sessions, and gamified social experiences through Below-the-Line (BTL) activations. *Jeelo Dobara* captured lived experiences through online communities on WhatsApp and Facebook, and amplified voices via digital campaigns, where micro-influencers boosted messaging around COVID-19 vaccinations, incorporating socioeconomic, scientific, and health themes.
Results/Impact: The six-month project engaged 40 grassroots leaders, collaborating on 296 information sessions with 3069 individuals (M=38%, W=62%). 30 TO performances engaged 782 (M=52%, W=48%) audience members, and 15 BTL activations involved 1905 individuals. On-ground efforts supported recruitment for six online communities hosting 1425 members (M=58%, W=42%). Amplifying communal voices, 30 micro-influencers participated in five digital campaigns across six social media platforms. This community-driven digital movement mobilised 1039 individuals (M=54%, W=46%) towards 21 integrated camps offering COVID-19 and childhood immunisations.
Conclusions: *Jeelo Dobara*'s hybrid approach prioritised community involvement at a time when the pandemic fractured collectivity. The digital groups fostered trusted networks, enabling safe spaces for dialogue on multiple health/social concerns. Lived experiences shaped content and strategies for on- and offline engagement, further tailored by insights from group discussions about COVID-19, vaccines, and other health needs. Messages embedded in social realities enhance engagement and can be utilised for health promotion.

PP25-1032-15 Changes in private healthcare service delivery during the COVID-19 pandemic and potential impacts on TB care

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Background: The COVID-19 pandemic changed many aspects of healthcare services and delivery. However, little is known to what extent the COVID-19 pandemic affected private healthcare providers (i.e., private healthcare facilities [HCFs] and private practitioners [PPs]), and how this potentially impacted tuberculosis (TB) care.
We aimed to describe changes in spread, characteristics of providers, and services offered before and during the COVID-19 pandemic.
Design/Methods: We conducted a cross-sectional survey among 36 randomly selected community health centers areas in Bandung, Indonesia, from April to December 2021 (i.e., during the COVID-19 pandemic). Data before the COVID-19 pandemic was abstracted from a similar survey conducted in 2017 (i.e., INSTEP study). We obtained latitude and longitude coordinates of HCFs and then compared them with INSTEP study data.
We compared characteristics and services offered before vs. during the COVID-19 pandemic using descriptive and bivariate analyses.
Results: We surveyed 367 private HCFs and interviewed 637 PPs during the study period. The spreads of private providers between the two studies were similar (Figure 1a&b).
Compared to before the COVID-19 pandemic, the number of operating HCFs decreased by 3% during our study period (401 vs. 412). A quarter (60/235, 25.3%) of operating private HCFs we interviewed had to close their facility temporarily during the pandemic.
The number of practicing PPs also decreased by 7% (872 vs. 936), although the number of those seeing individuals with presumptive TB disease increased by 7.2% (42.9%

vs. 35.7%, p=0.008). We also observed increased capacities, including laboratory service (37.8% increase), x-ray service (66.7% increase), and pharmacy (18.1% increase) during our study period.

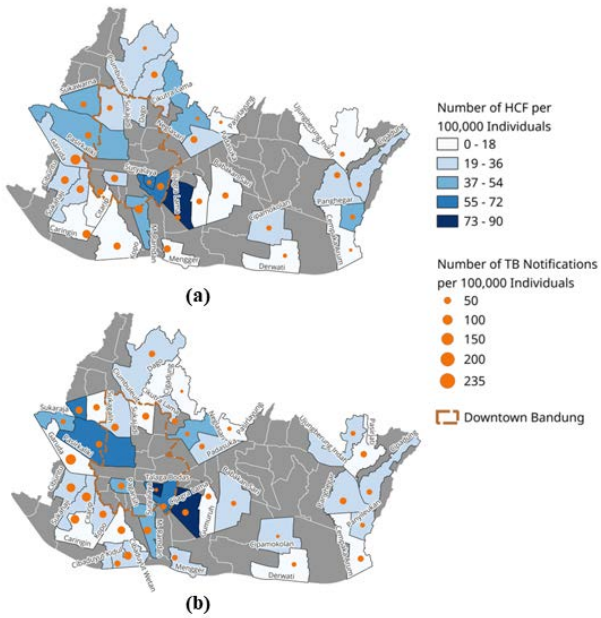

Figure 1. Maps of private healthcare facilities' density and TB notification rates relative to population size were included in study areas during INSTEP (a) and COVET (b) study periods, Bandung, Indonesia.

Conclusions: This study confirmed that the COVID-19 pandemic adversely impacted private healthcare service deliveries, largely marked by facility closures. The increased diagnostic and pharmacy services during the COVID-19 pandemic made a more compelling case to further implement the public-private mix model for TB care in Indonesia.

PP25-1026-15 Developing a reproducible quality COVID-19 RDT proficiency testing scheme: A rapid response to quality assured COVID-19 point of care testing

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Background and challenges to implementation: Diagnostic testing for SARS-CoV-2 went through changes during the pandemic from centralized testing centers to full scale point of care testing. As the pandemic progressed in 2021, numerous test kits were rolled out without a robust quality assurance system such as proficiency testing(PT) in place. A PT panel prepared in form of liquid matrix for the detection of SARS-CoV-2 by RDT was optimized at Supranational Reference Laboratory Uganda as the first of its kind and later rolled out to 766 laboratories in 12 LMICs.

Intervention or response: The PT materials were prepared using characterized strains of SARS CoV-2. Panel optimization was done using varying concentrations of buffers to ensure homogeneity and stability. A pilot round was done and ISO 17043:2010 accreditation achieved in 2022. A full PT round was sent to 766 participants in 12 countries including Angola, Eswatini, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Tanzania, Uganda and Zambia. Results were reported and analyzed using the SRL online PT system.

Results/Impact: Homogeneity testing with 10% testing per panel ID yielded 100% testing accuracy agreement across different brands of Antigen RDT kits used. Of the 766 participants that were enrolled, 406 (53%%) were able to submit results before the closing date. Of the 360 that did not submit results, only 06 (1.7%) gave reasons. The Panel sensitivity and specificity among participants stood at 95.42% and 91.01% respectively. This put the testing accuracy at 92.77% {95%CI 78.23%,100%}. The invalids accounted for 1% (22/2186) of entire tests done in this RDT proficiency testing round.

Conclusions: The NTRL SARS-CoV-2 RDT PT scheme developed proved to be robust, affordable and relevant especially now at a time when COVID-19 testing has been scaled up as part of routine testing in LMICs and will serve to ensure continued quality assured testing and strengthen pandemic preparedness systems.

PP25-1033-15 SARS-CoV-2 prevalence and TB treatment response in prospective cohort of persons with active TB disease in Kenya

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Background: Tuberculosis (TB) and COVID-19 are among the leading causes of mortality worldwide. Much remains unknown about disease progression and outcomes of TB patients with SARS-CoV-2 infection. We evaluated SARS-CoV-2 infection, clinical progression and outcomes among patients on TB treatment in Kisumu, Kenya.

Design/Methods: Patients newly diagnosed with bacteriologically-confirmed TB at 62 public health facilities in Kisumu County between April and July 2022 were

enrolled and followed through their 6-month treatment. At baseline, all patients were screened for SARS-CoV-2 by antigen and antibody testing. Patients testing negative were re-screened at their 2-month and 6-month follow-up visits or upon report of COVID-19 symptoms or close contact with a known case. Demographic and clinical data, including TB treatment outcomes, were captured using routine programmatic tools. Associations were assessed by logistic regression.

Results: The study enrolled 200 TB patients. Two-thirds of patients were men and median age was 38.4 years (IQR: 30.2, 48.0). At baseline, 12 (6%) patients were antigen-positive and 97 (48.5%) were antibody-positive for SARS-CoV-2. By month 6, 161 (80.5%) patients tested either antigen- or antibody-positive for SARS-CoV-2.

At month 6, 158 (79.0%) TB patients were cured, 19 (9.5%) completed treatment, 1 (0.5%) had drug resistance, 4 (2.0%) were lost to follow-up, 11 (5.5%) had no TB treatment outcome assigned and 7 died (5 TB-only, 2 with SARS-CoV-2 infection).

Patients with SARS-CoV-2 infection were more likely than TB-only patients to be cured or complete treatment (OR=4.9; 95% CI: 2.0, 12.1). Risk factors of HIV co-infection, history of diabetes, body mass index and prior TB disease did not differ between groups.

Conclusions: TB patients with SARS-CoV-2 infection had higher TB treatment success rates and lower mortality compared to TB-only patients. These unexpected outcomes suggest closer monitoring of patients with co-morbid conditions can improve adherence to treatment guidelines and clinical outcomes including mortality.

PP25-1029-15 Lessons learned from Pakistan's COVID-19 response to build resilient health systems and future preparedness

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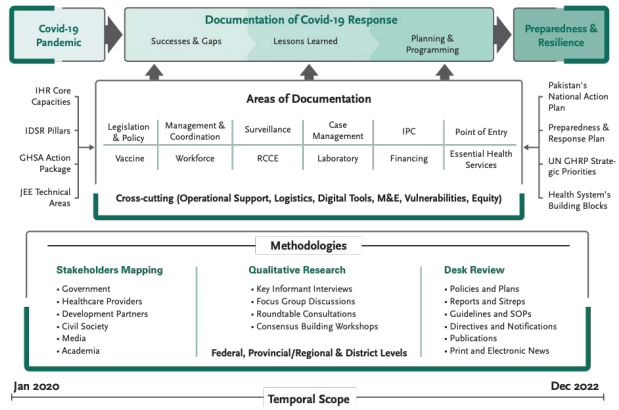
Background: COVID-19 has transitioned from global emergency to an ongoing health issue and countries must focus on sustaining the capacity gains and lessons learned to build their resilience. In this backdrop, Pakistan's Ministry of National Health Services, Regulations, & Coordination commissioned this research to explain how the country strategically realigned itself, enhanced its capacities, overcame challenges, suffered insufficiencies, and implemented plausible solutions to tackle the pandemic.

Design/Methods: The research framework took a participatory approach to engage diverse stakeholders through key informant interviews, roundtable consultations, and focus group discussions, and applied thematic analysis for categorising and classifying overarching themes to elicit lessons learned and recommendations. Literature, comprising of strategic and operational documents, publications, and media reports, was extensively reviewed covering the entire temporal span of the pandemic.



Results: Pakistan's response in early 2020 demonstrated remarkable level of foresight, surpassing global understanding at that time. The government established National Command and Operation Center (NCOC) to address COVID-19 as a cross-cutting issue, extending beyond health sector. Success of this platform was attributed to factors such as data-driven decision-making, nonpartisan collaboration, clear and effective public messaging, and fairness and transparency in rollout of vaccine. Implementation of public health measures and non-pharmaceutical interventions, particularly the strategy of smart and micro lockdowns proved effective in securing livelihoods and saving the country from an economic meltdown. Despite lacking a surveillance system, effective utilization of existing polio surveillance network provided a significant advantage. However, the pandemic also exposed vulnerabilities in the healthcare system, including disparities in infection prevention and control practices, workforce challenges, and disruptions to essential health services.

Conclusions: Pakistan tackled COVID-19 with a whole-of-nation approach. While the lessons learned will continue to shape the nation's health resilience, Pakistan's experience offers valuable insights for global community, emphasizing importance of a holistic, adaptable, and inclusive approach to pandemic response.

PP25-1030-15 Antivirals Introduction in the COVID-19 management in Senegal through Test to Treat (T2T) pilot project implementation

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Background: In Senegal, several Covid 19 Care strategies were developed . In December 2022, Covid 19 vaccination coverage was low and the risk perception decreased. Thus, the use of antivirals in the COVID-19 mild or moderate forms with risk of serious health outcomes were included in national care guidelines.
In this context, FHI 360 supported the Ministry of Health to implement a test to treat (T2T) pilot project for the introduction of antivirals to improve health outcomes of Covid -19infected patients.
Design/Methods: This is a qualitative and quantitative approach with the aim to describe the process of introducing antivirals (Nirmatrelvir /r: Paxlovid) in 4 health districts (Center, South Guediawaye and Thies) form October 2022 to February 2024. The T2T pilot targeted providers, general population and patients screened for covid 19. Data collection was done using standardized questionnaires (tested positive and under antivirals) and interviews.
Results: This process started with the needs quantification and the provision of 1,450 Paxlovid boxes in sites enrolled. A clinical and community coordination mechanism was set up to promote risk communication, community and providers engagement. 174 providers were trained on T2T approach. Interviews with 40 stakeholders permitted to identify low-risk perception and screening offer determinants and to develop communication materials. The quality improvement model allowed to increase Covid 19 demand care. Effective implementation in July 2023 allowed to disseminate 194 audiovisual spots, 4150 promotional materials, 2600 displays and digital campaign.
Overall, 10,944 presumptive cases were received, they were all 15 year or older; 6347 (58%) were female. 7,077 (67%) were tested; 835 (12%) were COVID-19 positive; 742 (89%) were initiated on Paxlovid. The tolerance was good and the evolution favorable in 735 patients (99%).
Conclusions: With good coordination, we observed a smooth introduction of T2T approach and a favorable evolution.

PP26 Impact of COVID-19 on TB programmes

PP26-1036-15 Over rebound of tuberculosis burden in the post-COVID-19 pandemic period of East Java, Indonesia

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Background: Worldwide, tuberculosis (TB) notification cases were reduced during the coronavirus disease 2019 (COVID-19) pandemic. A reduction was also seen in East Java, Indonesia's second-heaviest TB burden province. In recent observations, the TB burden has risen after the pandemic. In this study, we aim to check the details of the changes among the population subgroups in East Java.
Design/Methods: We analyzed the national TB surveillance data to identify trends and patterns in the data on TB notifications and TB-related deaths in East Java. We considered three periods: pre- (2018-2019), during (2020-2021), and post-COVID-19 pandemic (2022-2023). We stratified the study population by sex, age and region.
Results: The table summarizes the changes. Generally, TB notification cases were reduced from 2018-2019 to 2020-2021 by one-fifth. There was a strong gradient of change at this transition by age group, that is, a 30.4% rise in the under-5 age group compared to a 47.6% reduction in the elderly. The rises were observed in two urbanized regions of Bojonegoro and Pamekasan. The notification rate then rebounded in 2022-2023 at 31.9% from the 2018-2019 baseline, with an extraordinarily high 391.7% increase in the under-5 age group. TB-related death persistently rose throughout the study period, most seriously up to 6.5 times increase in the under-5 age group.

Variables	TB notification (N)			Change (%)		TB-related deaths (N)			Change (%)	
	2018-2019 (pre-COVID-19 pandemic)	2020-2021 (during COVID-19 pandemic)	2022-2023 (post-COVID-19 pandemic)	$\left(\frac{b-a}{a}\right)$	$\left(\frac{c-a}{a}\right)$	2018-2019 (pre-COVID-19 pandemic)	2020-2021 (during COVID-19 pandemic)	2022-2023 (post-COVID-19 pandemic)	$\left(\frac{e-d}{d}\right)$	$\left(\frac{f-d}{d}\right)$
	a	b	c			d	e	f		
Overall	125042	100199	164956	-19.9	31.9	4237	5802	10970	36.9	158.9
Sex										
Male	68946	56168	92439	-18.5	34.1	2668	3850	7015	44.3	162.9
Female	56096	44031	72517	-21.5	29.3	1423	1952	3955	37.2	177.9
Age group (years)										
<5	2229	2906	10961	30.4	391.7	12	30	90	150.0	650.0
5-18	8263	8045	15990	-2.6	93.5	82	194	344	136.6	319.5
19-49	57881	50780	72157	-12.3	24.7	1335	2299	3732	72.2	179.6
50-69	46361	33063	55363	-28.7	19.4	2096	2582	5196	23.2	147.9
>70	10308	5405	10485	-47.6	1.7	566	697	1608	23.1	184.1
Region										
Madiun	20946	14351	24246	-31.5	15.8	922	1022	1539	10.8	66.9
Bojonegoro	18773	20901	35773	11.3	90.6	568	1039	2085	82.9	267.1
Malang	38691	32807	56448	-15.2	45.9	926	1609	3716	73.8	301.3
Pamekasan	8333	9660	14736	15.9	76.8	183	565	979	208.7	435.0
Jember	38299	22480	33753	-41.3	-11.9	1492	1567	2651	5.0	77.7

Conclusions: The serious rebound of TB notification cases and TB-related deaths and persistent sharp rise in the under-5 age group and the urban region indicated that the TB burden has become more serious following the concealing effect of the COVID-19 pandemic.

PP26-1040-15 Navigating challenges: Implementing TB interventions amidst COVID-19 restrictions in Myanmar

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Background and challenges to implementation: Soon after the COVID-19 outbreak in Myanmar in March 2020, prompting the government to announce measures to avoid crowds and implement COVID preventive protocols across all sectors. Due to these restrictions and roadblocks, The Asian Harm Reduction Network (AHRN) could not implement its Active Case Finding (ACF) activity among the community. Moreover, as part of these measures, AHRN suspended recreational services at all its Drop-in Centers (DIC).

Because of these COVID-19 restrictions and roadblock, accessing TB services became challenging for the community, particularly for people who inject drugs (PWID/PWUD), who are more hidden and reluctant to access regular healthcare services.

Intervention or response: AHRN developed COVID-19 operational and programmatic contingency planning and response guidelines. Following WHO and national guidelines, AHRN formulated COVID-19 screening questions, implemented at all Drop-In Centers (DICs). With recreational activities suspended, available space in DICs facilitated clinic attendance. COVID-19 screening booths were established at DIC entrances, ensuring clients undergo COVID-19 screening before entry.

Simultaneously, clients are screened for TB, leveraging bidirectional diagnosis due to symptoms overlap between TB and COVID-19.

Results/Impact: From January 2022 to December 2023, a total of 5,414 clients underwent screening for both COVID-19 and TB. Among them, 302 were diagnosed with TB, with 148 being bacteriological and 154 clinical diagnoses. All people diagnosed with TB promptly received anti-TB treatment.

Furthermore, AHRN's treatment facilitators and DOTS providers conducted regular follow-ups with clients at their homes, minimizing the need for them to visit DICs. Only essential visits to DICs were requested for follow-up appointments.

Conclusions: AHRN's integration of COVID-19 and TB screening illustrates proactive healthcare delivery during the pandemic. With swift TB diagnosis and treatment initiation, complemented by home-based follow-ups, AHRN ensures ongoing care while reducing clinic visits. This approach reflects AHRN's commitment to adapting services, including bidirectional diagnosis for TB and COVID-19, to meet community needs amidst challenging circumstances.

PP26-1038-15 Integration of TB screening into a COVID-19 vaccination campaign to find missing people with TB in Tigray Regional State, Ethiopia

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Background and challenges to implementation: The TB program was severely impacted due to the protracted war in Tigray that resulted in disruption of the health system that led to an increase in missed TB cases. Among the interventions to find missed TB cases is the integration of TB screening into outreach services like in COVID-19 vaccination campaigns.

Intervention or response: Among 82%(76/93) of districts included in the nationally supported 2nd-round COVID-19 vaccination campaign, the USAID Eliminate TB Project integrated TB screening in 83%(63/76) of them from Aug 15-25, 2023. The project availed TB/COVID-19 registers and provided orientation to health care workers who participated in the campaign.

Results/Impact: About 97%(824,364/849,225) of the COVID19 vaccinated individuals were screened for TB, of which 0.7%(5,525) presumed TB cases identified. About 23%(1,256) of the presumed TB cases were tested on appointment to nearby health facilities by GeneXpert. Fifty-five(4.3%) TB cases were detected, among which 3(0.25%) were rifampin resistant (RR). Furthermore, other 11 became smear positive pulmonary TB cases through AFB microscopy test, and 34 individuals were clinically diagnosed TB cases.

Indicator	Performance
Number of individuals screened for TB	824,364 (97.1%)
Individuals identified with presumed TB and appointed to health facilities	5,525 (0.7)
Number of individuals tested with GeneXpert	1,256 (22.7%)
MTB not Detected	1,161 (95.5%)
MTB detected RR not detected	52 (4.3%)
MTB detected RR detected	3 (0.3%)
Smear positive pulmonary TB cases through AFB microscopy , Xpert not tested	11
Diagnosed clinically (PNeg and EPTB)	34

Table: Integration of TB screening into COVID-19 vaccination, August 15-25, 2023 in 63 district of Tigray regional state, Ethiopia (n=849, 225)

Overall, a total of 97 all forms of drug-susceptible (DS) and 3 drug-resistant (DR) TB cases were notified, which accounted to 6.6%(97/1,472) of DS- and 42%(3/7) of DR-TB cases notified in the quarter where the campaign was conducted.

Conclusions: Had adequate supply availed with national support and testing integrated at every vaccination site instead of giving appointment, the three-fourths of presumptive TB cases (4,269) would have been GeneXpert tested in this 2nd round COVID19 vaccination campaign. Had TB screening been integrated in the 1st round at least same as the 2nd round, similar number of TB cases could have been notified.

COVID-19 vaccination and other similar community-wide health campaigns shall be an opportunity to find missed TB cases particularly in severely war-affected areas like Tigray.

PP26-1039-15 Examining factors associated with COVID-19 disruptions to TB services

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Background: The COVID-19 pandemic posed unprecedented challenges to global health systems, significantly impacting the delivery of essential health services, including tuberculosis (TB) care.

It is important to analyze the factors associated with the reductions in TB notifications during the pandemic, with a focus on high TB burden countries, to inform strategies for making TB programs more resilient to health system shocks.

Design/Methods: Amongst 98 selected high-burden countries, a GLM analysis was employed to examine the association between 'missed' TB case notifications from 2020 to 2021, and various country-level factors including: COVID-19 mortality estimates, lockdown stringency index, GDP per capita, health expenditure, population density, TB case detection rate (CDR), TB incidence rate, and WHO region.

Results: Disruptions to TB services were driven more by the stringency of restrictions than by the severity of the pandemic itself (see Table). GDP per capita emerged as the sole factor exerting a protective influence against service disruptions.

Unexpectedly, higher levels of health expenditure correlated with greater disruptions in TB services.

Additionally, countries within the Southeast Asia region experienced more severe service disruptions than in the Africa Region.

However, the model accounted for only <50% of the variance observed, suggesting that other unexamined factors may have influenced TB service disruptions.

COVID mortality	0.000012	[-0.00036, 0.00039]
Stringency Index	0.20*	[0.0036, 0.39]
GDP per capita†	-0.044*	[-0.08, -0.0081]
Health Expenditure†	0.18**	[0.055, 0.31]
Case Detection Rate†	0.19	[-0.09, 0.48]
WHO Region: EMRO¶	0.0134	[-0.19, 0.22]
WHO Region: SEARO¶	0.33***	[0.14, 0.51]
WHO Region: EURO¶	0.19	[-0.013, 0.39]
WHO Region: WPRO¶	0.10	[-0.086, 0.29]
WHO Region: AMRO¶	0.11	[-0.07, 0.29]

Variables Missed Cases 95% Confidence Interval
* p<0.05, ** p<0.01, *** p<0.001
† Relative to values in 2019
¶ WHO Regions in reference to WHO AFRO

Table 1: GLM analysis results: Associations between country level determinants and 'missed' case notifications

Conclusions: Although several factors are likely to have played a role, our analysis highlights the stringency of restrictions as a driving factor in TB service disruptions. In future such health shocks, those countries experiencing the most stringent restrictions, rather than those with the greatest pandemic burden, would benefit most from emergency mitigating measures to ensure continuity of TB services.

PP26-1037-15 Impact of COVID-19 pandemic on the notification and treatment outcome of drug-susceptible TB in Mongolia

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Background: Tuberculosis was the top-killing infectious disease caused by a single infectious agent before COVID-19. Global TB Report 2021: TB disease notification rate has dropped to 5.8 million cases in 2020, far shortfalls from the estimated 10 million TB disease. There have been significant difficulties in preventive care services to fight TB, and there have been negative consequences.

Design/Methods: A quantitative retrospective cohort study was employed in this study. The analysis was based on the Nationwide data on tuberculosis occurrence. The DS-TB cases treated successfully or cured were referred to

as the successful treatment. In contrast, the DS-TB cases whose treatment was not successful died, failed, lost to follow-up, moved to DR-TB, or were unevaluated were referred to as unsuccessful.

Results: The DS-TB The regression analysis result was less likely to have a successful drug-susceptible TB treatment outcome during post-COVID-19 than during the pre-COVID era [1.98(95% CI; 1.65 - 2.36)] and pro-COVID-19 era [95% CI; 2.18(1.82 - 2.61)].

Specifically, in the year 2022, it was less likely to have a successful drug-susceptible TB treatment outcome than in the year 2018 [2.09(95% CI; 1.72 - 2.55)], 2019 [1.89(95% CI; 1.57 - 2.29)], 2020 [2.25(95% CI; 1.86 - 2.72)], and 2021 [2.09(95% CI; 1.71 - 2.55)].

Conclusions: The detection, notification, and treatment outcomes of DS-TB were affected during the COVID-19 pandemic. While the detection and notification of new cases decreased during the pandemic, the treatment outcome success increased during this period. Age, gender, residential area, and region were found to be associated with the treatment outcome of DS-TB during the pro-COVID-19 era.

PP26-1035-15 Treatment interruption amongst tuberculosis patients during COVID-19 in West Kalimantan, Indonesia: a retrospective cohort study of 13,924 participants

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Background: Indonesia has a high incidence of tuberculosis (354 per 100,000 residents). Restrictions imposed by the COVID-19 pandemic have hindered access to TB diagnosis and access to treatment globally. Losing patients to follow-up contributed to the spread of drug-resistant TB and the ongoing circulation of the disease within communities.

In Indonesia, the percentage of patients being lost to follow-up (LTFU) during their treatment has increased from (6.9%) in 2021 to (7.1%) in 2022. West Kalimantan Province has the highest LTFU (6,47%) among the five provinces on Kalimantan island.

Design/Methods: This study was conducted retrospectively and included drug-sensitive tuberculosis (DS-TB) patients who were registered in the Indonesian Tuberculosis Information System (SITB) in West Kalimantan Province from 2019 to 2022. We used a Cox proportional hazards model to assess the probability of treatment interruption based on a number of predictors, including age, sex, TB Pulmonary or extrapulmonary, TB Status, HIV infection, DM History. The analysis was visually represented using Kaplan-Meier curves and Cox proportional hazard models.

Results: The study analysed data from 13,924 patients. The incidence rate of treatment interruption was 4.5% among new and 8.5% among retreatment patients. The risk of treatment interruption was highest during the continuous phase of treatment. Older patients >55 years were most likely to interrupt treatment (HR: 18, CI 7.44, 43.7), followed by being HIV-positive (HR: 8.32, CI 6.29, 11.0) and new tuberculosis patients (HR: 0.56, CI 0.35, 0.89). Male patients had a higher risk of treatment interruption. (HR: 1.20, CI 1.02, 1.40).

Conclusions: We find a number of factors that are significantly associated with patients stopping treatment. Our findings support that interventions to retain patients should focus on patients during the continuous phase, older patients and those who have previously been treated, and the promotion of integrated TB and HIV services among public and private facilities.

PP26-1041-15 Impact of South Africa's National post-COVID-19 TB Recovery Plan on TB testing, diagnosis, and treatment initiation in Cape Town, South Africa

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Background and challenges to implementation: The 2022 South African National TB Recovery Plan aimed to counteract the decreases in TB testing and diagnoses observed during the COVID-19 pandemic by increasing testing among at-risk populations and bolstering linkage to care. This study assesses the impact of the recovery plan in Cape Town, South Africa.

Intervention or response: We analysed aggregate data on Xpert MTB/RIF Ultra (Xpert) testing, TB diagnoses, and treatment initiations in 2018 and 2023, obtained from the Western Cape Provincial Health Data Centre. We used summary statistics to describe TB testing volumes, diagnoses, and treatment initiation differences.

Results/Impact: In 2018, 105,033 Xpert tests were conducted, with a 17% (n=18,077) positivity rate. In 2023, Xpert testing increased to 163,480, with a 14% (n=22,782) positivity rate, indicating increases of 56% and 26% in the testing volume and positive tests, respectively. Total TB diagnoses, including those confirmed by Xpert and other

methods, remained stable (n=29143 in 2018 vs n=29531 in 2023), with a significant increase in Xpert-confirmed diagnoses (62% in 2018 to 77% in 2023, RR 1.24, 95% CI 1.23-1.26, p<0.05).
Treatment initiations were similar (n=26,586 in 2018 vs n=26,325 in 2023), with a small but significant decrease in the proportion of all individuals diagnosed who initiated treatment (91% in 2018 vs 89% in 2023, RR 0.98, 95% CI 0.97-0.98, p<0.05).

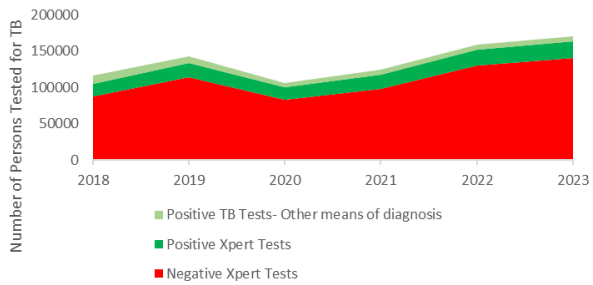

Figure. TB testing and diagnoses in Cape Town 2018 - 2023.

Conclusions: Despite an overall decline in TB incidence in South Africa, the consistent number of total TB diagnoses between 2018 and 2023 indicates that the expansion of testing in Cape Town has likely enhanced TB detection.
However the high Xpert positivity rate (13.9%) suggests that there may still be significant under-testing for TB. Furthermore, there was a small but significant decrease in the proportion of diagnosed individuals who received treatment for TB. This highlights the need for continued efforts to strengthen linkage to care.

PP28 Community empowerment: Successful TB intervention

PP28-1051-15 Empowering communities: An approach to tackling TB in Myanmar amidst political and security challenges

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Background and challenges to implementation: Myanmar grapples with substantial tuberculosis (TB) burden. Despite global recovery post-COVID-19, Myanmar faced further declines in 2021 from the political crisis, with high TB incidence (475/100,000), only 47% treatment coverage and 49,900 TB-related deaths in 2022. TB services are hindered by widespread civil unrest, travel restrictions, displacement, health workforce loss, and utilities shortages. In this compromised environment, community participation is vital to rejuvenate TB elimination efforts.
Intervention or response: The USAID Local Action Toward TB-Free Myanmar (LATT-M) project (2020-2023) aimed to expedite progress in ending Myanmar's TB epidemic through the first civil society TB community network comprising 90 civil society organizations (CSOs) and self-help groups (SHGs). LATT-M mobilized and expanded the network for active advocacy and service provision and provided technical assistance focusing on grassroots TB service delivery. These entities play a vital role in raising awareness, identifying patients, providing support, and addressing stigma. LATT-M differs from previous community-based TB care projects by offering community-led services and strategically enhancing the network's capacity designed for lasting impact beyond project lifespan, without dependence on incentives.
Results/Impact: Through community-led services, the TB community network enhanced care quality across the cascade, effectively bridging care gaps. Between October 2022 and December 2023, CSO/SHG(s) referred 3,557 presumptive TB cases resulting in 938 diagnoses. The network offered essential treatment support to 719 TB patients and initiated TB preventive treatment for 120 households. These services were crucial in bridging the gap in healthcare services by providing transportation to TB centers and distributing medicine to conflict-affected populations and refugee camps, while TB awareness sessions and advocacy campaigns helped reduce stigma and discrimination.

Figure. A LATT-M affiliated CSO giving TB awareness in an IDP settlement.

Conclusions: TB community networks provide a valuable mechanism to fortify the care continuum and foster inclusivity, knowledge, and support within diverse communities. This community-led approach offers a resilient grassroots TB response, emphasizing the transformative power of locally-led interventions in fighting TB.

PP28-1059-15 Not just a cough: Linking behavioural insights to mount a digital communications campaign to promote early self-screening for TB

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Background and challenges to implementation: The National TB Prevalence Survey in India 2022, suggests that of those not seeking care, 68% did not do so because they ignored the symptoms and 18% because they did not recognise them as TB symptoms. This presents an alarming risk of possible persons with TB going 'missing'.
There was a need therefore, to further understand these barriers and arrive at a communication campaign rooted in an audience-centred approach, to drive early testing for TB.
Intervention or response: Capitalising the popularity of digital media, The Union conceptualised a digital media campaign to activate the at-risk audiences to take the first step towards TB detection by undertaking a digital self-screening. Before taking this to scale in Madhya Pradesh in India, a test campaign was run to generate evidence for effective messaging for the said objective.
Four different approaches to messaging were deployed to arrive at the most effective route; leading to the audience clicking the call to action button and visiting the self-screening site and/or taking the self-screening test. A 4-week test campaign was deployed on display and video inventory across Google Display Networks.

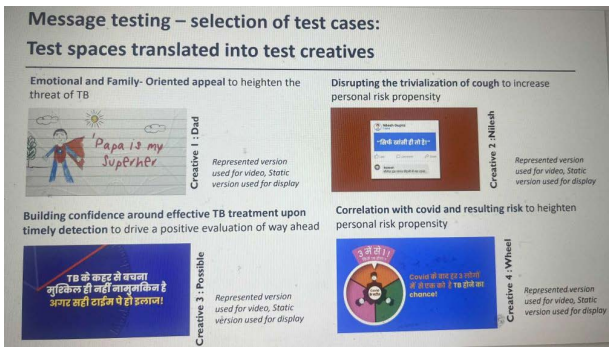

Figure.

Results/Impact: Disruption of trivialisation of cough was the most effective messaging; both for raising awareness and mobilising action. This indicates that a significant barrier to be breached is the trivialization of cough due to its commonplace symptoms.
Additional evidence suggests that while video worked best for reach and driving awareness; display worked best for driving mobilization. In terms of audience, precise targeting is recommended with 25+ Male / Female with Blood Sugar, Asthma, Respiratory conditions and weight loss as audience parameters. Open targeting is recommended with 18+ Male / Female with Entertainment, Health, News, Business and Finance as audience parameters.

Conclusions: With the above learnings, a scaled up digital media camapign to promote early testing is being rolled out.

PP28-1061-15 The impact of social protection interventions on treatment and socioeconomic outcomes of TB-affected individuals and households: A systematic review and meta-analysis

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Background: Social protection interventions, endorsed by World Health Organization (WHO) and included in UN high level meeting commitments, have the potential to curb the TB epidemic by addressing the underlying social and structural determinants of disease.
We conducted a systematic review and meta-analysis to quantify the impact of social protection in conjunction with biomedical interventions on TB treatment and socioeconomic outcomes for affected people and households.
Design/Methods: We conducted a comprehensive search across multiple electronic databases for articles published from January 2012 to September 2023, reporting studies that described at least one social protection intervention and focused on treatment and/or socioeconomic outcomes for people with TB or their households using standardized PICOT approach. Random-effects meta-analysis was used to analyze our primary outcome of interest, TB treatment success, across included studies.
Risk of bias was assessed using the Newcastle Ottawa Scale and the Cochrane Risk of Bias tool. This review was registered prospectively in the PROSPERO database (registration number CRD42022382181).
Results: Out of 44,404 articles identified in our search, 46 were eligible for inclusion. Thirty-three studies reported TB treatment outcomes, seven studies reported on socioeconomic outcomes, and two studies reported both TB treatment and socioeconomic outcomes.
Eight studies described implementation challenges, with the most common reason (n=6) for poor implementation fidelity being administrative related barriers. Random-effects meta-analysis found that individuals who were re-

cipients of social protection interventions in conjunction with standard biomedical treatment had 2.12 times the odds of TB treatment success (95% CI 1.7, 2.6).
Conclusions: Social protection interventions significantly improve rates of TB treatment success. Additional studies that systematically collect data on socioeconomic outcomes, mortality, and implementation are still required. The standardized outcomes and definitions used in this systematic review and meta-analysis have the potential to guide further research, monitoring and evaluation on social protection programs for TB-affected populations.

PP28-1052-15 Empowering communities: Unveiling the transformative impact of the Unite to Act Project's Support Hub in Punjab, India with the help of TB champions

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Background and challenges to implementation: In the realm of community engagement and empowerment, the challenge persists in ensuring inclusive and comprehensive care for people with Tuberculosis (PwTB). Recognizing this, TB Support Hubs have emerged as vital initiatives, offering holistic services managed by trained TB Champions. These support hubs are established at the sub-district level facilities and aim to enhance access to person-centered support services throughout the treatment journey for PwTB.
Intervention or response: In collaboration with the National TB Elimination Program (NTEP) in Punjab, India, and the Joint Effort for Elimination of Tuberculosis (JEET) 2.0 initiative, the Unite to Act (UTA) project has played a pivotal role in this endeavor. It has recruited 32 trained TB Champions across five intervention districts: Patiala, Ludhiana, Jalandhar, Moga and Ferozepur. These champions operate within high-load TB diagnosing facilities, ensuring tailored support for PwTB throughout their treatment process. The project utilized a structured counseling tool to provide peer group counseling to PwTB facilitated by the TB Champions.
Results/Impact: From October 2022 to September 2023, leveraging the expertise of 32 TB Champions stationed at diverse support hubs, a cumulative count of 5253 PwTB underwent counseling throughout their treatment journey. Remarkably, out of the 4076 PwTB outcomes registered on Nikshay, 3700 (91%) PwTB demonstrated successful outcomes, surpassing the state average of 86%. It's worth noting that 376 individuals are presently undergoing treatment, underscoring the continuous support and care facilitated by the project.
Conclusions: The establishment of TB support hubs, bolstered by the dedication of trained TB Champions under the Unite to Act project, has demonstrated a significant positive impact on the management and outcomes of TB cases in Punjab. This underscores the importance of community-driven interventions in fostering empowerment and improving health outcomes for individuals affected by tuberculosis.

PP28-1058-15 Resilience amidst adversity: Community-based TB care in Myanmar's conflict zones

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Background and challenges to implementation: Myanmar is one of the 30 countries with the highest burden of TB in the world. Its prevalence is twice the regional average and three times the global average.
In 2021, a political crisis occurred, leading to the interruption of most public health services, including HIV and TB care, especially in rural areas of the Sagaing Region due to armed conflict.
Intervention or response: In addressing these challenges, Best Shelter initiated community-based TB care program, employing 53 community prevention workers (CPWs) across 8 townships in the Sagaing Region starting in 2021. During this triple-burden state of Covid-19, conflict, and collapse of public health services, CPWs serve as the entry point for TB care for people in these regions.
CPWs conduct community awareness sessions about TB, Covid-19 and HIV, presumptive TB screening, refer patients or sputum sample to the AHRN DIC clinic for diagnostic evaluation, accompany referrals for issuing Anti-TB medicine, and provide adherence support until treatment completion.
Results/Impact: From 2021 to 2023, 12,679 individuals were facilitated by CPWs for presumptive TB screening, which had a significant impact on TB care in this region. Among them, 633 people were diagnosed with TB, and 93% completed their treatment.
Additionally, CPWs reached 50,716 community members with TB awareness information. This contribution filled the gap in the national TB program while the public health sectors were not fully functioning during the conflict situation.
Conclusions: Despite challenges posed by the Covid-19 pandemic and political instability, Best Shelter effectively implemented community-based TB programs. This initiative stands as a commendable model for addressing

similar challenges in conflict-affected regions, emphasizing the pivotal role of community empowerment and collaboration in advancing health and well-being. To ensure sustainability, it is imperative to expand initiatives, maintaining support and involvement of CPWs for consistent and accessible provision of community-based TB services in conflict-prone regions of Myanmar.

PP28-1056-15 Introducing innovative approaches to strengthen community influence on TB programmes in Ukraine

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Background and challenges to implementation: In the context of russian federation's military aggression, the public health system of Ukraine has suffered significant losses and devastating damages. For the CCM it is crucial to maintain access to necessary medical and social services as well as assistance to key populations remain a priority and focus of the state policy. The development of flexible and effective systems of interaction between power structures and representatives of key communities is an important component in this direction.
One Voice Community platform is one such effective and innovative tool developed within the framework of the CCM.
Intervention or response: One Voice Community platform an innovative solution for activating cross-sectoral dialogue to enhance communication with and among communities on the way to obtaining the necessary management and state decisions which target the needs of communities. One Voice Community is an alternative to committees and working groups, which is a model of interactive and systemic interaction, rapid response, and urgent interventions through existing mechanisms of the CCM. Also, the platform enables communities to make their voices heard and be heard by a wide audience, as well as influence public opinion.
Results/Impact: One Voice Community platform is an effective tool of the CCM that functions on the website https://www.onevoice.com.ua. With this tool is being carried out an assessment of the impact of key communities on TB programs and the result of this impact is provided.
Conclusions: The voice of civil society and communities in TB Response is transformed into effective solutions at the national level and regulatory changes.

PP28-1053-15 The contribution of community actors in the fight against TB in Mali

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Background and challenges to implementation: In 2020 in Mali, 6,922 out of the estimated 10,882 people suffered from tuberculosis (TB) and underwent treatment. Since January 2021, Save the Children has provided support through a TB-HIV Global Fund grant to Mopti health district to reduce morbidity and mortality linked to both diseases. Community networks and key stakeholders have been engaged to provide robust awareness and screening campaigns for TB, patient treatment support, and outreach for the loss to follow-up.
Intervention or response: The national TB program engaged and trained 53 community health workers and 140 traditional therapists, provided them with awareness campaign materials and reporting tools. The community members conduct active screening for TB, referral of those with presumptive TB for diagnosis and contacts for TB preventive treatment. The community members also provide treatment monitoring and tracking of the loss to follow-up.
Knowledge on human rights and reduction of stigma for TB patients and survivors of gender-based violence was also enhanced through training of 15 municipal counsellors, 28 representatives of community network actors, 30 leaders of women and youth associations and 701 community health workers.
Results/Impact: 2063 people were reached with messages on TB and HIV in 2023. 185 people with presumptive TB were referred by community members to health facilities in 2023, from 178 in 2022 and 76 in 2021. The TB treatment success rate increased to 88.1% in 2023, from 79.4% in 2022, and 73.5 in 2021.
Conclusions: Participation of community networks and key stakeholders in provision of services is essential to eliminate TB as a public health challenge. From the success in Mopti district, implementation of similar interventions will be scaled up to two other districts from 2024.

PP28-1057-15 TBusco: I'm looking for you - Community positive communication strategy for the active search for new TB cases in the LGBTIQ population

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Background and challenges to implementation: Antioquia leads Colombia in TB cases (3,483 in 2022). Traditional communication hasn't worked. Poverty, overcrowding, and social stigma contribute. A new approach is needed: address specific needs of each population group and integrate prevention, diagnosis, treatment, and follow-up. Collaboration between government, health institutions, and communities is crucial to eliminate TB in Antioquia.
Intervention or response: Antioquia's high TB rates (especially among LGBTIQ+ people) led to a multi-phase project.
Phase 1 involved understanding the community's needs through a social lab.
Engaging artists (phase 2) created attractive communication materials (murals, videos) on prevention, detection, and treatment.
Phase 3 focused on dissemination through social media, public events, and exhibitions.
Phase 4 evaluated the impact on knowledge and treatment adherence.
Phases 5-8 actively searched for new cases, provided medical care, and monitored treatment completion.
This comprehensive approach aimed to reduce TB in Antioquia.
Results/Impact: The project achieved tangible results in different areas:
Reducing the incidence of TB: Increased knowledge about TB: 80% of the people intervened at the end of the project had adequate knowledge about TB, its symptoms and ways of transmission. 60% increase in knowledge about TB prevention measures.
Reduction of stigma and discrimination: 70% of the people surveyed at the end of the project expressed a positive attitude towards people with TB. 50% reduction in cases of discrimination against people with TB.
Empowerment of communities: Creation of 20 community support groups for people with TB. Active participation of communities in the planning, implementation and evaluation of the project.
Conclusions: The project thrived on community collaboration. It involved building communication strategies with residents, resulting in positive outcomes: lower TB rates, increased knowledge (80%!), reduced stigma, empowered communities, and a stronger healthcare system. This successful, community-driven approach is a model for combating TB elsewhere

PP28-1060-15 Mobilising community stakeholders for effective project development: A case study in TB intervention in Niger State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a formidable global health challenge, with Nigeria ranking among the top countries burdened by the disease. In Niger State, situated in the north-central region of Nigeria, TB prevalence is particularly pronounced, exacerbated by a diverse population encompassing various religious and cultural backgrounds. Notably, the state hosts a considerable number of Faith-Based Organizations (FBOs), presenting a unique opportunity to leverage their influence in the fight against TB.
However, prior to 2019, FBOs contributed minimally to TB case notification in the state, representing only 2% of reported cases.
Intervention or response: A diverse array of community stakeholders, including eight Community Heads, 22 Religious Leaders, eight Local Government Supervisors, and 18 community Youth Leaders, were purposefully selected across eight Local Government Areas and two political zones. The stakeholders were apprised of the overarching goal of TB intervention and the indispensable role of community participation therein.
Results/Impact: The resultant turnout for TB screening and diagnosis exceeded expectations, underscoring the efficacy of community-driven interventions. Over the course of 15 months, from January 2020 to March 2021, the contribution of FBOs to TB case notification in Niger State soared from a mere 2% to a commendable 21%.
This notable achievement garnered acclaim both locally and nationally, serving as a beacon of success for similar endeavors nationwide.
Conclusions: The resounding success of FBOs TB intervention in Niger State underscores the indispensable role of community stakeholders in driving impactful and sustainable project development. By fostering inclusive engagement and empowering local leaders, we have witnessed a remarkable transformation in TB case notification rates. This triumph serves as a testament to the power of collaboration and underscores the imperative of community-driven approaches in addressing public health challenges.

PP28-1054-15 Empowering self-help groups for gender equality in TB elimination efforts: Insights from the breaking the barriers project in India

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Background and challenges to implementation: The USAID supported BTB project, aims to accelerate TB elimination efforts in vulnerable populations across four Indian states. Gender-related challenges liike unequal access to healthcare, limited awareness among women, and stigma present significant obstacles to effective TB management. These challenges are exacerbated by factors like poverty, education level, and cultural norms, impeding progress towards elimination goals. We engaged with SHGs, which are small groups of mainly women who promote small savings amongst members.
Intervention or response: Community engagement strategy employed by BTB project (2020-2023), focuses on SHG involvement in TB elimination efforts. The project adopted a systematic engagement approach to build an inclusive TB elimination effort involving SHGs, with around 10-15 women members in each group predominantly in vulnerable areas. The project conducted sensitization and awareness sessions at accessible locations which equipped SHGs with knowledge on TB, discrimination associated with TB, gender inequities leading to access issues and perspectives regarding health rights and empowerment.
Results/Impact: 5,298 sensitised SHGs were actively involved in organizing 85,417 awareness campaigns. They engaged with over 1,75,79,619 vulnerable individuals both men and women, disseminating crucial information about tuberculosis. Additionally, they conducted 1,24,91,692 verbal screenings for TB and 1,41,999 presumptives were referred for testing, leading to the diagnosis 8,646 individuals. Testimonials highlight SHGs' significant role in raising TB awareness and enhancing access to TB care services. Furthermore, the SHG members reported a sense of self-empowerment while simultaneously fostering community ownership in not only Tb but overall health and well-being.
Conclusions: Positive outcomes of SHG-led initiatives on TB care cascade highlight the significance of involving SHGs in TB elimination efforts in India, emphasizing their pivotal role as grassroots change-makers. With India having approximately 12 million SHGs, engaging them will be an efficient and cost-effective approach in locally-led TB elimination and gender empowerment efforts, as these groups are found in almost all vulnerable sites.

PP28-1055-15 Power of word of mouth and local community networks as significant communication and mobilisation channels

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Background and challenges to implementation: William J Clinton Foundation, under the aegis of Central TB Division, is conducting Active Case Finding integrated health camps in India. In collaboration with public health staff, camps employ integrated Chest X-Ray for TB screening with basic health tests such as height-weight, blood pressure, random blood sugar (RBS). This integration enables both — a stronger engagement of frontline health workers and alleviation of stigma attached to "TB-centric" camps. To achieve effective footfall, dedicated mobilisation efforts are required, focusing on end-user needs. Here, potency of word-of-mouth communication and interpersonal nudges emerge as a formidable force.
Intervention or response: Word of mouth enables individuals to become local influencers and champions for the community, thereby encouraging the same behaviour to be replicated. Harnessing the power of personal connections and informal networks, these organic channels foster trust and participation. They not only facilitate effective dissemination of information but also cultivate a sense of community engagement and ownership, amplifying impact of mobilisation efforts.
Results/Impact: Three aspects of an individual's behaviour are enabled, driving the desired behaviour, as explained below.

Component	Explanation	Indicators
Capability	The individual's psychological and physical capacity to engage in the behaviour	Access to comprehensible health information Knowledge and understanding of basic health tests Ability to physically attend the camp
Opportunity	The environmental/ external factors that prompt the behaviour from social, cultural or economic lens	Availability/ ease of commute to camp site Availability of free of cost health camps Scheduling of camps at convenient timings and accessible locations Presence of signage, information and awareness about camp and services offered
Motivation	The mental processes that nudge and direct behaviour, both conscious and subconscious	Concern for one's health, perceived benefits of availing basic health tests Encouragement from family/ community to attend camp Experiencing sense of achievement on attending camp

Table. Putting COM-B Model of Behaviour Change into Perspective.

Nearly 14% of camp attendance was aided by word of mouth. For low-literacy areas, this channel not only acts as a reliant source of mobilisation but also one that evokes concern, friendship and trust.
Conclusions: Word of mouth conversations enhance community mobilisation efforts by acting as a litmus test for the experiential journey of an individual at the camp. It conveys the value of camp offerings in a compelling manner.

PP21 Child TB care cascade

PP21-995-15 Exploring barriers and facilitators: Implementing Tuberculosis Preventive Therapy (TPT) for under-five children in Myanmar

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Background: The Tuberculosis Preventive Therapy (TPT) program for under-five TB household contacts in Myanmar, faces significant implementation challenges. This study assessed TPT implementation among eligible children under-five-year-olds from the perspectives of caregivers and providers, exploring barriers and facilitators in 6 States and Regions from Myanmar.
Design/Methods: A cross-sectional mixed-method study conducted between August and September 2023, involved a pragmatic review and descriptive analysis of TPT implementation data from community-based and facility-based TPT providers, and in-depth interviews with 15 caregivers and 16 TPT providers, purposively selected from various States and Regions. The interviews were audio-recorded, and thematic analysis was conducted to identify barriers and facilitators for TPT uptake.
Results: During January 2022-March 2023, 6,629 household contacts were reported from 3,206 index cases of pulmonary tuberculosis patients, comprising 898 under-five-year-olds and 5,731 over-five-year-olds. Among under-five-year-olds, 493 out of 898 (54.9%) were screened, and 326 (66.1%) initiated TPT, with varying rates between community-based (48.2%) and facility-based (85.3%) channels.
Qualitative analysis showed that facilitators of TPT uptake included participant knowledge, perceptions, and accessibility to TPT while barriers included provider selectivity, limited awareness, disagreement on TPT requirements, and workload constraints. Client factors included caregiver reluctance, lack of understanding, neighbors' opinions on TPT, and fear of side effects. Others included community misconceptions, transportation barriers, and pill-related issues such as daily regimen, difficulty swallowing, and unwillingness to take for six months. Community support played a crucial role in TPT uptake through home visits and reminders.
Conclusions: The study highlighted suboptimal TPT provision in Myanmar due to barriers at program, facility, and client levels, emphasizing the need for improved contact investigation, prevention, and transmission reduction efforts. Healthcare providers' varying commitments and doubts about TPT's efficacy, alongside limited resources and awareness, hindered comprehensive TPT implementation. There was limited comprehensive contact investigation, standardized TPT monitoring, guidelines and limited patient and community awareness about TPT.

PP21-996-15 Evaluation of TPT initiation among children living with HIV in Zimbabwe 2022 - 2024

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Background and challenges to implementation: Tuberculosis (TB) preventive treatment (TPT) remains integral for curbing active TB disease among high-risk populations including children living with HIV (CLHIV). Although the prevention-of-mother-to-child transmission program has reduced HIV incidence in children <5 years, the program needs to be complemented with TPT.
This would further reduce TB incidence among children, especially in Zimbabwe, where TB/HIV co-infection is 51% in the general population. We report TPT initiation among CLHIV in 12 facilities in Zimbabwe.
Intervention or response: For evaluation of TPT initiation, we prospectively enrolled CLHIV <15 years who visited selected facilities between August 2022–January 2024. Those who initiated anti-retroviral therapy (ART) on or after 1 August 2022 were classified as newly diagnosed CLHIV (CN), and those who initiated ART before 1 August 2022 as CLHIV already on ART (CC).
We tracked enrolments against target sample sizes (60 CN and 300 CC) and monitored data for completeness and accuracy during support and mentorship visits. We used descriptive statistics and Chi-square tests to characterize TPT among children.
Results/Impact: Overall, 320 CLHIV were enrolled: 39/60 CN and 281/300 CC. Among them, 54% (172/320) were female, 57% (183/320) were 10–14 years, and 71% (227/320) initiated TPT. TPT initiation was significantly lower among CN compared to CC: 28% (11/39) versus 77% (216/281) ($p < 0.001$). Most CLHIV (60%, 191/320) initiated TPT before their enrollment in the project. Among them, 8% (16/191) reported TPT-related adverse events. During the enrollment period, only 88 CLHIV were eligible for TPT; among them 41% (36/88) initiated TPT, whereas 55% (48/88) did not due to stockout of TPT drugs.

Conclusions: TPT initiation is suboptimal among CLHIV in Zimbabwe, especially among children who are not already on ART. Better understanding of the service delivery model and improvement of supply chain management, including availability of pediatric TPT formulations may increase access to TPT among CLHIV in Zimbabwe.

PP21-991-15 Involvement of nutritionists in identifying missed paediatric TB cases through active case finding. A case of Chandaria Health Centre, Nairobi Kenya

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Background and challenges to implementation: In 2022, the global burden of pediatric tuberculosis (TB) stood at approximately 1.3 million cases. Out of these, 900,000 cases were diagnosed and reported, highlighting a concerning 40% detection gap among children. Kenya estimated TB cases in 2021 was 133,000, however only 77,854 cases were officially notified, leaving a substantial 41% missed. Chandaria Health Centre has consistently recorded a low proportion of pediatric TB cases and in 2021, pediatric TB case finding was at 9.6% (9 out of 94 cases) , falling below the target of 10-15%. This indicates a significant number of undiagnosed children with TB, leading to increased morbidity and mortality.
Intervention or response: Chandaria Health Centre faced challenges with ACF Screening in its Maternal and Child Health (MCH) department, primarily due to the absence of a trained nutritionist in tuberculosis (TB) management. This led to a significant number of under-5 children, averaging between 950 and 1100 per month, not undergoing TB screening.
To tackle these challenges, the Nutritionist underwent TB training and ACF Screening sensitization, with support from partners and the county. Subsequently, a revised patient flow system was implemented, requiring all children under 5 years to undergo ACF screening by the Nutritionist. Additionally, the Nutritionist initiated interventions for malnourished cases and promptly referred presumptive cases to the Clinical Officer for further assessment.
Results/Impact: In 2021, a total of 94 TB cases were reported, with 9 pediatric TB cases accounting for 9.6% of the total cases. However, after involving Nutritionists in ACF screening in 2022, the number of reported TB cases increased to 152, including 45 pediatric TB cases, 29.6% of the total cases. In 2023, 164 TB cases were reported, with 35 pediatric TB cases,21% of the total cases.
Conclusions: This study demonstrates the potential to identify missed pediatric TB cases through the involvement of Nutritionists in ACF screening cascade.

PP21-993-15 Improving childhood TB case finding in Oyo State: Usefulness of focusing attention on paediatric contacts during contact investigation of people with index pulmonary TB

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Background and challenges to implementation: Nigeria is ranked the highest TB burden country in Africa and one of the countries contributing 87% of the global TB burden. Several case-finding strategies are currently being implemented which have increased case notification but with poor childhood TB (CTB) case proportion of 7% in 2022. CTB notification has remained low due to difficulties in targeting some of these interventions towards children. Oyo state situation is not different from NTP challenges as CTB proportion of cases notified was about 5%. Hence, we examined the contribution of CI to CTB case finding.
Intervention or response: The USAID TB-LON 3 project supports contact investigations of bacteriologically diagnosed TB patients in 26 high TB-burden facilities in Oyo State. Twenty-six contact tracers (CTs) were engaged and trained alongside DOT officers from these facilities and linked with NTP-trained clinicians. The CTs symptomatically screened all contacts and were on the lookout for children with symptoms of TB among contacts.
Children presumed to have TB and could produce samples (stool or sputum) were examined using GeneXpert. Those unable to produce samples and others bacteriologically negative were sent to clinicians for review and evaluation using free CXR services.
Results/Impact: A total of 3000 index TB cases were traced and 12,883 contacts were screened for TB. Pediatric contacts screened were 25% (3217) of the total. Of the 3072 presumptive TB identified 23% were children presumed to have TB and all were evaluated for TB. A total of 229 TB patients were identified through contact investigation in these facilities in 2023. The CTB proportion was 24.9% of the total cases, with 38.6% of the cases from stool Xpert testing. Age less than 5 years accounted for 49% of the CTB cases.
Conclusions: Scaling up contact investigation with a special focus on pediatric contacts is essential in improving CTB case finding in other high TB-burden facilities.

PP21-992-15 Childhood TB: NNS and NNT as useful metric for identifying high-yielding intervention

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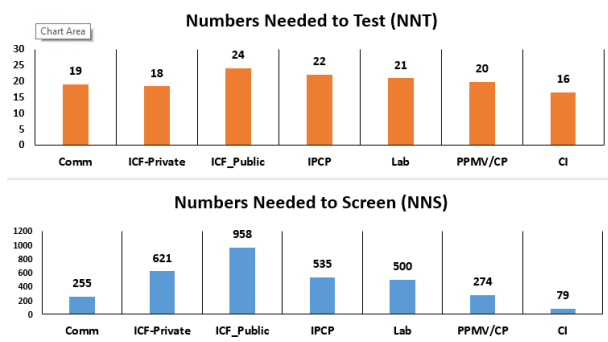
Background: Globally TB among children and young adolescents aged under 15 years is about 11% of all tuberculosis (TB) cases reported globally, with Nigeria ranking 6th among the 30 high burden countries for TB. Hence need to prioritize efficient and high-yielding interventions to ensure judicious and efficient use of scare resources for childhood TB case finding and treatment. This study explores the utility of Number Needed to Treat (NNT) and Number Needed to Screen (NNS) as metrics for evaluating the efficiency of interventions in childhood TB case detection.

Design/Methods: Data among children aged 0-14 years from 7 Interventions of TB LON 3 project that is implemented by Institute of Human virology Nigeria (IHVN) with the support from USAID in Southwestern Nigeria from Oct 2022 to December 2023 (15 months) was analyzed. The interventions included Intensified Case Finding (ICF) in Public facilities, ICF in Private facilities, Contact Investigation, Active Case Finding in the Community, ICF-Private Laboratories, ICF among Patent Medicine Vendor/Community Pharmacy and ICF in the Informal Private Sector. The NNS and NNT were calculated to determine the efficiency of the interventions in TB case detection.

Results: A total 1,691,961 children aged 0-14 years across 7 interventions were screened. Contact Investigation emerged as the most efficient intervention with the lowest NNS of 79 compared to other interventions. Further analysis of NNT revealed that out of a total of 55,966 presumptives tested, Contact Investigation intervention also emerged the most efficient with an NNT of 16 compared to other interventions (see graph below).



Conclusions: With Contact Investigation emerging as the most effective approach for active TB cases among children ages 0 – 14 years, highlighting the importance of targeted investigation of contacts, reaffirms effectiveness of contact Investigation in childhood TB case finding and the need to optimize resource allocation to improve TB case detection among children.

PP21-997-15 Scale up childhood TB notification through intensified screening and testing campaign: Insights from Ogun State, Nigeria

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Background and challenges to implementation: Despite global efforts to combat tuberculosis (TB), Childhood TB remains inadequately diagnosed and treated, presenting significant hurdles to TB control initiatives. In 2023, Ogun State, Nigeria, joined the National Programme and launched the National Child TB Testing Week to tackle this issue, amidst challenges such as limited resources and low awareness regarding Childhood TB.

Intervention or response: During the comprehensive Child TB Testing Week, intensive TB screening was conducted at various sites frequented by vulnerable children, including schools, orphanages, clinics, and communities. Screening methods utilized included symptom assessment, chest X-rays, and alternative diagnostics such as nutrition assessment.

Presumptive cases were evaluated with diagnostic tools like GeneXpert and radiological review employed for confirmation. TB-diagnosed children were notified, contact tracing was initiated, and eligible contacts received TB preventive treatment.

Results/Impact: Screening encompassed 36,926 children, identifying 2,590 presumptive cases, representing a 7% yield. Among the presumptives, 387 (15%) were aged 0-4 years, while 2,224 (85%) were aged 5-14 years.

From the 2,590 presumptive cases, 97 children were diagnosed with TB (64 [65%] through GeneXpert, 34 [35%] via chest X-ray), all of whom were promptly enrolled in treatment with subsequent contact tracing. Notably, the number of cases diagnosed in just one week exceeded the

total number notified in the preceding three months. The quarterly proportion of total case notifications who are children increased to 10%, marking a significant achievement in addressing childhood TB challenges in the state as shown below:

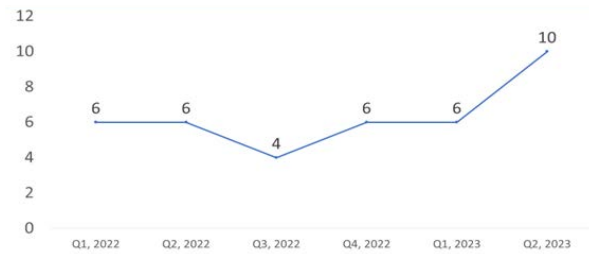

Figure. Quarterly trends of childhood proportion of the total case notification.

Conclusions: The National Child TB Testing Week held in 2023 in Ogun State, Nigeria, stands as a pivotal milestone in tackling Childhood TB challenges. The lessons learned from its execution offer invaluable insights for shaping future endeavors aimed at enhancing pediatric TB diagnosis, treatment, and overall control strategies, particularly in resource-constrained settings.

PP21-999-15 Perceived benefits of community-based TB preventive treatment in children in Uganda: "When she sees other children getting the same medication, she will feel not alone"

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Background: Tuberculosis preventive treatment (TPT) uptake remains low in sub-Saharan Africa. A recent trial demonstrated effectiveness in increasing TPT uptake and completion in children via community-based TPT delivery.
However, implementation research is needed to inform scale-up in real-world settings. We conducted qualitative research to understand community and provider perspectives around anticipated benefits of community-based TPT delivery for children.
Design/Methods: The proposed community-based model assessed included:
1. TPT screening and initiation at the nearest public health facility;
2. Community health worker (CHW)-led TB education in a community adherence group;
3. Delivery of refills and continued TB health education by CHWs in a community group.
We conducted in-depth semi-structured interviews (N=20) from November–December 2023 with a purposively selected sample of 6 public health care providers, 4 CHWs, and 10 caregivers of a child with latent TB infection. A six-person multi-regional team translated and inductively coded transcript data. Framework analysis identified perceived benefits of community-based TPT delivery.
Results: Participants identified five main benefits of community-based TPT delivery:
1. Comfort receiving care in the community due to familiarity of differentiated HIV care models and trust in CHWs;
2. Peer support in community TPT groups can promote adherence, reduce stigma through a sense of "not feeling alone", and children might find it fun;
3. Receiving TPT in the community will reduce transport costs associated with taking children to the health facility;
4. CHW delivery increases efficiency and sustainability by reducing patient lines, waiting times, and provider workload at the health facility;
5. Adding CHWs to the model will enhance their ability to provide TB prevention services, increase awareness about TB prevention, and promote community health.
Conclusions: Community-based models are beneficial. Implementation models should consider and incorporate these benefits for rural communities in East Africa.

PP21-998-15 Prioritising children: Decentralised diagnostics and child-friendly approaches transform childhood TB management in Zambia

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Background and challenges to implementation: Diagnosing Tuberculosis (TB) in children, especially those under five, is challenging. The standard method of using sputum specimens is often not practical. Additionally, alternative procedures such as induced sputum and bronchoalveolar lavage can be uncomfortable for children. In 2019, only two tertiary facilities could perform these procedures, resulting in centralized diagnosis. Before 2021,

the percentage of children with TB out of all TB notifications was below 10%. To increase coverage of TB diagnostic services for children, expanding diagnostic capabilities using child-friendly TB diagnostics tools is cardinal.

Intervention or response: In 2018, the program introduced urine LAM testing in a phased approach, starting with 15 tertiary facilities and expanding to all health facilities. In 2020, sputum induction and nasal pharyngeal aspirate (NPA) sets were procured for all 10 health facilities. In December 2020, stool for Xpert testing was adopted, validated, and rolled out to all GeneXpert facilities.

Results/Impact: The number of reported cases of childhood TB increased from 2,724 in 2020 to 6,245 in 2023. In 2022 and 2023, the percentage of children with TB out of all reported TB cases was 11%. In 2023, there were 3,521 children between the ages of 0-4 with TB, representing 56% of all children detected.

Impact: In 2022, the TB program achieved a TB treatment coverage of 92%. Furthermore, detection of TB in children aged 0-4 increased ultimately saving their lives. Healthcare workers also started accepting Nasopharyngeal Aspirate (NPA) as a sample type for GeneXpert, which has improved testing yield.

Conclusions: Significant improvements in childhood TB detection and decentralized capabilities have been achieved following the introduction of child-friendly TB diagnostics. To ensure that we continue to build on these gains, we must have a consistent and reliable supply of these child-friendly TB diagnostic tools such as Urine LAM in the global market.

PP21-994-15 Enhancing TB case finding among under-15 children in Southwest, Nigeria: Evidence-based from TB-Local Organisation Network Region 3 (TB-LON 3) Project

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Background and challenges to implementation: During the TB Local Organisation Network (LON) three interventions conducted in Oyo, Osun, Ogun, and Lagos States in Southwest Nigeria between October 2020 and September 2023, case-finding activities were targeted at children aged 0-4 and 5-14 years. These interventions aimed to identify and diagnose tuberculosis (TB) cases among pediatric populations. The outcome of the case-finding efforts was assessed using the TB outcome cascade, a framework that delineates the various stages of TB diagnosis and treatment, from initial screening to treatment initiation and completion. This comprehensive approach allowed for the systematic evaluation of TB case identification and management among children within the specified age groups, contributing valuable insights into the effectiveness of TB control strategies in pediatric populations in the region

Intervention or response: Out of the 3,498,741 children aged 0-14 years screened between 2020 and 2023, 58.57% (2,049,312) were aged 0-4 years. However, 59.4% (59,923) out of 100,871 children presumed to have TB were evaluated and 7.9% (4,731) were diagnosed with TB. About one-third 1,504 (31.8%) of children diagnosed with TB were aged 0-4 years whiles others 3,228 (68.21%) were 5-14years. Almost all 4,395 (92.9%) children diagnosed with TB within this period were started on treatment.

Age Group (years)	Number Screened	Children Presumed to Have Tb	Children Evaluated	children Diagnosed with TB	Children Started on Treatment	Presumptive Yield	TB Yield
0-4	2,049,312	59,923	35,595	4,731	4,395	1.3%	8%
5-14	1,449,429	40,948	24,328	3228	3,228	5.1%	8%
Total	3,498,741	100,871	59,923	7,959	7,623	3%	8%

Results/Impact: These findings reveal significant differences in TB screening, diagnosis, and treatment outcomes between the two age groups. While children aged 0-4 years constituted the majority of those screened, a higher proportion of TB cases were identified among children aged 5-14 years. However, a similar TB yield was observed across both age groups, indicating the importance of targeted screening and intervention efforts for both younger and older children.

Conclusions: Tuberculosis case findings were higher among children aged 5-14 years than those aged 0-4 years despite a higher screening rate among the younger group. Operation research needs to be conducted to determine their sources of susceptibility to TB.

PP24 Emerging NTM infection

PP24-1023-15 WQ-3810: A novel fluoroquinolone drug against fluoroquinolone-resistant Mycobacterium avium DNA gyrase

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Background: *Mycobacterium avium* complex (MAC) infection poses a significant threat, particularly in immunocompromised individuals, leading to MAC lung disease. Fluoroquinolones, along with rifampicin, and ethambutol are frontline therapies for managing macrolide-resistant MAC lung disease.
However, their excessive use may lead to resistance, necessitating the development of alternative fluoroquinolones. WQ-3810, a novel fluoroquinolone displaying notable efficacy against fluoroquinolone-resistant pathogens. Nonetheless, investigations regarding its activity against *M. avium* are sparse.
Design/Methods: Our study evaluates the inhibitory effects of WQ-3810 on recombinant wild-type (WT) gyrase A, B, and four mutant gyrase A proteins (Ala91Val, Asp95Ala, Asp95Gly, Asp95Tyr) utilizing a DNA supercoiling inhibitory assay, determining the drug concentration required to inhibit half of the enzyme activity (IC_{50}).
Additionally, the Minimum Inhibitory Concentration (MIC) of WQ-3810 against 11 clinical *M. avium* isolates (7 WT, 2 Asp95Gly, 2 Asp95Tyr) were assessed and compared with three fluoroquinolones (Ciprofloxacin, Moxifloxacin, Levofloxacin) from a previous study.
Results: The IC_{50} values of WQ-3810 were determined as follows: 1.741±0.05, 4.53±1.3, 7.05±0.52, 7.79±0.66, 9.93±0.61 for WT, Asp95Ala, Asp95Gly, Asp95Tyr, Ala91Val respectively. WQ-3810 exhibited dose-dependent inhibition against both wild-type and mutant gyrase A.
Comparatively, all four mutant *M. avium* DNA Gyrase A variants displayed higher IC_{50} values (2.60–4.47-fold) than the WT *M. avium* DNA Gyrase A. Compared with findings from a previous study, Ciprofloxacin demonstrated the highest IC_{50} values for all mutant DNA gyrase A. Conversely, WQ-3810 showed the lowest IC_{50} values for three mutant gyrase A variants.
Furthermore, it is worth mentioning that the Minimum Inhibitory Concentrations of WQ-3810 were similar to those of Moxifloxacin for the wild-type strain. Moreover, the MIC of WQ-3810 was half those observed for Moxifloxacin in the case of the mutant strains.
Conclusions: This indicates a favorable inhibitory profile of WQ-3810 against both wild-type and mutant *M. avium* DNA Gyrase A, suggesting promising therapeutic potential.

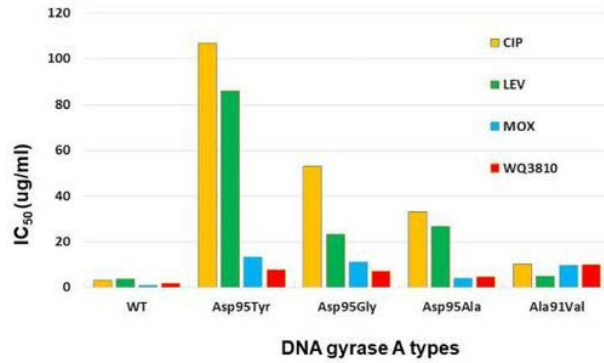

Figure. Fluoroquinolones activity against M. avium DNA gyrase A.

PP24-1021-15 Colony morphology as a prognostic indicator in M. avium complex pulmonary disease

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Background: This study investigates the prognostic significance of colony morphologies in solid media cultures for patients with *M. avium* complex (MAC) lung disease, focusing on their predictive value for treatment outcomes.
Design/Methods: A retrospective case-control study categorized 87 MAC lung disease patients based on their 6-month post-treatment sputum culture outcomes into two groups: 38 patients achieving culture negativity and 49 patients failing to achieve culture conversion.
Isolates were cultured on 7H10 agar to assess colony morphology for uniformity or mixed morphotypes, with species identification conducted through 16S rRNA and rpoB gene sequencing.
Results: *M. intracellulare* infections were associated with significantly lower rates of achieving culture negativity (p=0.0344). The presence of mixed morphotypes (p=0.0410), yellow-colored colonies (p=0.0251), and ‚Glue' phenotypes (p=0.0201) were significantly correlated with the failure to achieve culture conversion, indicating poorer treatment outcomes.
Conclusions: The evaluation of colony morphologies in solid media cultures provides crucial prognostic information for MAC lung disease. Identifying ‚Glue', mixed, and yellow morphotypes as markers for patients failing to achieve culture negativity underscores their importance in predicting treatment success.

This approach facilitates the tailoring of therapeutic strategies to enhance patient outcomes, especially in challenging cases of *M. intracellulare* infection.

PP24-1025-15 Non-tuberculous mycobacteria among people with microscopy-positive and Xpert-negative in Niger republic

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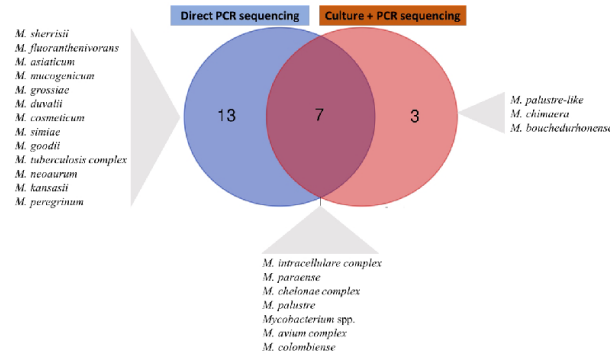
Background: Disease caused by non-tuberculous mycobacteria (NTMs) shares many clinical features with tuberculosis (TB), challenging differential diagnosis. GeneXpert currently used for TB screening only detects *Mycobacterium tuberculosis* complex.
This study aimed to explore the causes of microscopy-positive but Xpert-negative results in patients with chronic lung disease in Niger.
Design/Methods: This descriptive cross-sectional study was conducted between July 2022 and June 2023 at the TB National Reference Laboratory in Niger, in collaboration with the Institute of Tropical Medicine, Belgium. It included any patient previously treated for TB presenting with a microscopy-positive but Xpert-negative result, for whom sputum samples were cultured on solid medium. All sputum samples collected had undergone culture and direct *rrs* PCR sequencing. Positive cultures also had *rrs* PCR and Sanger sequencing.
Results: We included 59 patients who were predominantly male (sex ratio = 5.5), with an average age of 49.3 (± 14.8) years, and a mean BMI of 17.4 (± 3.15) kg/m^2. Respiratory signs were found in 94.9%, whereby productive cough (71.4%) and dyspnea (59%) predominated. Majority of patients (93%) had abnormal chest X-rays, of which 50 had bilateral and 5 unilateral cavitary lesions.
Half (45.8%) of samples grew mycobacteria, while 84.7% were positive by direct PCR: 13 were only positive by direct PCR, three only by culture, and seven by both.
Twenty-one different NTMs species were identified, majority belonging to the *M. intracellulare* complex, followed by *M. palustre*. Of note, three patients were positive for *M. tuberculosis* complex by direct PCR sequencing.
On multivariate logistic analysis, no risk factor was associated with detection of NTMs. Programmatic monitoring is needed to assess their clinical relevance.



Conclusions: NTMs are increasingly isolated from previously treated TB patients in Niger. Isolation and rapid identification of these mycobacteria, and assessing their clinical relevance are important, as the treatment strategies for tuberculosis and respiratory NTM infections differ.

PP24-1022-15 Epidemiological characteristics of people with non-tuberculous mycobacterial pulmonary disease in South Korea

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Background: Recently, the isolation and infection rates of non-tuberculous mycobacterial (NTM) have been increasing worldwide. NTM causes respiratory diseases that are similar to tuberculosis. However, it is not classified as a notifiable disease, leading to a lack of systematic monitoring due to its exclusion from mandatory reporting. Consequently, comprehensive data on the incidence of NTM patients in South Korea remain scarce.
Design/Methods: We developed a customized database by collating claims and general health examination data from the National Health Insurance Service. This database included all subjects diagnosed with the ICD-10 code A31.0 from January 1, 2010, to December 31, 2022. We performed a basic statistical analysis on a cohort of 33,592 patients newly diagnosed with NTM, identified by at least two outpatient visits or one hospital admission under the A31.0 code. This analysis excluded patients diagnosed with NTM between 2010 and 2011 to ensure a focus on new diagnoses.
Results: The analysis revealed that of the total NTM pulmonary disease (PD) patients, 44.9% were male (n=15,070) and 55.1% were female (n=18,522). The in-

cidence rates per 100,000 population increased for both genders, from 4.3 in 2012 to 5.4 in 2022 for males, and from 4.9 to 7.0 for females over the same period. The peak year for NTM PD incidence was 2019, with rates of 7.2 for males and 9.4 for females per 100,000 population. In 2012, Jeollabuk-do had the highest incidence rate at 10.6 per 100,000, while Jeju Special Self-Governing Province had the lowest at 0.9 per 100,000. By 2022, the highest incidence was observed in Daejeon Metropolitan City (21.2 per 100,000), with the lowest in Busan Metropolitan City and Gyeongsangnam-do (2.7 per 100,000).

Conclusions: This study elucidates the epidemiological trends of NTM PD by year, gender, and region, utilizing a decade of national data from South Korea.

PP24-1024-15 Non-tuberculous mycobacteria: Diagnostic methods in the Kyrgyz Republic

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Background and challenges to implementation: Mycobacterioses. Caused by non-tuberculous mycobacteria (NTMB), sometimes very similar to tuberculosis in clinical symptoms. The most common species are *M.avium-intracellularae,* causing up to 60% of cases of pulmonary mycobacterioses, *M.kansasii*, *M.xenopii* and others.

Intervention or response: At the beginning of 2018, the National Reference Laboratory (NRL). NRL has implemented the species identification of non-tuberculosis mycobacteria (NTMB) using molecular genetic methods, including GenoType Mycobacterium CM/AS (Hain LiveScience, Germany).

The testing process includes: DNA isolation from mycobacterium cultures grown in a dense or liquid medium. Multiplex amplification (PCR) using biotinylated primers. Reverse hybridization of the DNA of the studied strain with species-specific DNA probes for mycobacteria immobilized on a nitrocellulose strip. The results are evaluated by comparing the probes that appeared on the strip with the interpretation table.

Results/Impact: Since 2018, the National Reference Laboratory has collected data on 76 samples of non-tuberculous mycobacterium (NTM) using the GenoType Mycobacterium CM/AS diagnostic method.

The results showed the following distribution of NTMs: *M. Tuberculosis*+NTM: 9 (11%); *M. Fortuitum*: 21 (27%); *M. intracellulare*: 11 (14%); *M.Abscessus*: 11 (14%); *M. Avium*: 3 (3.9%); *M. Gordonae*: 7 (9.2%); *M. Chelonae*: 2 (2.6%).

Conclusions: The results showed that *M. fortuitum*, *M. intracellulare* and *M. abscessus* were the most common NTM species, together accounting for 55% of all identified specimens. These data emphasize the importance of NTM diagnosis for the appropriate management and treatment of patients with NTM infections. It should be emphasized that, while a comprehensive diagnosis of NTMB disease is necessary, identification of the mycobacterial species (microbiological, molecular genetic) plays a key role, of course in combination with clinical and X-ray examination.

E-POSTER SESSION (EP)

EP13 Public-private mix for TB care

EP13-713-15 Deepening the engagement of transport workers to find the missing people with TB

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Background and challenges to implementation: Nigeria faces a significant challenge in combating tuberculosis (TB). It ranks seventh among high-burden countries with millions of „missing" TB cases. Each undiagnosed case can spread the disease to 15 individuals annually. While Nigeria has shown a 25% improvement in TB case findings, achieving WHO targets to reduce TB incidence by 80% and deaths by 90% by 2030 requires intensified efforts.
Intervention or response: Transportation networks in Nigeria, characterised by strong unions and associations, offer a unique opportunity for TB outreach. Collaborative efforts between TB programs and transport workers, facilitated by initiatives like United State Agency for International development (USAID) Tuberculosis Local Organising Network (TB LON) and Challenge Facility for Civil Society (CFCS) implemented by Society for Family Health (SFH), have successfully integrated TB services into routine transport operations. The CFCS grant 12 projects focuses explicitly on advocacy and collaboration with TB projects in Kano State to leverage transport workers as agents for TB sensitization and mobilisation.
Results/Impact: Results indicate that engaged transport workers have effectively integrated TB programmes into their routines, providing information, distributing educational materials, promoting mask-wearing, and facilitating access to screening and treatment services during long-distance trips. Their support extends to facilitating sample collection and providing free transport to healthcare facilities. These efforts have contributed to improvement of cases in first quarter of 2024, to about 2,370 TB case reported, as against 1700 in same quarter of 2023.
Conclusions: Addressing missing TB cases using a multifaceted approach is vital for public health in Nigeria. The ongoing support of transport workers in TB programming is commendable. The advocacy efforts of initiatives like StopTB partnership CFCS and USAID TB LON projects should be sustained as its crucial for continued progress in finding missing TB cases and achieving national and global targets.

EP13-714-15 Assistance for drug-resistant TB patients with spiritual, psycho-social, and economic approaches to reduce lost to follow-up (LFU) rates at Muhammadiyah Lamongan Hospital

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Background: MultiDrug-Resistant Tuberculosis (TBC-MDR) is an infectious disease caused by Mycobacterium tuberculosis which is still a health problem. In 2022, the total cases of TB-MDR patients in Indonesia are 8,268 cases but the treatment success rate ranges from 49-51% and the Loss to Follow Up rate is around 24-26%.
Design/Methods: The retrospective cohort research design was carried out at the TB-RO Polyclinic at Muhammadiyah Lamongan Hospital for the period December 15 2021 to May 31 2023 with the total sampling method grouped into one group which was given treatment without spiritual psycho-social and economic approaches in the period December 15 2021 to August 31 2022 then the group was given treatment with a psycho-social, economic and spiritual approach in the period 1 September 2022 to 31 May 2023. After that, the number of Loss to Follow Up events was calculated before and after being given the spiritual approach.
The design of the psycho-social approach includes patient support to ask about the patient's condition online or offline, pick-up and pick-up the patient when scheduled for control, deliver TB medication to the patient's home, focus group discussion-family gathering and visits to absentee patients. Economic approaches such as providing assistance with living costs, transportation costs, and milk.
The spiritual approach includes spiritual guidance before taking TB medication, patients want to be absent and preach religious lectures and pray together during focus group discussion-family gathering activities.
Results: One group that was treated with a psycho-social and economic approach without spirituality found three people had Loss to Follow Up, while after being given treatment with a psycho-social, economic and spiritual approach, there was no new Loss to Follow Up incidents.
Conclusions: Assistance for drug-resistant TB patients with psycho-social, economic and spiritual approaches can reduce the incidence of loss to follow-up.

EP13-715-15 Critical pathways to novel TB diagnostics adoption in health systems: A realist review

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Background and challenges to implementation: There is a translational gap that often leads to underutilization of research evidence in policy translation, especially in infectious diseases with high mortality like Tuberculosis (TB). Implementing highly sensitive TB diagnostic tests such as Xpert MTB/RIF has resulted in higher case finding. However, challenges in access and implementation to this molecular rapid test warrants the development of alternative diagnostics and ensuring effective adoption within the health systems. Thus, identifying critical pathways for diagnostics implementation, especially for TB, is needed to translate research into policies in an effort to eradicate TB by 2030.
Intervention or response: We conducted a realist review with primary aim to describe the critical pathway for the implementation of novel TB diagnostics adoption. The literature was searched from PubMed, Scopus, and grey literatures. We synthesized the findings to understand the context, mechanism, and outcomes (CMO) relevant to the adoption of new diagnostics using the Realist and Meta-narrative Evidence Synthesis: Evolving Standards (RAMESES).
Results/Impact: A total of 2197 articles were screened, with eight articles and relevant grey literatures included. We identified a ten-step pathway for diagnostics adoption as follows: identifying need, concept and feasibility, development, laboratory and clinical validation, regulatory approvals, the World Health Organization (WHO) evaluation, scale-up, and adoption leads to impact under quality control and review. The articles highlighted collaboration and communication among stakeholders during implementation. Confidence in test uptake grew with stronger evidence in validation study and endorsement from international agencies, such as WHO. Affordability of the new diagnostics was also a significant consideration in these papers.
Conclusions: Critical pathway identified in the studies complements the importance of effective communication, stakeholder, engagement, and policy alignment. It outlines relevant mechanisms along the ten-step TB diagnostics implementation pathway. These results inform researchers, policymakers, and other relevant stakeholders regarding concrete steps that need to be taken to translate tuberculosis diagnostics research into policies.

EP13-716-15 Innovative approaches to enhancing TB detection in the private sector: Implementing a nesting model with patent medicine vendors in Kano, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge globally, with a substantial burden in countries like Nigeria. Despite concerted efforts, TB case detection rates in the private sector remain suboptimal.
This abstract explores an innovative approach to improving TB case detection by implementing a nesting model with Patent Medicine Vendors (PMVs) in Kano State, Nigeria.
Intervention or response: KNCV Nigeria implements the USAID-funded TB Local Organizations Network (TB LON) regions 1 & 2 projects with the overall goal of increasing TB case finding in supported states of implementation. As part of efforts to improve case detection in the private sector, KNCV implemented a nesting model for PMVs whereby already-established PMVs co-opted other PMVs within their purview, supporting them with capacity building on screening and documentation.
When presumptive TB cases are found by the smaller PMVs the hubs step in to ensure diagnosis and enrollment into treatment is carried out. This allows for a greater number of persons to be reached with TB screening services.
Results/Impact: Between October 2022 and September 2023, a total of 767,242 people were screened for TB. Of these, 131,452 were presumed to have TB, and 11,384 cases were diagnosed giving a presumptive TB yield and a TB yield of 17% and 9% respectively. There was also a steady month-by-month increase in TB case detection numbers as shown in the graph below.

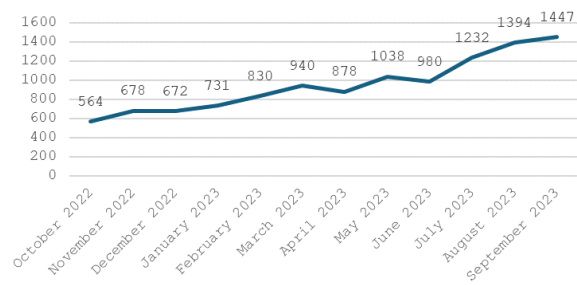

Fig 1: Monthly PMV TB Case Detection Trend October 2022-September 2023

Conclusions: In resource-constrained environments such as Kano state Nigeria, the PMV nesting model presents a viable and effective approach to enhancing TB case detection in the private sector. The model addresses key challenges by leveraging existing infrastructure and empowering frontline healthcare providers. Further assessment and scale-up of this model can significantly contribute to TB control efforts and reduce the burden of the disease in Nigeria and similar contexts globally.

EP13-717-15 Unlocking private sector potential: Engaging in TB preventive treatment management - Insights from India

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Background and challenges to implementation: Despite progress in tackling tuberculosis (TB), it remains a significant global health challenge, especially in countries like India. Though the private healthcare sector plays an important role in India's care delivery, its participation in TB preventive treatment (TPT) has been limited. The Programmatic Management of TB Preventive Therapy (PMTPT) targets high-risk household contacts (HHC) of TB patients, leveraging support from the private sector. Through systematic screening of HHCs with the provision of preventive treatment, PMTPT aims to effectively reduce TB incidence, contributing to the overall goal of TB elimination.
Intervention or response: In Partnership with Punjab's National TB Elimination Program (NTEP), TB-Alert India with funding support from FIND-India, has implemented Joint Effort for Elimination of Tuberculosis (JEET) 2.0 initiative across 4 high burden districts (Amritsar, Jalandhar, Ludhiana and Patiala. Deployed 5 Field Officers targeting private health care providers (HCPs) and engaged 691 HCPs by training, 433 through Continued Medical Education (CME) sessions and 258 via individual visits. Field Officers facilitated ongoing updates on TB infection and control measures, providing consistent support.
Results/Impact: From September ,21 to March ,24, 10,052 pulmonary TB cases (Index Patients - IPs) were notified. Out of them, 6,073 (60.4%) current district patients were verified and agreed to a home visit. Among the verified, 5,712 (94.1%) IPs were visited. During household visits, 20,731 eligible HHCs were identified, out of which 20,448 (98.6%) HHCs were screened. Among these, 15,458 (75.6%) contacts were put on TPT. Among these, 11,797 HHC results were declared, and out of these, 9,768 (83%) completed treatment. The remaining 3,661 HHCs are still on treatment.
Conclusions: Expanding initiatives like JEET 2.0 to involve the private health sector highlights the importance of collaboration between public and private healthcare. This collaborative model can serve as a blueprint for other high TB-burden countries aiming to bolster TB control through private-sector engagement.

EP13-718-15 Transformative strategies for TB notification enhancement through big chain hospital engagement in Indonesia

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Background and challenges to implementation: There are 1,163 public hospitals and 2,015 private hospitals in Indonesia. Engaging private hospitals at scale, is critical to the success of Indonesia's tuberculosis (TB) prevention and care program. This is challenging, requiring engagement and monitoring of many individual hospitals to support compliance with national TB management guidelines. Working with corporate management of 'chains' of hospitals, is an opportunity to efficiently engage private hospitals and enhance their TB contribution.
Intervention or response: In 2023 the USAID Tuberculosis Private Sector (TBPS) activity, in collaboration with the Ministry of Health, launched the Big Chain Hospitals Engagement (BCHE) program. This intervention engages the corporate level of five major hospital chains (Siloam, Hermina, Mitra Keluarga, Primaya, Pertamedika). The BCHE program leverages corporate strategies, optimizes hospital TB team functions, updates hospital chain procedures in line with national guidelines, and enhances health worker capacities through e-learning and coaching. This "top-down" approach reaches 154 chain hospitals with TB specific interventions.
Results/Impact: Since BCHE program initiation, there has been an improvement in TB notification, diagnosis and treatment initiation in the 154 chain hospitals. In 2023, 32,776/68,623 (48%) of presumptive TB were diagnosed and notified (a 112% increase from 15,442 in 2021). Treatment initiation among diagnosed patients reached 80%, with an 11% referral rate to other facilities, mainly for national health insurance patients. However, 9% of notified TB patients had initial loss-to-follow-up. The use of molecular WHO-recommended diagnostics rose from 42% in 2021 to 49% in 2023.

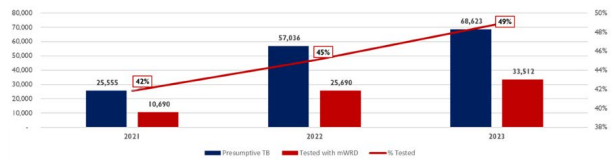

Figure. Proportion of presumptive TB identified at 154 big chain hospitals tested with mWRD 2021-2023.

Conclusions: The collaboration between USAID TBPS and Indonesia's major hospital chains has markedly improved TB case notification rates and diagnostic practices and demonstrated that corporate level engagement can be used to efficiently expand TB service reach across the private sector. Despite these advances, addressing the initial loss to follow-up remains imperative for enhancing patient outcomes and interrupting TB transmission.

EP13-719-15 Navigating impact of interface agency in catalysing private sector engagement under National TB Elimination Programme, India

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Background and challenges to implementation: Engaging private sector and enhancing quality of tuberculosis care services accords priority in India's National Strategic Plan (2020-25) for TB elimination efforts. Private sector is ever evolving, with diverse diagnostic & treatment practices followed by wide spectrum of private providers. While private sector remains first point of contact for 80% TB cases[1], there is a substantial disparity between private notified TB cases vis-a-vis patient estimates from drug sales data, underscoring pressing need for effective private sector involvement.
Intervention or response: Introduction of Patient Provider Support Agency as a link between private providers & TB patients catered by them with NTEP is a key strategy in Private sector engagement. PPSA has been scaled-up through domestic funded output-based contracts to >200 districts across India. Agencies support through mapping and engagement of private providers to facilitate notifications, linkage for specimen management and programmatic drug delivery, public health actions and treatment adherence for successful outcome. PPSAs offer innovative solutions to systemic gaps through augmenting HR, call center-based patient counseling, resource sharing for diagnostics and incentive-based engagement of pharmacists etc.
Results/Impact: In 2023, India achieved the highest-ever notifications of 0.84million TB cases (33%) from the private sector out of a total of 25.3m notified patients. Districts with PPSAs (~30% of total districts) contributed 62% (0.5m) of these cases and showed an increase in notifications of 27% over 2022 versus 4% gain in non-PPSA districts. Similarly, the number of private providers notifying TB cases increased from 20,823 in 2022 to 27,537 (32%) in 2023 in PPSA districts, versus 17% in non-PPSA districts. Simultaneously, there is a significant improvement in quality of TB care parameters in private sector.

SN	Parameters	Districts with PPSA (242)	Districts without PPSA (572)
1	Private TB notifications in 2023	501,985	339,804
2	% Gain in private TB notifications in 2023 as compared to 2022	27%	4%
3	Gain in private providers notifying TB cases - 2023 vs 2022	20,823 to 27,537 (32%)	27,327 to 31,891 (17%)
4	Gain in High volume providers (private providers notifying more than 1 case per month) - 2023 vs 2022	5,416 to 6,690 (24%)	4,901 to 5,130 (5%)
5	% NAAT testing amongst private notifications	52%	36%
6	% Comorbidity testing (HIV) amongst private notifications	95%	90%
7	Proportion of TB patients received financial support by the program during TB treatment	71%	67%

Source: Nikshay Data as on 24 February 2024

Table. Comparison of private sector TB care indicators in 2023 based on presence of Interface Agency - PPSA under NTEP, India.

Conclusions: Interface agency engaged under output-based contracting has emerged as a key intervention to bolster engagement of private providers and improving quality of care for TB patients.

EP13-720-15 Going beyond health sector: Integrating TB prevention services into Uganda's workplace policies and budgets for equitable access

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Background and challenges to implementation: Uganda is among the 30 high-burden TB/HIV countries globally, with 94,480 new cases and 12,000 deaths reported in 2023. The country experienced an 11% increase in incident TB

cases, with treatment success rates increasing from 87.3% to 89.4%. The mortality rate decreased from 1180 to 1019. National TB notification data shows a higher risk among miners, uniformed personnel, fisher folks, and health workers. A Multi-sectoral Accountability Framework for TB (MAF-TB) is needed to address challenges.

Intervention or response: In November 2020, Office of the Prime Minister launched the MAF-TB Framework, led by the Prime Minister at the policy coordination level and the Ministry of Health's National TB and Leprosy Program at the technical coordination level. The framework facilitated policy coordination and technical committee meetings, promoting collaboration among government entities.

The Office issued circulars to Ministries, Departments, and Agencies to integrate TB interventions into their work plans and budgets. MDAs designated TB focal persons to oversee TB prevention strategies and align them with HIV/AIDS workplace policies. NTLP conducted awareness campaigns and screening activities to strengthen TB prevention efforts.

Results/Impact: Three Ministry of Development (MDA) have integrated TB prevention into their workplace policies, while three others have initiated the policy review process. 18 out of 19 MDAs have designated TB focal persons to oversee TB prevention interventions and ensure alignment with existing HIV/AIDS workplace policies. MDAs like the Ministry of Information, Communications Technology, National Guidance, Agriculture, Animal Industry, Fisheries, and Internal Security Organizations have demonstrated commitment by incorporating TB prevention interventions into their Fiscal Year 2024/2025 budget policy statements. The Head of Public Service and Secretary to Cabinet have reinforced integration efforts.

Conclusions: Uganda is on the right track towards reducing the tuberculosis burden, integrating prevention into workplace policies, and committing MDAs to include TB prevention interventions in their budgets for Fiscal Year 2024/25.

EP13-721-15 Sustainable interventions for improvement in External Quality Assurance (EQA) of Truenat MTB/RIF, Telangana State, India

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Background and challenges to implementation: National TB Elimination program (NTEP) in India has rapidly scaled up Truenat MTB/RIF testing as upfront molecular testing for TB diagnosis. External Quality Assurance (EQA) is a key step especially when new Nucleic Acid Amplification Test (NAAT) being offered.

NTEP has developed EQA program by using CDC's dried tube technology for NAAT and evaluated for a score of 100.Score more than 80 is considered satisfactory while score less than 80 as unsatisfactory. Telangana State recorded poor EQA for Truenat Program in 2021 and 2022.

Key challenges are frequent changes of staff at field level, equipment maintenance, limitation of knowledge and training for lab staff, inadequate site Monitoring visits.

Intervention or response: Communication mechanism was established whenever there was change in the staff operating Truenat machines. Post EQA visits were conducted for poor performing sites and the root cause analysis (RCA) was done.

Based on the RCA corrective action and recommendations were given to the sites and implementation was monitored. Refresher training was conducted for all laboratory supervisors and technicians in 2022.

Monthly virtual sessions were conducted for regular monitoring. Established data cell for analysis of monthly quality indicators and presented in virtual sessions to the sites.

The State developed internal Quality checklist for continuous monitoring. Close coordination with the respective equipment vendors was maintained to resolve site wise issues.

Results/Impact: Stepwise improvement recorded for EQA performance from 2021 to 2023 in the following figure below.

Truenat EQA summary over last 3 years in Telangana, India				
	Indicators	2021	2022	2023
1	Sites participated	31	85	91
2	No of truenat machines particpated	36	90	95
Numerical analysis of sites with satisfactory results (≥ 80)				
3	Satisfactory results (Truenat machines and percentage)	25 sites 69.4%	72 sites 80%	92 sites 96.8%
4	Sites with a score of 100/100	13 (36.%)	51 (71%)	84 (91.3%)
5	Site which gave results within tumaround time	26 (72.2%)	69 (76.7%)	84 (88.4%)
Numerical analysis of sites with unsatisfactory results (< 80)				
6	Unsatisfactory results (Truenat machines and percentage)	11 (30.6%)	18 (20%)	3 (3.2%)
7	Number of sites showing error and invalids	6	7	0
8	Number of sites with less than 40 scores	3	1	0

Conclusions: Telangana state of India has showed a significant improvement in all parameters of EQA in Truenat testing by implementing effective monitoring mechanism.

EP13-722-15 Exploring advocacy communication social mobilisation through sensitisation in schools to improve TB detection among school children

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Background: Tuberculosis (TB) remains a significant public health challenge in Nigeria, particularly among school-aged children. Despite ongoing efforts to end the disease, TB detection and treatment among this demographic remain suboptimal. In response, innovative approaches are necessary to improve case detection and treatment. This study focuses on exploring the effectiveness of advocacy communication, social mobilization, and sensitization in schools to enhance TB case detection among school children in Nigeria.
Design/Methods: The study targeted three Local Government Areas (LGAs) - Ajeromi, Badagry, and Ojo – for the school screening intervention in year 2023. Approval was gotten from the Lagos state Ministry of Education to conduct screening in Secondary schools in the state. Prior to screening in each school, students and staff and parents were sensitized about the burden of TB, its signs and symptoms and prevention and the importance of actively looking out for presumptive patients from their communities. To facilitate the intervention, three community volunteers were deployed to each LGA. These volunteers conducted routine screenings for TB using the standardized WHO four symptom screening (W4SS) checklist, supplemented by chest X-rays using CAD4TB enabled mobile X-ray vans when available.
Results: The intervention resulted in the screening of a total of 65,937 individuals across 36 schools in the three LGAs. From these screenings, 1,870(3%) presumptive TB cases were identified, leading to the diagnosis of 68(4%) cases. Among the diagnosed cases, 42(62%) were clinically confirmed, with 60 (88%) cases successfully linked to treatment.
Conclusions: Results from the study show the effectiveness of advocacy communication, social mobilization, and sensitization initiatives in schools for improving TB case detection among school children in Nigeria. Moving forward, sustaining these efforts and expanding similar interventions to other regions can significantly contribute towards increasing cases detection.

EP14 Case finding, triaging and access, finding the missing millions

EP14-723-15 Boosting systematic screening at the primary health care level in Ukraine for populations at risk for TB

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Background and challenges to implementation: Ukraine ranks fourth highest TB disease prevalence in Europe, with one of the highest multidrug resistant TB burdens globally. Despite the existence of approved national-level procedures for systematic TB screening, the identification of populations at risk for TB among PHC-level staff has faced barriers to implementation due to lack of practical guidance.
Intervention or response: Beginning January 2023, STBCEU supported the operationalization of systematic TB screening in 15 primary health care centers (PHCCs), which combined serve 549,637 people across four regions. Support included protocol, patient route, and standard operating procedure development; workshops and trainings for 370 family doctors; and supportive supervision. TB risk identification began in March 2023, also with focus on improving HIV testing among people with presumptive TB.
Results/Impact: By the end of 2023, 73% of trained doctors had assessed nearly half of the clients (253,030 out of 549,637, 46%) for TB risk across the four regions.

Among those assessed, 64,044 (25%) were categorized into high TB risk groups, 29,746 were screened for TB symptoms, and 2,286 (7.7%) screened had positive results. Additionally, 24,711 people were referred for chest X-ray (CXR) screening: among the 22,046 (89%) who completed CXR, 1,803 (8.2%) had CXR abnormalities. HIV testing was prescribed for 2,778 persons with presumptive TB; among the 1,653 people tested (59.5%), 26 returned positive (1.6%). GeneXpert was prescribed for 595 persons, among whom 487 (82%) were tested and 104 (21.4%) received positive results. 277 TB cases were diagnosed by PHC-level family doctors in 2023.

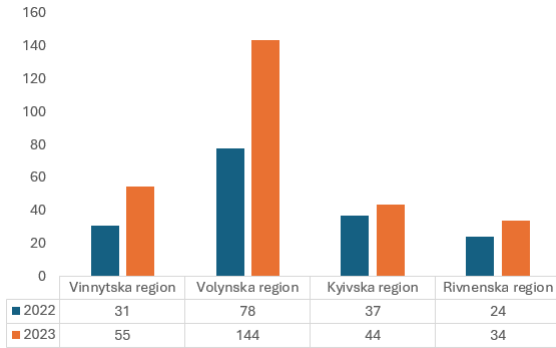

Figure 1. The number of people detected with TB in four regions.

Conclusions: The intervention contributed to capacity-building among family doctors, and TB detection at the PHC level increased 63% from 2022 to 2023. Despite the advancement, incomplete coverage of TB risk assessment existed, as only half of the population was screened for TB risk. This indicates that continuous support is needed to improve accessibility to medical services and enhance TB detection.

EP14-724-15 Expanding private sector involvement to enhance TB identification in Pakistan

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Background and challenges to implementation: Pakistan, with a population of 235.8 million, ranks sixth globally and fifth among 30 high-burden TB countries, with an annual incidence of 608,000 new TB cases. However, around 183,400 incident TB cases are missed from reporting, including those treated in private facilities and individuals with TB symptoms not seeking healthcare. Given that over 80% of the population seeks private healthcare, engaging the private sector is crucial to expanding TB management services, particularly in vulnerable communities with limited healthcare access.
Intervention or response: Since 2010, Mercy Corps, with support from the Global Fund, has been integrating private healthcare providers (HCPs) into the Public-Private Mix (PPM) model. Implemented incrementally, these PPM interventions have steadily expanded from 1,330 (2015) HCPs to 12,750 (2023). Mercy Corps also expanded its network of health facilities by taking onboard 350 private hospitals and 800 private labs. This trajectory demonstrates a significant increase in TB notifications from the private sector over the past 10 years, highlighting the efficacy of scaling up the PPM approach.
Results/Impact: Over the past decade, the PPM model has made a notable contribution to TB case notifications. The proportion of all forms of TB cases notified through PPM has steadily risen and the contribution in total National case notification rose from 8% to 40%, as illustrated in the table below.

Year	Total No. of Onboard HCPs	No. of All form cases reported by PPM	% contribution in National Case notification
2015	1,330	15,253	8
2016	1,560	36,005	17
2017	1,620	40,863	19
2018	1,620	36,774	22
2019	1,640	38,969	25
2020	1,780	39,669	24
2021	4,343	87,981	26
2022	8,945	141,955	34
2023	12,750	186,313	40

Conclusions: The contribution of the private sector in TB case notification underscores the importance of continued investment and expansion of PPM initiatives to further enhance TB detection and control efforts.

EP14-725-15 Decentralised triaging of people with TB under Differentiated Care Model in Jharkhand, India to reduce loss to TB care cascade

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Background and challenges to implementation: Triaging TB patients at baseline can potentially reduce adverse outcomes resulting in a decreased loss to TB care cascade. Initiating TB patients on treatment without a thorough clinical evaluation has resulted in 4% deaths and 1% Lost to Follow Up (LTFU) in Jharkhand in 2022.
Intervention or response: Jharkhand state in India has started implementing Differentiated TB Care model (DCM) in 2022 to provide baseline assessment to all diagnosed TB patients. The scheme was launched in the state in a phased manner and 23 of the 24 districts were

covered under the scheme by December 2023. The state has conducted phase wise facility assessment and cascade trainings to ensure field readiness. The scheme is implemented in 26% (n=700) of peripheral health institutions (PHIs) which includes decentralized triaging conducted by Community Health Officer (CHOs) at 387 Ayushman Arogya Mandirs (earlier known as Ayushman Bharath Health and Wellness Centers) in addition to 178 TB Units and 135 primary and secondary care centers. TB Patients are evaluated for 19 indicators after the diagnosis. Based on the baseline assessment, if patients require admission and management, they are referred to a higher center with secondary or tertiary care facilities at the earliest.

Results/Impact: In 2023, Jharkhand has offered decentralized baseline assessment to 35% (n=8641) of patients diagnosed in implementing PHIs. Of which 13% (n=)1123 patients were referred to a higher center with 1077 patients were referred for Outpatient (OP) and 46 for In Patient (IP) management respectively. LTFU was 0.1% (n=25) and 1.2% (n=102) patients died among those offered a baseline assessment.

Conclusions: The intervention has brought a 90% reduction in LTFU and 70% reduction in death among TB patients in the state in 2023. The state is planning to scale it up to all PHIs in 2024.

EP14-726-15 Engaging miners and mining communities in finding missing people with TB in Northeast Nigeria

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Background and challenges to implementation: There are an estimated 2.5 million miners in Nigeria, a community known to have high TB rates due to poor access to health care, high prevalence of HIV and Silicosis among other factors. Nigeria's TB response has not adequately engaged the mining communities who may contribute to the high number of undiagnosed people with TB. JHF/SCDI conducted Active TB screening in mining communities of Gombe State with funding support from TB REACH. This paper demonstrates results from active TB screening among among miners and mining communities in Nigeria.

Intervention or response: A participatory approach was employed to actively engage and involve mining communities in TB screening in 2 local government areas (LGAs) of Gombe State. Key stakeholders were identified and engaged, community volunteers (CVs) were identified, trained and engaged, the mining community was mobilized, and active TB screening was conducted using door-to-door and community mass screening approaches. Sputum was collected and transported to the nearest Xpert sites. The TB screening cascade was documented and the impact on LGA notifications assessed.

Results/Impact: A total of 64 community screening events were conducted in 24 mining villages over 8 months (August 2023 – March, 2024); 18,441 individuals were verbally screened out of whom 3,294 (17.8%) were identified with presumptive TB and had their sputum examined by Xpert. 395 people with all forms of TB were detected; 344 were Bac+ while 22 individuals (5.6%) had drug resistant TB. Overall, there was a 25% increase in TB case notifications in the 2 LGAs compared with baseline notification.

Conclusions: Key populations like the miners often have outsized burdens of TB. Additional efforts are often required to reach these populations. They can make up large proportions of the TB burden in many settings. Community-based organizations are ideally suited to integrate key populations to improve the TB response.

EP14-727-15 Statewide triaging at diagnosis for severe illness followed by inpatient care reduces early TB deaths

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Background: Tamil Nadu is a southern Indian state with a reported TB death rate of 6% among ≈83 thousand people notified in 2021. Early deaths (within two months) constitute 70-80% of total deaths. Beginning April 2022, triaging for severe illness was initiated at diagnosis and those with very severe undernutrition, respiratory insufficiency or poor performance status were prioritized for referral and inpatient care. Following this differentiated TB care, we assessed the number of quarters it took to have an impact on reducing early TB deaths (if any) and whether this impact was sustained.

Design/Methods: We conducted a cohort study using program data. For successive quarterly diagnosis cohorts of adults (≥15y) notified from public facilities (not known to be drug resistant at diagnosis) who were the target for this initiative, we compared the early TB death rate with

baseline (January to March 2022 diagnosis cohort). Adjusted hazards ratio(aHR) calculated using cox regression was used to infer the impact.

Results: Early TB death rate was 5.2% at baseline. Between April 2022 and June 2023, 66,765 (92%) of 72,404 notified adults were triaged,7950 (12%) were triage-positive, among whom 5870 (74%) were referred and admitted. No impact was observed among the April to June 2022 diagnosis cohort. After adjusting for potential confounders, a 21% reduction in early TB death rate was observed among the July to September 2022 diagnosis cohort when compared to baseline(aHR 0.79, 95% CI 0.71, 0.88). This impact was not sustained in the successive cohorts: October to December 2022(aHR 0.93, 95% CI 0.84, 1.03), January to March 2023(aHR 0.95, 95% CI 0.86, 1.05) and April to June 2023(aHR 0.92, 95% CI 0.83, 1.01) (see Table).

Table. Impact of TN-KET on early deaths[#] in successive quarterly diagnosis cohort of adults with tuberculosis (age ≥15 years, without known drug-resistance at diagnosis) from public health facilities of Tamil Nadu[*], India

Quarterly diagnosis cohort	Total	Early deaths				
		Incidence proportion		Incidence rate per 100 pm	HR (95% CI)	aHR[$] (95% CI)
	N	n	(%)			
July to September 2022						
During TN-KET (July to September 2022 diagnosis cohort)	13525	616	(4.5)	0.08	0.85 (0.77, 0.95)	0.79 (0.71, 0.88)
Before TN-KET (January to March 2022 diagnosis cohort)	14530	767	(5.2)	0.09	Ref	
October to December 2022						
During TN-KET (October to December 2022 diagnosis cohort)	13854	747	(5.4)	0.09	1.01 (0.91, 1.12)	0.93 (0.84, 1.03)
Before TN-KET (January to March 2022 diagnosis cohort)	14530	767	(5.3)	0.10	Ref	
January to March 2023						
During TN-KET (January to March 2023 diagnosis cohort)	14485	766	(5.3)	0.09	0.99 (0.90, 1.09)	0.95 (0.86, 1.05)
Before TN-KET (January to March 2022 diagnosis cohort)	14530	767	(5.3)	0.09	Ref	
April to June 2023						
During TN-KET (April to June 2023 diagnosis cohort)	14107	681	(4.8)	0.09	0.91 (0.82, 1.01)	0.92 (0.83, 1.01)
Before TN-KET (January to March 2022 diagnosis cohort)	14530	767	(5.3)	0.10	Ref	

TN-KET- Tamil Nadu *Kasanoi Erappila Thittam* (mean TB death-free project in Tamil) involving triaging for severe illness at diagnosis and prioritizing patients with very severe undernutrition, respiratory insufficiency or poor performance status for referral and inpatient care; [#]early death (within two months), [*]all TB districts of Tamil Nadu except Chennai, [$]adjusted for potential confounders

Conclusions: It took two quarters of differentiated care to have an impact on reducing early TB deaths. Challenges for sustained impact should be identified and addressed.

EP14-728-15 Using patient-pathway analysis to increase access to TB services and inform a differentiated programme response in Nigeria

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Background: Nigeria is ranked sixth among the high-burden TB countries and for over a decade (up to 2018), only 15 to 24% of the incident TB cases were notified annually by the Nigeria National TB Programme (NTP). To address this challenge, the NTP scaled-up several strategies to improve the TB treatment coverage. The aim of this study was to assess the alignment between patient health-seeking behaviour and TB service availability across different service delivery points in Nigeria.

Design/Methods: A patient-pathway analysis was completed to assess the alignment between patient care initiation and the availability of TB diagnostic and treatment services at the national and all 36 States of Nigeria including the Federal Capital Territory (FCT) using existing NTP and survey datasets.

Results: Nationally, 27.4% of all TB patients first sought care from the informal private sector, mainly from patent medicine vendors; this ranged from 6.9% to 50% across all States of the country. For the availability of diagnostics nationally, 15 states had 100% and other 14 states ≥ 50% availabilities at tertiary level of care.

At secondary level, only 5 states had ≥ 50% availabilities with none up to 100%. At primary level, 13 states had < 1% availability. For treatment services, 31 states with FCT had 100% DOTs services. At the secondary-care level, 16 states had 100% and another 14 states ≥ 50% availability of TB Services. At primary level, 21 states had ≥ 50% availabilities, while others had less than 50%.

Nationally, only 24% of TB patients accessed any diagnostic services at first visit; and 64% accessed first-line treatment services at first visit.

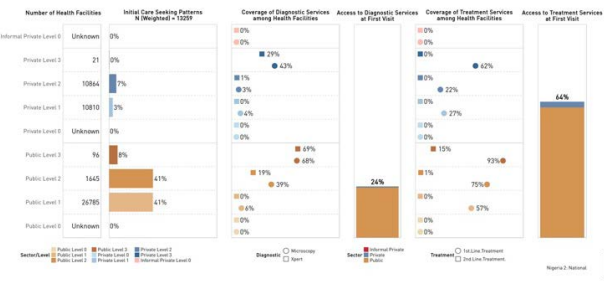

Figure 1. TB patient pathway visual at the national level.

Conclusions: Sustained engagement of the informal sector will improve the efficiency and timeliness of TB diagnosis, and strengthening of the public-private mix could help identify the majority of missing TB cases in Nigeria.

EP14-729-15 Innovative endeavor to improve TB notification from private sector by asserting Clinical Establishment Act, 2017 in West Bengal state of India

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Background and challenges to implementation: Private sector in India is huge, heterogenous & largely unorganized. Engaging private sector is a tough, yet a very essential steps towards TB elimination. In the post-Covid period the state of West Bengal was trying to improve its TB performance indicators including the private sector indicators in absence of any Patient Provider Support Agency (PPSA).

Intervention or response: During the early months of 2022, the state had identified the big corporate hospitals, where there is high patient footfall, in and around Kolkata Metropolitan City. These private hospitals need to have license from the department of Clinical Establishment (CE) to run their business and hence are bound to abide by the rules. The State TB program utilized that opportunity to sensitize the big hospitals in collaboration with the CE cell.

Zone wise sensitization program arranged in presence of the CE licensing officers as well as TB officials. Post-sensitization periodic follow-up visit for monitoring & handholding was conducted by the district TB team. Few monitoring indicators like presumptive case referral and sputum positivity rate, were chosen for prioritizing visits & revisits.

Results/Impact: From the year 2021 to 2023, TB notification in Private sector saw an increase from 12910 to 29991(132%). Percentage of programmatic medicine utilization increased from 87% to 91%.

Proportion of rapid molecular test for diagnostic samples and rate of microbiological confirmation increased from 62% to 73% & 52% to 61%, respectively. Percentage of direct benefit transfer (DBT) decreased from 74% to 57% (Fig-1).

Conclusions: The innovative endeavor of collaboration with CE licensing department gave a good boost to the Private sector notification target achievement in West Bengal. Now it's time to focus on the post-notification public health actions including DBT (Direct Benefit Transfer) beside sustenance of the already achieved achievement.

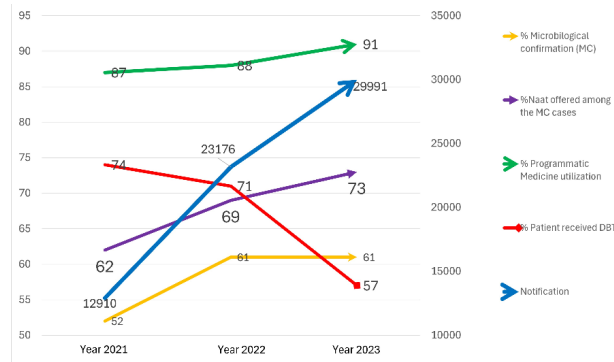

Figure 1. Trend of TB service indicators in private sector of West Bengal, India.

EP14-730-15 Intensifying TB case finding through multi-prong approaches in Cambodia: A review of four years program data

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Background and challenges to implementation: Cambodia remains on the global TB watch list, and the path towards ending TB was impeded by the missing cases. In 2023, approximately 40% of TB cases were estimated to be undiagnosed and untreated. Intensifying case finding using a multi-prong approach to increasing TB case detection, notification, care, treatment outcome, and prevention is critical to ending TB in Cambodia.

Intervention or response: Community Mobilization Initiatives to End Tuberculosis (COMMIT) is a five-year USAID-funded project that implements a multi-prong approach using locally generated solutions and community engagements to improve TB case finding, TB prevention, linkage to diagnosis, and treatment support in Cambodia. The multi-prong approaches to case finding included one-off roving, snowball, community TB screening, hospital linkage, bi-directional screening of TB and diabetes, contact investigation, screening, and provision of TB preventive treatment (TPT). COMMIT operates in points of care, including 14 referral hospitals and 187 health centers in six provinces and municipalities. We aimed to highlight the program's 48 months of achievement from January 2020 to December 2023.

Results/Impact: Over the past four years, we screened 391,537 people for TB (25.0% identified as presumptive TB), and 95,677 were tested for TB (female=58.3%). We

detected 8,978 people with all forms of TB (female=45.4%) and 99% enrolled in treatment (female=45.3%). Of the 2,371 persons diagnosed with bacteriologically confirmed TB who were identified as TB index cases, we screened and evaluated a total of 12,605 close contacts. 10,686 (female=55.3%) were eligible for TPT. 74% (female=55.3%) of those who were eligible for TPT-initiated treatment. 95 % of the enrolled treatment complete TPT treatment.
Conclusions: COMMIT's multi-prong approaches to TB could improve TB case detection, care, treatment outcomes, and prevention efforts in Cambodia. The experience, data, and lessons learned are pivotal in informing relevant programs and policies on the path toward ending TB in the country.

EP14-731-15 Improving TB case finding among children through intensified multisectoral targeted screening: Lessons from the TB LON3 project in Ogun State

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Background and challenges to implementation: Tuberculosis among children and adolescents is currently underdiagnosed and under reported in Nigeria. This is largely attributed to the country's inability to achieve universal health coverage. Many families lack access to formal healthcare facilities at all levels. The conventional method of TB case identification among children at healthcare institutions has yielded limited success. The TBLON3 project seeks to screen marginalized children in schools and informal educational settings.
However, with a third of Nigerian children not in school, extending screenings to other community congregate settings is vital, particularly where children are predisposed to TB risk factors like malnutrition and overcrowding.
Intervention or response: A dedicated week was allocated for targeted screening in various settings such as public schools, orphanages, street children, Qur'anic schools, residential care for children with disabilities, and children within the communities. This initiative required collaborative efforts across multiple sectors, including the Ministry of Education, religious entities and Ministry of Women Affairs and Social Development, to locate and engage with these children effectively. Additionally, increased resources, including personnel, financial allocations, and Information, Education, and Communication (IEC) materials, were mobilized to expand the coverage of TB screening activities.
Results/Impact: The number of cases diagnosed during the targeted screening week for childhood TB case finding in May 2023 saw a significant increase, showing a 171% rise compared to the mean number of cases diagnosed between January and April 2023, which was 24 cases.
Furthermore, the Number Needed to Screen (NNS) to diagnose one case was 227, a marked improvement compared to previous months where it was no less than 400.

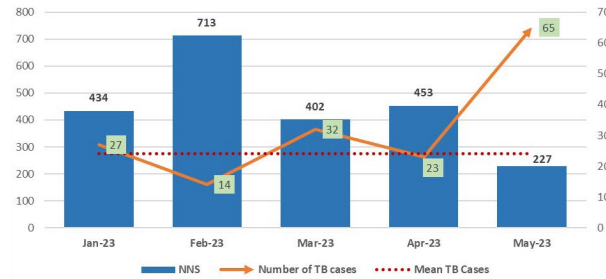

Figure. Active childhood TB case finding in Ogun state TBLON project, January - May 2023.

Conclusions: Targeted multisectoral childhood TB screening has proven to be highly effective and efficient in finding the missing TB cases in children and sustaining this multisectoral collaborative effort in identified TB high risk community settings is essential for ongoing TB case detection among children.

EP14-732-15 Finding the missing people with TB: Lessons learned from using artificial intelligence-enabled chest X-ray system for active TB case search in communities in Lagos, Nigeria

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Background and challenges to implementation: About 32% of people with Tuberculosis (TB) are missed annually in Nigeria. Hard-to-Reach areas are characterized by vastness, inadequate infrastructure, and limited access to basic healthcare services. This highlighted the need for

chest X-ray screening in communities and targeted outreaches are crucial to finding missing people with TB in these communities.

Intervention or response: The DCXR team worked with Lagos State TB control program, Damien foundation and Institute of Human Virology, Nigeria through Global Fund support, implemented CXR TB screening in rural areas. Hotspots were mapped using EPCON. We trained radiographers and TB screeners. Between January 2021 and December 2023, 1,469 outreaches were conducted in 721 rural communities.

Focusing on cough categories: Not coughing, Coughing <2weeks and coughing > 2 weeks for screening of clients, symptomatic client's sputum sample were collected for investigation and those asymptomatic or could not produce a sputum were referred for CXR screening.

CXR films were interpreted by hired radiologist and findings and reports were sent to Medical Officers for further evaluation.

Results/Impact: Over a 36-month period from January 2021 to December 2023, a total of 2,847,612 were verbally screened with 135,384 (5%) screened using the X-ray trucks with fixed DCXR attached with CAD4TB. 4,832 TB cases diagnosed were following verbal screening and 2,344 from CXR with CAD4TB AI screening and total of 7,176 TB cases were identified– See table below.

TB Screening modality	Number Screened	TB Presumptive	Evaluated	TB Patients Identified	TB Patients on treatment	% TB yield	NNS	NNT
Verbal screening	2,712,228	116,823	103,803	4,832	4313	5,866	561	24
CXR Screening	135,384	9711	9,634	2,344	1,553	1.73%	58	4
Total	2,847,612	126,534	113,437	7,176	5,866	0.25%	397	18

Conclusions: The intervention conducted shows that 2,344 (33%) out of the total of 7,176 TB cases identified during the period, would have been missed without the integration of CXR since they presented with No cough or Cough of <2 weeks duration. Considering the NNS (58:561) & NNT (4:24), It is recommended that consistent use of AI enabled CXR system attached with CAD4TB should be deployed for community TB screening as part of active TB case finding strategies.

EP14-733-15 TB missing cases in primary health care in Padang Panjang City, Indonesia

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Background: The ambitious goal of ending Tuberculosis (TB) by 2035 encounters a significant obstacle with a substantial number of unreported and undiagnosed TB cases, termed as „missing cases." In Padang Panjang City, Indonesia, a staggering 69.35% of TB cases have gone missing over the last three years, surpassing regional, national, and global averages. This situation carries profound implications as these index cases' whereabouts and health status remain unknown, hindering effective TB control efforts. The process of TB case discovery, the extent of missing cases, and their specific locations remain unclear, necessitating focused research.This study aims to provide a comprehensive understanding of the TB case discovery process, quantify missing cases, and identify their locations in Padang Panjang City.

Design/Methods: Conducted from January to July 2019, the research employed a case study approach within Community Health Centers, Pratama Clinics, and Independent Practice Doctors. Tracking missing TB cases utilized the Patient Care Cascade approach, while the location of these cases was determined through Patient Pathway Analysis, elucidating the journey of patients through the healthcare system.

Results: The results underscore the critical importance of effective TB case management. While the flow of pulmonary TB case discovery within government primary health care facilities adhered to established guidelines, disparities were observed in non-government facilities. A notable underdiagnosis of 71 cases and underreporting of 25 TB cases were identified, with missing cases predominantly located in private clinics and Independent Practice Doctors' settings.

Conclusions: Understanding the implications of unreported TB cases on public health and disease control is paramount. Unidentified TB cases perpetuate transmission, leading to increased disease burden and posing challenges to TB control initiatives. By addressing the gaps in case discovery and highlighting missing case locations, this study offers valuable insights for enhancing TB surveillance and management strategies in Padang Panjang City, ultimately contributing to global TB elimination efforts.

EP15 Improving TB care to make it person centred: Old and new strategies revisited

EP15-734-15 Understanding health-related quality of life among people with TB

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Background: Every year 1.5 million people in the world have died from TB. Several factors that cause death of TB patients are low quality of life. This study was aimed to analyse the factors influencing the quality of life of TB patients.
Design/Methods: This research used a cross sectional study design on TB patients conducted in August – October 2023 in Kupang City, Indonesia. The study population was all pulmonary TB patients who were undergoing treatment. The sample size of 102 was determined using the two proportion hypothesis testing formula. Sample selection was based on convenience sampling. The inclusion criteria for the sample were TB patients who had been on treatment for at least 1 month, had pulmonary TB confirmed bacteriologically, were at least 18 years old and were willing to be respondents. The research variables consisted of respondents' demographic characteristics, health literacy, Body Mass Index (BMI), social support, treatment status, comorbid status and quality of life. The quality of life of TB patients is measured using WHO-QOL-BREF (WHO Quality of Life - BREF). The research instrument used a questionnaire that had been tested for validity with a correlation coefficient of >0.60. Binomial regression test was used for multivariate analysis.
Results:

Variable	QoL (n= 102		P value	Prevalence Ratio (CI 95%)
	Poor (%)	Good (%)		
Age:				
20-35	18 (46.2)	21 (53.8)	0.48	
36-55	23 (54.8)	19 (45.2)		
56-76	13 (61.9)	8 (38.1)		
Sex				
Male	39 (60.0)	26 (40.0)	0.09	
Female	15 (40.5)	22 (59.5)		
Status Comorbidity (HIV or Diabetes)				
Yes	32 (69.6)	14 (30.4)	0.026	4.05 (1.180 – 13.927)
No	22 (39.3)	34 (60.7)		
Health Literacy				
Low	36 (63.2)	21 (36.8)	0.431	(0.489 – 5.349)
Higher	18 (40.0)	27 (60.0)		
Social Support				
Low	36 (65.5)	19 (34.5)	`0.999	(0.001-0.326)
High	18 (38.3)	29 (61.7)		
BMI				
< 18.5	34 (64.2)	19 (35.8)	0.020	3.14 (1.195 – 8.250)
>= 18.5	20 (40.8)	29 (59.2)		
Treating TB				
Intensive	35 (72.9)	13 (27.1)	0.030	4.93 (1.166 – 20.898)
Continuation	19 (35.2)	35 (64.8)		
Smoking Status				
Smoking	38 (66.7)	19 (33.3)	0.999	0.000 – 0.021
Not Smoking	16 (35.6)	29 (64.4)		

The results of multivariate analysis show that there are three variables that influence quality of life, namely comorbidity status (PR=4.05; CI= 1.180 – 13.927), treatment phase (PR=4.93; CI=1.166 – 20.898) and patient BMI (PR=3.14; CI=1.195 – 8.250).
Of these three variables, the most dominant variable is the intensive treatment phase, which has 4.9 times the risk of experiencing poor quality of life compared to patients who take part in advanced treatment.
Conclusions: It is important to provide special intervention and attention to ensure the quality of life for TB patients who have comorbidity status, BMI < 18.5 and who are in the intensive treatment phase.

EP15-735-15 Strategic foundations and preliminary insights: USAID ACCELERATE 2 project's baseline assessment in South Africa's TB landscape

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Background and challenges to implementation: The USAID ACCELERATE 2 Project's initial baseline assessment by Maternal, Adolescent and Child Health Institute (MatCH) as a sub-recipient of THINK-SA across Nkangala, West Coast, and Cape Winelands districts, completed by March 2024, combines quantitative and qualitative methods to form the empirical foundation for tailored TB prevention and care strategies in South Africa.
Intervention or response: The baseline assessment utilized a multi-faceted approach to gather both quantitative and qualitative data, offering a comprehensive view of the TB prevention and care landscape. This included data on TB prevalence, HIV co-infection rates, and healthcare access, enriched by qualitative insights from stakeholder interviews and community focus groups.
The methodology included health facility assessments, patient satisfaction surveys, and above-site evaluations, gathering data from 72 health facilities, 27 patient satisfaction surveys, and insights from 3 above-site evaluations.
Results/Impact: Facility assessments revealed TB diagnostic adherence between 75% to 90% and treatment success rates from 70% to 92%, indicating a need for tailored interventions. Patient surveys reflected high satisfaction levels (90% to 95%) with the timeliness of treatment and clarity of information.
More than 75% of facilities effectively implemented crucial TB prevention and care measures like sputum GeneXpert use and comprehensive screenings.
Yet, challenges in patient engagement and data management were noted, with under 50% of facilities adequately providing sputum collection instructions or tracking re-

jection rates. Above-site evaluations identified a robust TB program framework but also highlighted areas for improvement in health system coordination.
Conclusions: Even as the baseline assessment continues, its initial outcomes offer valuable insights into the strengths and gaps within South Africa's ending TB efforts. These findings have enabled the MatCH ACCELERATE 2 Project to begin tailoring its interventions, emphasizing the importance of a data-driven approach in tackling TB.

EP15-736-15 Assessing the gap: Adolescent-centric policies in high burden countries for TB

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Background: The World Health Organization (WHO) underscores higher prevalence of TB among adolescents and the need for developing and implementing specific policies for this age group. Yet, adolescent-centric TB policies are lacking.
To assess the adoption status, we evaluated whether adolescent-centric policies are incorporated into the national TB strategic plans (NSPs) of 30 high burden countries for TB (HBCs).
Design/Methods: We selected the countries based on the WHO list of 30 HBCs. To identify the adoption status of adolescent-centric policies, we tracked if the countries 1) categorized adolescent population as a distinct group, 2) have specific targets and intervention, and 3) tailored healthcare delivery models. To identify the adoption status, we reviewed the NSPs for TB via desktop reviews or the document repository of the HIV Policy Lab (www.hivpolicylab.org).
Results: Relevant documents were found for 25/30 countries. All NSPs categorized children as a distinct population but only 7 view adolescents as a distinct/vulnerable population. Among the 18 that do not, 7 focus on young adolescents (YA) by grouping them with pediatric population, 9 do not refer to adolescents at all, and 2 are inconsistent in how adolescents are defined.
Among the 7 countries that recognize adolescents as a distinct population, all have interventions tailored for adolescents for screening, prevention, diagnosis, or treatment in their NSPs and 6 have developed adolescent-centric models of healthcare delivery.
Of the 7 countries that focus on YA by grouping them with the pediatric population, all included specific interventions for YAs while 4 countries had specific targets and a YA-centric healthcare delivery model.
Conclusions: Despite the recognition of the unique needs of adolescents, NSPs lack sufficient adolescent-specific interventions, targets, and approaches. Moving forward, we will explore policy dimensions tailored to address adolescent-centric interventions within NSPs, such as data disaggregation, funding commitments, and capacity building strategies.

EP15-737-15 Understanding the social protection requirements for people with TB in India

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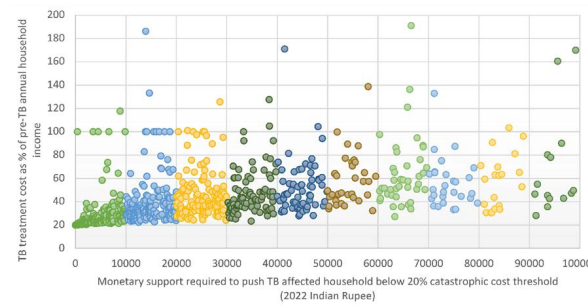
Background: Developing strong socioeconomic support for TB affected families is essential to reduce the disease burden. India government policy is to provide INR 500 (US$6) per month as direct benefit transfer to all registered persons with TB during their course of treatment for nutritional support. Following a cohort of 1462 persons with TB, we examined types of social support received by the study participants, how the support helped them in mitigating catastrophic cost and the amount and type of support they need to manage the disease.
Design/Methods: We estimated total cost of TB treatment and catastrophic cost following WHO guidelines of TB patient cost surveys. Using these estimates, we calculated the actual amount of cash transfers required to achieve zero catastrophic cost target. We also examined other socioeconomic impact to understand whether India government needs to think for other social support.
Results: 54% study participants received current government benefit and 11% received the full amount (INR 3000). 12% received food support and 4% received other forms of support from other sources. 1% got paid sick leave. 61% study participants faced catastrophic cost when income loss was considered in treatment cost calculation. This implied the disease had serious impact on study participants' employment. Government support of INR 500 per month helped only 2% study participants to remain below catastrophic cost. We estimated that a support amount of INR 30000 for 6 months of treatment (10 times of current support) will push back 64% study participants below catastrophic cost threshold.



Conclusions: Onging government benefit amount needs to be revised; however, it will have serious impact on TB programme budget. Hence, targeted approach may be

considered. As unemployment and income loss were the major contributors of catastrophic cost, only cash transfers may not be enough, policies to support livelihood or alternate employment opportunities needs to be considered.

EP15-738-15 Retreatment and anti-TB therapy outcomes in Brazil between 2015 and 2022: A nationwide study

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Background: Adherence to anti-tuberculosis treatment (ATT) in Brazil remains a challenge in achieving the goals set by the World Health Organization (WHO). Patients who are lost to follow-up (LTFU) during treatment pose a significant public health concern. There is scarce knowledge about the determinants of ATT outcomes in persons who priorly experienced LTFU. This study aimed to investigate the factors associated with unfavourable ATT outcomes among people undergoing retreatment in Brazil.

Design/Methods: We conducted an observational study of tuberculosis cases >18 years-old reported to Brazilian National Notifiable Disease Information System between 2015-2022. Only cases with information about the outcome were included in the analyses. Clinical and epidemiologic variables were compared between the study groups (new tuberculosis cases and retreatment). Next, we applied regression models to identify variables associated with increased risk of unfavourable outcomes.

Results: Among 743,823 reported tuberculosis cases in the study period, 594,513 were eligible for inclusion, consisting of 462,061 new tuberculosis cases and 93,571 undergoing retreatments (44,642 recurrent and 48,929 retreatments after LTFU [RLTFU]). RLTFU (OR:3·96; 95% CI: 3·83-4·1) was a significant risk factor for any type of unfavourable ATT (Figure 1a).

Furthermore, RLTFU (OR:4·93; 95% CI: 4·765·11) was the main risk factor for subsequent LTFU. For death, aside from advanced age (> 80 years-old) living with HIV (OR: 6·28; 95% CI: 6·03- 6·54) was the top risk factor (Figure 1b).

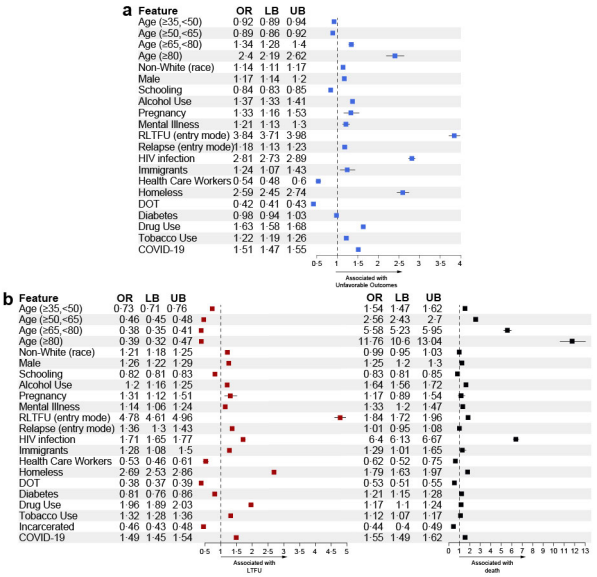

Figure 1: Results from logistic regression models quantifying the associations between various risk factors for (a) unfavorable treatment outcomes and (b) death and LTFU in the overall study population.

Conclusions: Retreatment is a substantial factor driving increased risk of unfavourable ATT outcomes, especially subsequent LTFU. The rates of treatment success in the retreatment group, especially in RLTFU, are distant from the WHO End TB Strategy targets throughout Brazil.

EP15-739-15 Risk factors for loss to follow-up across twelve rifampicin-resistant TB treatment sites in KwaZulu-Natal and Eastern Cape, South Africa

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Background: Our understanding of and ability to prevent loss to follow-up (LTFU) from rifampicin-resistant (RR-TB) care in South Africa (SA) is limited. Accordingly, this analysis aimed to determine the individual risk factors associated with LTFU. Further, it sought to improve understanding of facility-specific factors influencing LTFU by comparing rates of LTFU and facility characteristics across twelve RR-TB treatment sites.

Design/Methods: We retrospectively analyzed 2134 people treated for RR-TB at 12 SA public hospitals enrolled in a cluster-randomized trial. Descriptive statistics were compared across treatment sites using or the Kruskal-Wallis H test, and members of the parent study team

provided additional context about the treatment sites as appropriate. Then, the relationship between LTFU and 19 potential predictors was modeled using logistic regression. Variables significantly related to LTFU (α=0.05) in a bivariate analysis were included in a final multivariable analysis to identify independent risk factors for LTFU.
Results: Rates of LTFU varied significantly across the twelve RR-TB treatment sites, and treatment site was found to be independently associated with LTFU in our final model.
Further, older age (aOR: 0.98, 95% CI 0.97-0.99), higher BMI (aOR: 0.96, 95% CI 0.94-0.99), and receiving an all-oral treatment regimen (aOR: 0.56, 95% CI 0.40-0.78) decreased odds of LTFU, while history of incarceration (aOR: 1.86, 95% CI 1.30-2.65) increased odds, when controlling for sex, marital status, household size, employment status, substance use, binge drinking, housing status, and treatment site.
Conclusions: Future care engagement research should focus on facility-level factors, which are under explored in the current literature. Our study team hypothesized that public transit access, RR-TB clinical expertise, and interdisciplinary collaboration are facility-level factors that impact LTFU and should be investigated. In the meantime, knowledge of individual risk factors, including incarceration history, age, and BMI, may help providers identify those at risk for LTFU to help retain those patients in care.

EP15-740-15 Differentiating financial assistance for drug-resistant TB affected households to offset income loss during care in Ho Chi Minh City, Vietnam

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Background: Approximately 87% of households affected by drug-resistant tuberculosis (DR-TB) in Ho Chi Minh City, Vietnam experience catastrophic costs, even though financial assistance is available and Vietnam's social health insurance (SHI) covers many forms of care. The majority of these costs are driven by income loss.
Design/Methods: A predictive model for catastrophic cost incurrence was developed into a five-question risk assessment tool easy to administer at point of care. This tool was used at treatment initiation to assess the eligibility of people starting DR-TB treatment for differentiated tiers of socioeconomic support.
An intervention utilizing three cumulative packages of support was conducted.
Level 1: income generation;
Level 2: income replacement through cash transfers;
Level 3: improving social protection by procuring SHI.
Results: Out of 194 people with DR-TB screened using the risk assessment tool, 52.6% (n=102) households were eligible for support of whom 78 (76.5%) agreed to participate in the intervention. Social workers co-developed individualized plans for increasing household income, provided capital investments of up to ~120 USD, and weekly support and engagement. Income was increased among 65 (83.3%) of the households who had agreed to participate. Among the households that did not register an increased income, the reason for 46.2% of eligible households was limited capacity in the household. Cash transfers were distributed to all 38 eligible households in Level 2 to offset income loss. SHI was procured for 2 of 3 (66.7%) eligible households.

	Eligible DR-TB households	Participating DR-TB households
Risk assessment tools completed	194	-
Intervention households	102 (52.6%)	78 (76.5%)
1: Income generation	78	65 (83.3%)
2: Income replacement through cash transfers	38	38 (100%)
3: Social protection via SHI procurement	3	2 (66.7%)

Conclusions: This household-based intervention demonstrated the feasibility of stratifying risk and distributing social protection benefit packages according to socioeconomic vulnerability among people with DR-TB. Key lessons emerged on the potential for DR-TB affected households to increase their income during care. Cash transfer delivery and SHI procurement had better acceptability and were easier to deliver than individualized income generation.

EP15-741-15 Zero-day ambulatory treatment in drug-resistant TB to enhance enrolment and treatment adherence in Bangladesh

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Background and challenges to implementation: Globally the diagnosed multidrug-resistant or rifampicin resistant tuberculosis (MDR/RR-TB) is much lower than the estimation. In 2022, only about 43% of estimated MDR/RR cases could be diagnosed and the enrollment for treatment was lower. In Bangladesh 1373 people developed MDR/RR in 2022 of which 1267 had been enrolled for treatment. This gap between diagnosis and enrollment mostly due to refusal of staying at hospital, long term treatment, weak referral system in community, stigmatization, poor socio-economic condition, lack of community awareness, etc.

To improve enrollment for treatment and compliance of the patient The National Tuberculosis Control Programme, Bangladesh has started Zero-day ambulatory treatment for MDR/RR patients.

Intervention or response: In order to mitigate the difficulties of the hospital staying and distress of MDR/RR patient Zero-day ambulatory treatment had been introduced in selective areas in Bangladesh from 2023. In this modality initial molecular test (Gene Xpert/Truenat) of the presumptive of MDR/RR is performed in the community and treatment is started at the community as soon as possible following evaluation by a physician.

Moreover, medicine supply, baseline, follow-up, post follow-up investigation support and palliative care support are provided at the community level to enhance the treatment adherence.

Results/Impact: In 2023, with traditional enrollment method 72% of MDR/RR cases were enrolled from 2136 diagnosed cases, whereas with Zero-day ambulatory enrollment areas the enrollment was 96% (541 out of 562). So the Zero-day ambulatory enrollment is able to increase the rate of enrollment compared to the traditional method. Moreover, this system is also convenient for continuation of treatment.

Conclusions: Bangladesh is one of the high burden countries for MDR/RR TB in the world. We have advanced technologies & facilities to diagnosis and treatment of MDR/RR cases. Proper implementation of Zero-day ambulatory treatment could minimize the gap between diagnosis and enrollment of the MDR/RR cases.

EP15-742-15 Demonstrating the feasibility of differentiated TB care assessment for tailored person care in a high-incidence, low-resource setting district of Bihar, India

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Background and challenges to implementation: India accounts for 27% of global TB deaths (Global TB Report 2023). With number of deaths reducing from 32 per lakh in 2015 to 23 per lakh in 2023, India is far from the ambitious target of 90% reduction in TB deaths by 2025. Government of India published the Differentiated TB Care (DTC) guidelines in 2021 aiming to address this imperative need to reduce mortality.

The guidelines recommend comprehensive assessment of 16 parameters (clinical, laboratory and radiological) at time of TB treatment initiation and provisioning tailored care to patients. Bihar, the third largest Indian province by population (>130million), with TB notification rate (NR) 124.5, reported 3.7% deaths amongst patients (India TB Report 2023).

Intervention or response: Feasibility testing of DTC guidelines was conducted across 37 high notifying, public health facilities- 33 Health & Wellness Centres, 3 block Primary Health Centers (PHC) and District hospital in Muzaffarpur, Bihar (having NR 155, with 5.4% deaths). A basic tool for assessment based upon 16 parameters of DTC guidelines was developed and health staff were trained on administering the tool, patient assessment and further algorithm for care.

Results/Impact: Between March 2023-March 2024, of 804 eligible patients (adult, drug sensitive pulmonary TB), 346 (43%) were assessed at baseline, and 176 (61%) of them within a week of treatment initiation. 76% of the recommended parameters could be assessed (X-ray, hemoglobin, respiratory rate and mid-upper-arm circumference were challenging). 27% patients got a follow-up assessment.

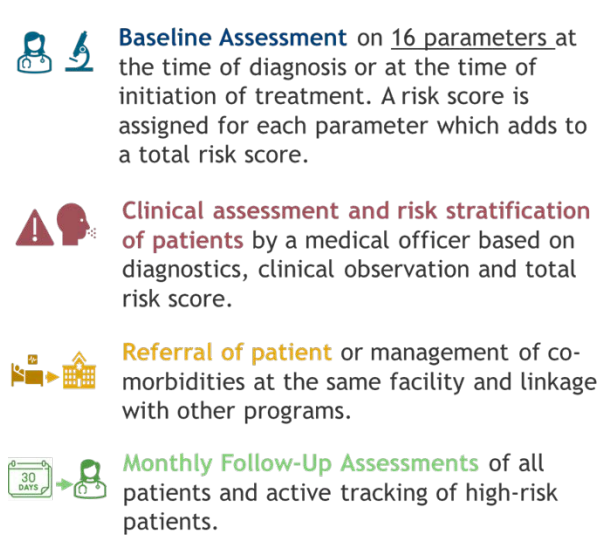

Figure. Steps in differentiated TB care.

Conclusions: It is feasible to adopt DTC guidelines in low-resource setting geographies, with basic service provisioning preparedness. State government of Bihar has undertaken diagnostic network optimization, amping up X-ray availability up to block level, together with other laboratory services. Bihar is preparing to scale up DTC implementation across all districts, with improved preparedness to enable assessment of all parameters and needful referral linkages for optimal patient care.

EP15-743-15 Profiling digital technologies used to support the TB care cascade and their implementation across high TB-burden countries: Findings from a systematic realist review

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Background: Digital technologies are increasingly being developed and implemented to support individuals in high tuberculosis (TB)-burden countries in proceeding through the TB care cascade. Given their proliferation, a need exists to synthesize the respective functionality and implementation considerations of technologies in use. The objectives of this review were to:
1. Systematically identify literature on digital technologies for supporting the TB cascade in high TB-burden countries; and.
2. Conduct a realist analysis of contextual factors, mechanisms, and outcomes underpinning implementation of each identified technology.
Design/Methods: Four databases were systematically searched for published literature (Web of Science™, Scopus®, PubMed®, CINAHL®), and TB-organization websites for grey literature, from 2000-present. Two reviewers conducted two-stage eligibility screening of retrieved literature, data extraction, and qualitative analysis using a realist lens and hybrid inductive-deductive thematic analysis.
Results: Of 4,386 records retrieved and screened, 39 published articles were included. Articles described the implementation of six 'backbone' health information systems and a suite of other 'add-in' tools (e.g., mobile applications, digital data collection tools) that integrated with the 'backbone' systems. A high level of collaboration with National TB Programs facilitated effective implementation and sustained use of technologies. Implementation barriers included infrastructural challenges and interoperability with existing information systems.
Most identified technologies supported TB patients across at least two steps of the TB cascade (e.g., screening and testing); however, findings suggest a lack of technologies exist to support patients across the entire care pathway.
Conclusions: This study provides an overview of the extensive development and implementation of digital technologies to support patients in proceeding through the TB care cascade across high TB-burden countries.
There exists a pressing need for future research to move beyond evaluating implementation outcomes to also examining and reporting implementation processes, to inform the ongoing development and effective use of digital technologies to support TB care.

EP16 Treating and preventing drug-resistant TB: Dispatches from the coal face

EP16-744-15 Acceptability of an adult levofloxacin formulation in children on multi-drug-resistant TB preventive treatment: A quantitative analysis

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Background: Evidence from recent randomised controlled trials indicates that levofloxacin is effective in preventing multidrug-resistant (MDR) tuberculosis (TB) in child household contacts. Although paediatric formulations are a priority, adult levofloxacin formulations are widely available and are used for TB treatment and prevention.
Design/Methods: TB-CHAMP was an efficacy and safety trial of MDR-TB preventive treatment, comparing levofloxacin to matched placebo in children using 250 mg levofloxacin tablets at 15-20 mg/kg daily (Macleods Pharmaceuticals, India). Acceptability questionnaires were administered to caregivers at 6 time points during the 24-week treatment phase. A 5-point Likert scale was used to grade six domains of acceptability, and composite acceptability (CA) scores were generated. "Dislike" and "Dislike very much" were considered as poor acceptability. CA scores were compared between levofloxacin and placebo arms and over time, and the impact of delivery method was assessed. Data analysis used modified Poison regression models to estimate risk ratios (RR) for poor acceptability, accounting for household clustering.
Results:
Overall, 922 children were randomised, 452 to levofloxacin and 470 to placebo. Median age was 2.8 (IQR 1.3-4.2) years. At 12 weeks, 22.3% of children taking levofloxacin reported poor acceptability (on CA scores) versus 4.4% in the placebo arm (RR 5.07; 95% CI 3.68-6.98) (Figure 1). Acceptability in the levofloxacin arm improved between baseline (36.8% poor acceptability) and week 24 (12.9%) (RR 0.38; 95% CI 0.27-0.53). Of children aged 3 to <5

years, 65.6% were able to swallow levofloxacin tablets whole/halved at some point during the trial. Only 8.8% of all children swallowing tablets had a poor CA score at week 12, versus 29.9% of those unable to swallow (RR 0.29; 95% CI 0.13-0.66).

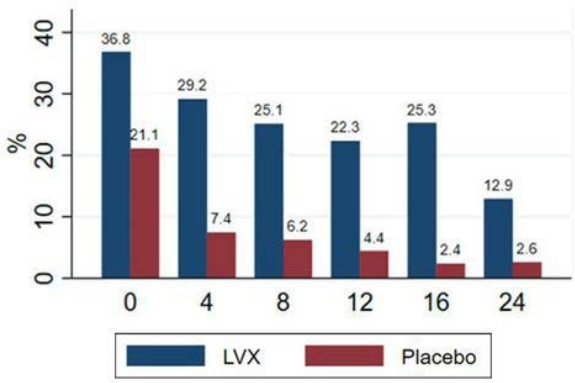

Figure 1. Percentage of children on TB-CHAMP with poor composite acceptability outcome scores by week of study visit.

Conclusions: The 250 mg levofloxacin formulation has reasonable acceptability and could be used as an alternative to dispersible formulations, especially in children able to swallow tablets whole.

EP16-745-15 Patient-reported outcome measurement and reporting for people with tuberculosis: A literature review

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Background: Tuberculosis (TB) remains a pressing global health challenge, due to antibiotic resistance and documented difficulties in achieving optimal treatment adherence. Despite progress in therapeutics, evidence is limited on patients' quality of life and treatment perspectives. Research on the patient experience with TB hasn't matched the pace of therapeutic advancements, highlighting the need for a deeper understanding of patient perspectives.
Recognizing this need, this study aims to identify, assess, and evaluate relevant candidate Patient-Reported Outcome (PRO) instruments for use in future clinical trials.
Design/Methods: Targeted searches of Embase and MEDLINE were utilized to identify candidate PRO instruments appearing in TB-related studies published in English between January 1, 2004 and March 1, 2024. The search followed PRISMA guidelines and was conducted with free text and MeSH terms for TB, health-related quality of life, PRO, and related outcomes.
Supplementary searches were conducted in the FDA's clinical outcome assessment (COA) compendium, PRO and Quality of Life Instrument Database (PROQOLID), and Clinicaltrials.gov. Secondary searches were then performed to characterize development, validation, and use history of each identified instrument.
Results: A total of 187 studies were identified in initial searches, 32 met inclusion criteria during screening, and 11 PRO instruments were identified within the 32 articles. Nine additional instruments were identified through supplemental searches and within a previously published systematic literature review.
Among the 20 candidate instruments, four TB-specific and 16 generic instruments were identified. Across all studies, the most frequently used instruments were: EQ-5D and its variations, World Health Organization Quality of Life Brief Version (WHOQOL-BREF), St. George's Respiratory Questionnaire (SGRQ), and Short Form Health Survey (SF-36).
Conclusions: This study identified a comprehensive list of PRO instruments used in TB clinical trials, and detailed their strengths and weaknesses with the aim to facilitate future instrument/endpoint selection based on mapping to known patient-centered outcomes of interest.

EP16-746-15 Effectiveness and safety of the BPaL treatment regimen for multi-drug-resistant TB in Myanmar: Current findings of an operational research study

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Background: Myanmar is one of the 30 high multidrug/rifampicin-resistant tuberculosis (MDR/RR-TB) burden countries in the world. Recently, Bedaquiline, Pretomanid and Linezolid containing treatment regimen (BPaL regimen) was recommended by World Health Organization to use in pre-extensively drug-resistant-TB (pre-XDR-TB) and MDR/RR-TB patients. National TB Program, Myanmar, participated in a multi-country study of LIFT-TB initiative and conducted operational research to estimate the effectiveness and safety of BPaL regimen.

Design/Methods: A prospective observational single-group cohort study was carried out in National TB Program (Yangon) and Aung San TB Hospital since 2021 and enrollment finished in 2023. MDR/RR-TB with additional fluoroquinolone resistance (Pre-XDR) patients were enrolled based on the inclusion and exclusion criteria after informed consent and treated with 6-9 months BPaL regimen. Effectiveness was determined by assessing the end-of-treatment outcomes and safety was evaluated by determining the rates of serious adverse events. Time to culture conversion and TB recurrence rates at 6- and 12- month post-treatment completion was assessed.
Results: Of 100 eligible patients enrolled, treatment success was achieved in 95 (95%) patients (75 cured and 20 completed treatment). Of 78 patients with positive baseline culture, 52 (67%) had culture conversion at one month of treatment. Over 90% (58/64) of isolates had Pretomanid minimum inhibitory concentration within 0.125-0.5 mg/L. Linezolid 600 mg was found to be safer than 1200 mg (P<0.05), comparably effective and well-tolerated. Fifteen (15%) patients encountered serious adverse events, including myelosuppression 8/15 (53%) and peripheral neuropathy 3/15 (20%). Currently (82) patients are observed at month-6 recurrent-free cure and (47) patients are at month-12 post-treatment relapse-free outcome.
Conclusions: Strength of BPal regimen is short treatment course, less pill burden, better sputum conversion, high treatment success, comparable safety and cost-effectiveness. Our study showed BPaL regimen is safe and effective for MDR/RR and pre-XDR-TB and supported National TB Program to implement the national scale-up of BPaL-based regimens.

EP16-747-15 Adherence of TB medication among key and vulnerable populations with TB: Experience from a community intervention in selected Indian states

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Background: As part of the Breaking the Barrier (BTB) initiative, funded by the United States Agency for International Development, Behaviour Change Solutions (BCS) were implemented to improve TB case identification and TB treatment outcomes. We implemented specific BCS and assessed its effect on medication adherence, recognizing its critical role in achieving successful treatment outcomes.

Design/Methods: Two cross-sectional surveys were conducted targeting vulnerable groups in four Indian states, including migrants, tea garden workers, miners, industrial workers, tribals, and urban and metro vulnerable populations with TB.
Our surveys measured the proportion of individuals who missed TB medication for two or more consecutive days and analyzed changes in medication adherence across different characteristics, as well as the effect of awareness about behaviour change solutions. Changes were evaluated using multivariate logistic regression.
Additionally, we estimated the treatment effect of behaviour change solutions on medication adherence using the nearest neighbourhood method.
Results: We conducted interviews with 4299 respondents, comprising 2153 at baseline and 2146 at endline. Overall, medication non-adherence significantly reduced from 9% to 6% (p-value<.001) among mining and industrial sector workers, tribal, urban in Karnataka and metro vulnerable groups. The results of the nearest neighbourhood method indicated that those aware of Starter Ki (p-value=0.032) and TB Mukt Certificate (p-value<0.001), showed statistically positive effects on improving medication adherence. However, another BCS, such as TB buddy, showed a negative effect on improving medication adherence.
Conclusions: The study highlighted the importance of tailored BCS interventions to enhance adherence to TB medication. Policies may prioritize BCS initiatives like Starter Kit and TB Mukt Certificate as such targeted approaches can optimize TB medication adherence and improve treatment outcomes.

EP16-748-15 Adherence during a nine month bedaquiline-based treatment regimen for rifampicin-resistant tuberculosis

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Background: Long-term adherence during treatment for rifampicin-resistant tuberculosis (RR-TB) in programmatic settings using shorter regimens is not well described. We aimed to evaluate the effect of time on adherence during RR-TB treatment in a programmatic setting.

Design/Methods: We conducted a prospective observational cohort study among patients with pulmonary RR-TB initiating a bedaquiline-based all-oral shorter regimen in South Africa. Adherence was measured by directly observed therapy (DOT) during hospital care and by an electronic adherence monitoring device (EAMD, Wisepill Evrimed500®) during ambulatory care up to nine months; no active adherence support was provided after hospital discharge.

We defined an adherent day as a day with DOT or any opening of the EAMD, excluding missing data. A mixed effect linear regression model was used to explore the relationship between treatment duration and adherence. Socioeconomic, demographic, and clinical characteristics were assessed as confounders.

Results: We enrolled 248 participants; 205 (82.7%) with available adherence data were included in the analysis. Overall median adherence was 81.2% (IQR 62.4-97.8) and 72.8% (IQR 51.1-92.6, n=184) if only EAMD data were included. Median adherence declined from 100% (95%CI 94.1-100.0) to 55.9% (95%CI 20.0-86.7) between month one to nine (Figure 1).

After adjustments, adherence declined with time (-5.4% adherence days per month, 95% CI -4.7 to -6.2) but increased in participants with a positive smear at baseline (5.5%, 95%CI 0.7-10.4) and in participants who received in-hospital care (16.2%, 95%CI 11.3-21.1). Similar results were observed with EAMD data only.

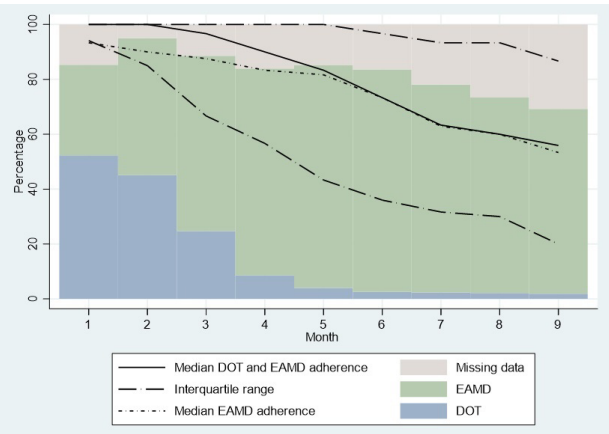

Figure 1: Adherence over time and type of adherence measurement for participants initiating a bedaquiline-based all-oral shorter regimen for rifampicin-resistant tuberculosis.

Abbreviations: EAMD: electronic adherence monitoring device (Wisepill Evrimed500®); DOT: directly observed treatment.

Conclusions: Adherence declined over time for participants who were treated with an all-oral shorter regimen for RR-TB. Intensified adherence support, particularly later during RR-TB treatment, is indicated.

EP16-749-15 TB treatment monitoring: Assessing the relationship between the method of monitoring and symptoms developed during treatment

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Background: Video DOT (VDOT) is an emerging alternative that utilizes mobile phones to monitor patients taking their medication. Whilst studies have assessed the effectiveness of VDOT compared to Directly Observed Therapy (DOT) regarding conversion, few have assessed its effectiveness regarding TB morbidity.

The aim of this study is to explore the impact of VDOT on morbidity 6 months after starting treatment.

Design/Methods: We conducted a clinical trial from January 2019 to December 2021 among adults ≥18 years who had drug-sensitive TB in Kampala, Uganda. Participants were randomly assigned to VDOT and usual care DOT (UC-DOT) and received treatment following the protocols for each. There were 4 contact points where structured questionnaires were completed: baseline, 2-month, 4-month, and 6-month follow-up.

Questionnaires were used to collect relevant data on demographics, health status, symptoms, and overall experiences. Questionnaires were completed in person or via phone.

Results: Of the 125 participants, the median age (IQR) was 34 (25-45) and 53% of participants were female. The prevalence of 1 or more symptoms experienced was 35% and 37% had 1 or more comorbidity for which they were taking medication. The majority (95%) reported a health status of good or excellent and 95% lived outside of Kampala. Treatment under UC-DOT and having an income below 200,000 were significantly associated with reporting a symptom 6 months after starting TB treatment with ARR(CI) of 1.72 (1.06-2.91) and 1.82 (1.04-3.68) respectively

Conclusions: TB-related symptoms are prevalent and VDOT and employed participants were less likely to report Tb-related symptoms 6 months after starting treatment. Implications of this include the need for TB programs to assess further needs of participants during treatment that ensure the patient experiences the highest quality of life during and post-treatment.

EP16-750-15 Efficacy and safety of shorter multi-drug-resistant TB regimens: A network meta-analysis

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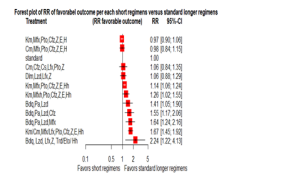

Figure 1: Forest plot for favorable outcomes among MDR-TB patients treated with shorter regimens.

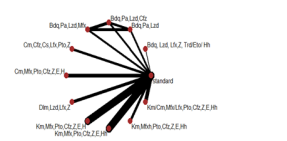

Figure 2: Network diagram for loss to follow-up among MDR-TB patients treated with short regimens.

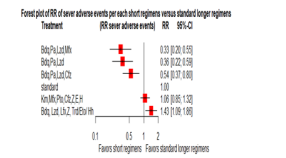

Figure 3: Forest plot for severe adverse events among MDR-TB patients treated with short regimens.

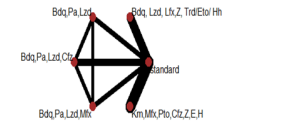

Figure 4: Network diagram for severe adverse events among MDR-TB patients treated with short regimens.

Background: Drug-resistant tuberculosis (DR-TB) remains a threat to public health. Shorter regimens have been proposed as potentially valuable treatments for rifampicin or multidrug-resistant tuberculosis (RR/MDR-TB). We undertook a systematic review and network meta-analysis to evaluate the efficacy and safety of shorter RR/MDR-TB regimens.

Design/Methods: We searched PubMed, Cochrane Center for Clinical Trials (CENTRAL), Google Scholar, ClinicalTrials.gov, WHO International Clinical Trials Registry Platform, US Food and Drug Administration, and Chinese Clinical Trial Registry for primary articles published from 2013 to July 2023.

Favorable outcome, loss to follow-up treatment failure and death were assessed as the main efficacy outcomes, while adverse events were assessed as the safety outcomes. The network meta-analysis was performed using R Studio version 4.3.1. The study protocol was registered in PROSPERO (CRD42023434050).

Results: We included 11 eligible studies (4 randomized control trials and 7 cohorts) that enrolled 3,548 patients with RR/MDR-TB.

A 6-month combination of BdqLzdLfxZTrd/Eto/H had two times more favorable outcomes [RR 2.2 (95% CI 1.22, 4.13), P=0.0094], followed by a 9-11month combination of km/CmMfx/LfxPtoCfzZEHh [RR1.67 (95% CI 1.45, 1.92), P<0.001] and a 6-month BdqPaLzdMfx [RR 1.64 (95% CI 1.24, 2.16), P<0.0005].

6 months of BdqPaLzdMfx had a low risk of severe adverse events RR 0.33 (95% CI 0.2, 0.55), followed by BdqPaLzd RR 0.36 (95% CI 0.22, 0.59), and BdqPaLzdCfz RR 0.54 (95% CI 0.37, 0.80) with P< 0.0001.

Conclusions: Shorter regimens of 6 months BdqLzdLfxZTrd/Eto/H, 9-11 months km/CmMfx/LfxPtoCfzZEHh, and 6 months BdqPaLzdMfx provides higher cure and treatment completion rates. However, 6 month of BdqPaLzdMfx, BdqPaLzd, and BdqPaLzdCfz short regimens are significantly associated with decreased severity of adverse events. Healthcare providers should weigh the benefits and risk of using different short regimens according to the specific needs of individual patients, the availability of regimens, drug susceptibility test and the cost of the drug.

EP16-751-15 Enabling access to QuantiFERON®-TB Gold and facilitating the introduction of up-to-date TB and drug-resistant TB prevention in Ukraine

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Background and challenges to implementation: Up until 2021, the main diagnostic method for TB infection in Ukraine was the tuberculin skin test, and testing was unsystematic. Use of QuantiFERON®-TB Gold (QFT-Gold) testing was infrequent and did not have a systematic application.

Short-term TB preventive therapy (TPT) regimens were not used. DR-TB prevention was prescribed in isolated cases.

Intervention or response: The USAID-funded Support TB Control Efforts in Ukraine (STBCEU) project, implemented by PATH, engaged two private laboratories to provide QFT-Gold testing access for latent TB infection (LTBI) detection in project-supported regions.

Project experts provided training and mentorship for regional clinicians on selection of people for testing, clinical decision-making based on test results, benefits of short TPT regimens, DR-TB prevention, outcomes analysis, and case discussions.

Results/Impact: From October 2021 – December 2023, 6,909 people from TB-risk group were referred for QFT-Gold testing. Among these, 1,206 people (17.5%) did not get tested.

Among 5,703 tested, 1,179 (20.6%) had positive result, and 830 (70.4%) started TPT, including 184 DR-TB prevention (22% of all TPT regimens). Shorter TPT regimens increased from 0% to 83% of all TPT during the intervention.

Among 663 people with positive tests who started TPT from October 2021–June 2023, 532 (80.2%) completed prescribed TPT.

Eight individuals deviated from diagnostic algorithm and were diagnosed with active TB after TPT initiation.

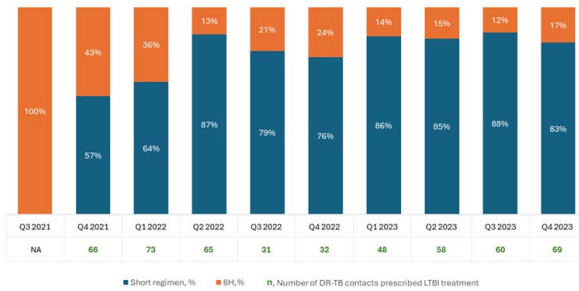

Figure 1. Proportion of different TPT regimens prescribed in project supported regions of Ukraine, July 2021 - December 2023.

Conclusions: Project support scaled up the use of DR-TB prevention and uptake of shorter TPT regimens. Among people with a positive QFT-Gold test, the majority successfully completed treatment, however some challenges should be further addressed:
1. Gaps between QFT-Gold referral and testing completion due to distance/cost;
2. Initiation of TPT before exclusion of active TB disease through X-ray and/or CT scans.
Further decentralization of both QFT-Gold testing and CT examination could reduce the geographic barriers to TB/LTBI diagnosis and care.

EP16-752-15 Implementing BPALM/BPAL regimen: From operational research to programmatic use - Experience of Ukraine

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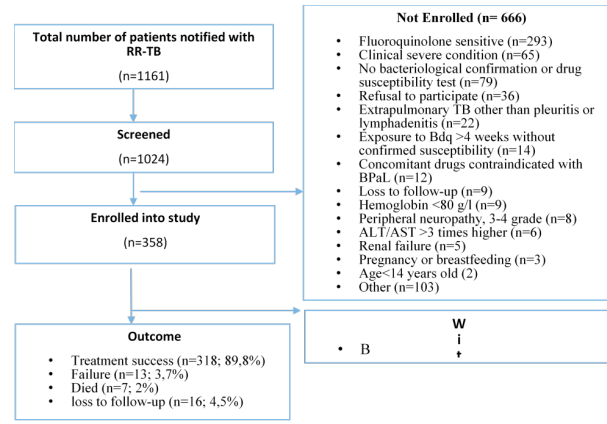
Background and challenges to implementation: Ukraine is one of the high-priority countries for drug-resistant tuberculosis of WHO. Every year, more than 4,000 people are diagnosed with MDR-TB. Treatment success for pre-XDR/XDR-TB with longer regimens in Ukraine is only 65,1%. Also, in Ukraine, the prevalence of fluoroquinolone resistance is high (27 %), which leads to limited treatment options for such patients. In the conditions of the war against Ukraine, due to population migration, destroyed infrastructure, constant rocket attacks, outflow of personnel, and barriers to access to health care, there is a high risk of loss to follow-up and, hence, a reduction in overall treatment effectiveness.
Intervention or response: Prospective operational research in one cohort of pre-XDR/XDR-TB patients to assess the effectiveness of BPaL in 22 regions of Ukraine out of 25 (excluding temporarily occupied ones). Recruitment to the study lasted from July 2022 to February 2023.
Results/Impact: Out of 1024 patients screened, 358 were enrolled in the study (Figure 1), 318 (89,8%) successfully completed treatment, 13 (3,7%) failed, and 16 (4%) lost to follow-up registered. 34 serious adverse events were registered (9.7%), and BPaL was discontinued for only 6 patients (1.7%). Since February 2023, Ukraine has included the BPaL/M regimen in the national guideline for TB care and has begun assigning BPaL/M regimens programmatically.
During 2023, 1,411 patients (32.6%) out of 4,326 with DR-TB started treatment with the BPaL/M regimen. Of those who completed treatment, the success rate is 88%.



Conclusions: The implementation of innovative short regimens is key to providing integrated human-centered care for TB, and it increases the effectiveness and safety of treatment.

EP17 Closing gaps in reaching TB

EP17-753-15 Enhancing the coverage of molecular diagnostics tests among private sector individuals with TB in Uttar Pradesh, India

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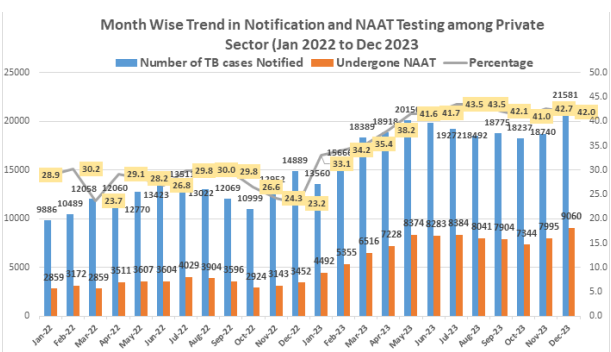
Background and challenges to implementation: In 2022, Uttar Pradesh contracted Patient Provider Support Agencies (PPSA) to enhance the state's capacity for private sector engagement for TB elimination. About 0.52M individuals with TB were notified, including 0.15M from the private sector, a highest ever achieved. However, only 25% of individuals with TB notified from the private sector had been microbiologically confirmed by a molecular WHO recommended diagnostic (mWRD) test.
Intervention or response: Under the guidance and support from State TB program, the TB State Technical Support Unit (TB-STSU) implemented by India Health Action Trust, monitored private sector notification, identifying gaps and trends in notification and molecular testing at health facility level. The STSU's on-field supportive supervision and advocacy with PPSA and state agencies was directed to address identified gaps and declining coverage. PPSA recruited lab technicians in 10 high burden districts to run additional shifts during evening hours for testing of private sector specimens. STSU also worked with the state to ensure regular supply of consumables from the state.
Results/Impact: Private Sector Notification has increased from 1,47,834 (Jan 2022 to Dec 2022) to 2,21,648 (Jan 2023 to Dec 2023). In 2022, average monthly notification of TB cases was 12320 and increased to 18600 in 2023. Total NAAT Testing among notified TB cases in 2022 was 28% (40660/147834) and increased to 42% (89045/221648) in 2023. Monthly average molecular diagnostic tests among notified cases was 28% in 2022 which increased to 40% in 2023. (Data was extracted from NI-KSHAY Analytics on 19th Feb 2024).



Conclusions: Intensified efforts have improved notification and coverage of molecular testing among private sector individuals diagnosed with TB.
More resources will be required to ensure that desired >85% coverage is achieved, and that turn-around-time is also optimised.

EP17-754-15 Engaging pharmacies in tracking and notifying missed people with TB through Rx Tracker intervention in Pakistan

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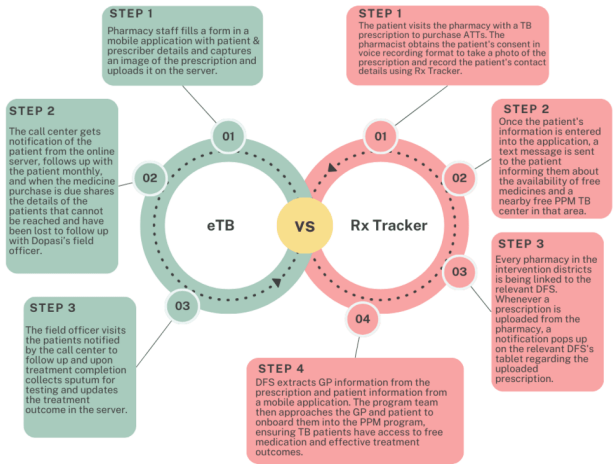
Background and challenges to implementation: In 2021, the Dopasi Foundation launched a mobile application called ‚eTB,' employing a pharmacy-centric approach to identify undetected TB cases obtaining Anti-TB Treatment (ATT) drugs through prescriptions without being reported in the national case notification system. While the outcomes showed promise, the project's reach was constrained.
Dopasi primarily concentrated on contacting patients for follow-up and treatment outcomes without further action.
Consequently, the advantages of participating in the Public-Private Mix (PPM) model, such as access to free medicines, remained elusive for them.
Intervention or response: To maximize patient outreach via pharmacies, Mercy Corps Pakistan has revamped the intervention to serve as a Patient and General Practitioner (GP) Tracker, aimed at tracking:

- TB Patients who are not getting treatment from the TB PPM Program
- GPs who are prescribing TB patients but are not engaged in the TB PPM Program
- Programmatically follow up these patients till they complete their treatment.

This intervention is currently being implemented across 57 districts of Pakistan which started in the 4th Quarter of 2023.
The application has been rebranded as Rx Tracker. A comparison of the methodological differences between eTB and Rx tracker apps is detailed below:
Results/Impact: Thus far, the program has garnered participation from 469 pharmacies.
Out of the 98 prescriptions received, 63 included ATT drugs while 35 did not.
Of these prescriptions, 38 patients have enrolled in the program, 15 declined participations, and 10 are pending enrollment. Also, 7 GPs have joined the program.
Additionally, 23 district-level advocacy sessions were conducted to raise awareness and sensitize pharmacies.



Conclusions: Rx tracker is serving as the eyes and ears of TB program; it has the potential to show us the community's actual situation of missed TB cases. Its potential to expand its reach and onboard more GPs is invaluable, enhancing program effectiveness and enabling preemptive healthcare interventions.

EP17-755-15 Enhancing TB elimination in India: The impact of multisectoral accountability framework and inter-ministerial collaboration on TB detection and notification

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Background and challenges to implementation: India has made significant strides in enhancing TB care, however it remains a public health concern with a significant gap, ~300,000-350,000 annually, between annual estimated and notified cases.
India has a vast network of healthcare service delivery in the public sector beyond Ministry of Health administered facilities. Recognizing the need for a collaborative approach, India has adopted Multisectoral Accountability Framework (MAF). This framework fosters interministerial collaboration across various public sector ministries involved in healthcare delivery, including CGHS, ESI hospitals, ECHS, Railways, NTPC and Shipping, to amplify case detection and notification efforts.
Intervention or response: Followed by a high-level policy decision on the collaborative framework, Health staff and physicians from collaborating sectors were oriented on National TB Elimination Programme updates and patient benefits upon notification. Upfront molecular diagnostics was offered TB case identification with support for close monitoring of these patients by NTEP health staff to ensure comprehensive public health actions.
Results/Impact: Active collaborative efforts with various line-ministries yielded additional 3.1 lakh cases between 2019 and 2023 from health facilities under CGHS, Coal, ECHS, ESI, Labour, Mines, NTPC, Railways, and Shipping. ESIC hospitals accounted for highest number of cases (22.1%), followed by Railways (22.1%) and CGHS (15.2%). A detailed table is attached for further insights.
80%, 76% and 62% of the cases diagnosed respectively from Coal, railways and CGHS were done using molecular diagnostic methods. Molecular diagnostics usage increased from 68% in 2019 to 73% in 2023.

Year	CGHS	Coal	ECHS	ESI	Labour	Mines	NTPC	Railways	Shipping	Grand Total
2019	9863	1256	10457	22085	5786	2493	824	16421	1745	70930
2020	6283	960	6681	15329	3990	1696	630	11001	1251	47821
2021	9107	892	7891	19130	4866	2093	986	12604	1104	58673
2022	11009	1091	9168	20971	5889	1989	1195	15474	1203	67989
2023	10636	1026	9726	19978	5772	2075	1097	12965	774	64049
Total	**46898**	**5225**	**43923**	**97493**	**26303**	**10346**	**4732**	**68465**	**6077**	**309462**

Table 1. Additional TB cases notified after collaborating with respective line ministries.

Conclusions: Through collaborative efforts under the MAF, various line ministries have yielded tangible results and shown substantial progress in identifying TB cases. This is attributed to the engagement of diverse sectors, including CGHS, ESI hospitals, ECHS, Railways, Shipping, and other stakeholders.
This increase in notifications signifies not only improved access to healthcare services but also highlights the strengthening of health systems for TB elimination.

EP17-756-15 Improving TB case holding through private sector engagement in Nigeria

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Background and challenges to implementation: Tuberculosis (TB) is a major public health concern in Nigeria with Nigeria having the highest burden of TB on the continent. The efforts to prevent, provide care and end TB involve proper management of patients notified to ensure they are successfully treated thereby ending community transmission. The health-seeking behaviour of Nigerians is such that over 60% will first seek health services in the private sector however the provision of TB services was predominately in the public health facilities.
Intervention or response: In the public-private mix model, the NTBLCP began a massive engagement of private facilities using a hub and spoke referral with private-for-profit and faith-based clinics and hospitals serving as hubs (for diagnosis and treatment). The hubs were given

incentives for successfully managing TB patients, this was to ensure all the follow-up investigations were conducted for the patients and reduce the need for the facilities to charge the patients for auxiliary services as the main TB services (tests and drugs) are free.

Results/Impact: The treatment outcomes of patients managed in the private sector improved with the case finding, the treatment success rate of patients in the private sector increased from 83% in 2019 (cases enrolled in 2018) to 93% in 2023 (cases enrolled in 2022). The increase in treatment success rate was commensurate with a decline in the death rates and Loss-to-follow-up rates which declined from 7% to 2% and 8% to 4% respectively. Interestingly, in 2019 2043 cases reported in the private sector had no outcomes in the cohort reports but with the active engagement, this reduced to 45 cases the following year and zero in subsequent years.

Conclusions: The deployment of services closest to patients and investment in healthcare, particularly in the private sector, will continually improve TB case finding and management of patients, strengthening the national and global efforts to end TB.

EP17-757-15 AHPI-led corporate hospitals' engagement in the Nation's TB elimination efforts

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Background and challenges to implementation: In India, more than 50% of people with presumed TB seek care from the private sector, where there are concerns regarding sub-optimal quality of care mainly due to lack of systems for providing treatment adherence support. National TB Elimination Program find it difficult to engage corporate private hospitals due to the lack of capacity to engage them. The Association of Healthcare Providers India (AHPI) is a non-profit organization representing a majority of private hospitals in India, comprising over 15,000 hospitals across 20 states.

Intervention or response: AHPI made itself accountable to End TB by launching ÁHPI End TB initiative.'AHPI advocated with its member corporate hospitals for ensuring the quality of TB care services equated to standards of TB care. The initiative was piloted in Delhi city. Through two official letters, three webinars, three meetings and two workshops, AHPI advocated its member hospitals to initiate STEPS (System for TB Elimination in Private Sector) centres where corporate hospitals establish single window system in their hospitals and follow up with their clients regularly over telephone for adherence support in an 'after-sales care' model. AHPI reviews the activity with corporate hospitals on a quarterly basis. AHPI also advocates with corporate hospitals to invest for TB projects as part of their social commitment.

Results/Impact: 18 corporate hospitals in Delhi have STEPS. TB Notification from these hospitals increased by 27% in quarter-1,2024 as compared with the previous four quarters. Over last six months, these hospitals actively supported 27,000 people with TB for treatment adherence, counselling and monthly nutritional support. Two hospitals initiated community based projects for Ending TB worth 115000 USD as a part of their social responsibility.

Conclusions: Corporate hospitals are willing to make themselves accountable for Ending TB. Organisations like AHPI can act as an interphase and establish a low cost sustainable system for private sector engagement.

EP17-758-15 Enhancing the role of first-line care providers in TB case-finding: Experience from a system strengthening approach in Kano State, Nigeria

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Background: Patent and Proprietary Medicine Vendors (PPMVs) and Community Pharmacists (CPs) can play an important role in providing healthcare services to a large proportion of patients with tuberculosis (TB). In Nigeria, efforts to incentivize the PPMVs and CPs to provide TB screening services and contribute to TB notification have intensified in recent years. Many models have been designed mostly around logical inferences. We assessed the contribution to TB notification.

Drawing from the PPMVs and CPs' perspectives, we examined the motivation and barriers to active participation in TB surveillance.

Design/Methods: Retrospective analysis of PPMVs and CPs' contribution to TB case notification in Kano state, Nigeria. A stratified sample of 64 PPMVs and CPs was surveyed in 2023.

Results: From January 2021 to December 2023, PPMVs and CPs screened 2,210,143 persons for TB out of which 25,263 (1.1%) TB patients were detected and notified, accounting for 45.3% of the total 55,793 TB notifications in the state. The annual contribution to TB case notification increased from 40% in 2021 to 51% in 2023. Among the PPMVs and CPs surveyed, 88.7% reported as strength the continuous training and involvement of the National Association of Private Health Practitioners in the engagement process.

Compliance with the requirements to record and report TB screening and referral activities was associated with gender, perceived financial benefits, and trust in the health bodies acting in their interests.

Noncompliance with the requirements to report TB screening activities was attributed to a lack of trust and capacity to record TB screening and referral activities.

Conclusions: PPMVs and CPs' motivation for active participation in TB surveillance was driven by the participatory engagement process, perceived benefits, and trust in the health bodies. Increasing the quality and quantity of active TB case-finding at the first-line points of care would be a sustainable intervention to improve TB notification.

EP17-759-15 Performance-based incentive for private sector engagement: A promising path towards TB elimination in Uttar Pradesh, India

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Background and challenges to implementation: Uttar Pradesh (UP) notified highest number of persons with TB (PwTB) in India in 2023, with a massive proportion from private sector. Therefore, effective engagement of private sector is imperative for TB elimination efforts. Performance-based incentive is a financial strategy proven to have significant impact on health indicators. UP onboarded Patient Provider Support Agency (PPSA) with performance-based incentive strategy to enhance private sector engagement.
This study measures the impact of performance-based incentives for PPSA in terms of case finding efforts and favourable treatment outcomes in PwTB.
Intervention or response: In 2022, PPSA was rolled out to improve TB services in 36 high-burden districts using a performance-based incentive strategy tied to specific indicators with a weightage which was distributed as follows: notification (25%), universal drug susceptibility testing (UDST) (15%), co-morbidity screening (15%), direct benefit transfer (15%), and successful outcome (30%). Impact of the study was assessed with respect to these indicators along with case fatality rate and loss to follow up. The data was extracted from Ni-kshay (India's digital TB surveillance system) and analysed in R version 4.2.3.
Results/Impact: In 2023, Uttar Pradesh state reported 631,180 persons with tuberculosis (PwTB), with 223,101 (35%) from the private sector, marking a 68% increase compared to 2021. Other key indicators also improved significantly in 2023 compared to 2021: UDST coverage increased from 61% to 89% ($p < 0.01$), direct benefit transfers rose from 56% to 70% ($p < 0.01$), treatment success rate increased from 87% to 93% ($p < 0.01$), case fatality rate dropped from 5% to 1% ($p < 0.01$), and loss to follow-up decreased from 4% to 1% ($p < 0.01$).
Conclusions: Performance-based incentive for PPSA improved TB program outcomes and public health actions, enhancing private sector engagements and strengthening TB services to accelerate TB elimination efforts.

EP17-761-15 Reducing inequity in access to molecular diagnostic tests among public and private sector individuals with TB in the state of Uttar Pradesh, India

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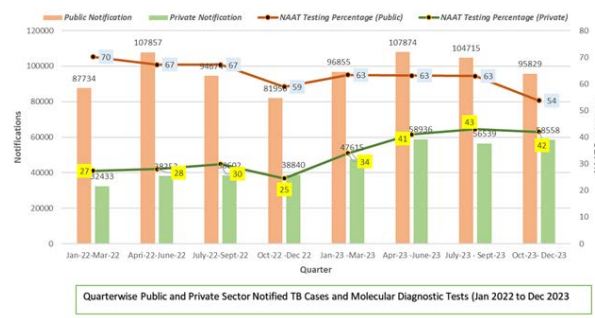
Background and challenges to implementation: The state of Uttar Pradesh (UP) with 16% of India's population accounts for more than one-fifth of TB notified in India. In 2021, the Central TB Division awarded India Health Action Trust (IHAT) the TB State Technical Support Unit (TB STSU) to enhance state's capacity for private sector engagement and health system strengthening. State engaged Patient Provider Support Agencies (PPSA) in 36 of the 75 districts. Since its inception the state witnessed huge increases in TB notification within both of TB cases from both public and private sector. The coverage with molecular tests among 0.52M individuals notified in 2022 was 25%, with 55% and 17% in public and private sector.
Intervention or response: Under the direction of State TB program the STSU monitored, provided supportive supervision and advocated with PPSA and state to address identified gaps in human resource availability, supplies of test-kits and consumables and documentation. PPSA deployed 10 additional lab technicians in high burden sites to ensure work during evening hours, exclusively for private sector patient specimens.



Quarterwise Public and Private Sector Notified TB Cases and Molecular Diagnostic Tests (Jan 2022 to Dec 2023

Results/Impact: In 2023 molecular testing among 0.63M individuals notified with TB in public and private sector increased to 63% and 40%. The inequity in uptake between private and public sector has declined, and the state will require consistent monitoring, supportive su-

pervision and innovative models to engage with expanding private sector laboratories to achieve equity in access. (Data was extracted on 19th Feb 2024 from NI-KSHAY Analytics).

Conclusions: Bridging the human resource gap, making NAAT testing working in two shifts, uninterrupted supplies of consumables, regular evidence-based monitoring help to address the inequality of NAAT uptake among public and private sector patients.

EP17-762-15 Enhancing private sector engagement for TB elimination in India: A retrospective analysis of the patient-provider support agency intervention

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Background and challenges to implementation: India accounted for 27% of incident TB cases and 26% of estimated TB deaths globally in 2023. Even though free diagnostic and treatment care are provided under the National TB Elimination Program (NTEP), the National TB Prevalence Survey (NTPS) has revealed that half of the people with TB symptoms sought care from the private sector and concerns persist regarding the quality of care, treatment adherence, and patient support in the private sector.

In response, the National TB Elimination Program introduced the Private Provider Support Agency (PPSA) to improve engagement with private healthcare providers and ensure comprehensive TB care.

Intervention or response: This study conducted a retrospective time series comparative analysis using TB patient data from the Ni-Kshay database across 16 states where PPSA has been operational from 2019 to 2023. Annual statistics were obtained and evaluated to assess the impact of PPSA on private sector engagement and TB management.

Results/Impact: Following the implementation of PPSA, there was a notable increase in private sector notifications, with a 41% rise from 2019 to 2023.

Additionally, improvements were observed in nucleic acid amplification testing uptake from 23% to 54% and a rise in bank seeding from 52% to 83%.

Furthermore, there was a significant enhancement in fixed-dose combination provision, increasing from 0.02% to 23% over the study period.

Year	Notification	NAAT Offered	FDC Provided	Bank seeding
2019	277271	62832	54	144521
2020	240493	108901	1062	169671
2021	314735	136537	79238	242735
2022	367777	182266	89038	284726
2023	472558	257015	109187	392006
Grand Total	**1672834**	**747551**	**278579**	**1233659**

Table 1. Private sector notification in PPSA districts and their management.

Conclusions: The findings highlight the pivotal role of Patient Provider Support Agencies in leveraging private sector resources for TB elimination in India. By fostering partnerships between TB programs and private practitioners, the PPSA model demonstrates promise in enhancing TB elimination efforts and reducing disease burden. Strengthening PPSAs through capacity building, partnership development, and innovative financing mechanisms is imperative to maximize their impact and accelerate progress towards TB elimination in India.

EP17-763-15 Adopt a block campaign: Leveraging the support of corporate social responsibility initiative to boost active TB case finding in Gurugram District of Haryana, India

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Background and challenges to implementation: Corporate social responsibility (CSR) plays a crucial role in complementing the efforts of the National TB Elimination Program (NTEP) in combatting Tuberculosis (TB). In line with this, corporate entities have embraced the 'Adopt a Block Campaign' to support regions across the state of Haryana in raising awareness and actively identifying TB cases. Specifically, in densely populated areas of Gurugram district, corporates have taken on the responsibility of bolstering active case-finding activities to enhance TB detection. By leveraging their CSR initiatives, these corporates have contributed resources, expertise, and outreach efforts to facilitate targeted interventions in the communities.

Intervention or response: Under the 'Adopt a Block Campaign', comprehensive case finding efforts were conducted through house-to-house visits in two blocks (Bhangrola and Pataudi) of Gurugram, Haryana from July 2023 to December 2023. This strategic approach involved the deployment of mobile vans equipped with X-ray facilities. Initial screening of persons with TB symptoms was done through chest X-ray and transportation of specimens was facilitated to the nearest TB detection centre for diagnosis. Following diagnosis, the persons diagnosed with TB were initiated on treatment at the nearest health facility.
Results/Impact: During the campaign, 256 community meetings were conducted at block and village level to sensitize the community and mobilize the persons with TB symptoms. A total of 23,329 persons underwent screening for TB symptoms and 830 (4%) presumptive TB cases were identified. The presumptive TB cases were subjected to standard diagnostic procedures, leading to detection of 30 persons with drug-sensitive tuberculosis which translated to a diagnostic yield of 4% in the intervention area.
Conclusions: The engagement of the corporate sector through CSR initiative within the framework of 'Adopt a Block Campaign' demonstrated its valuable contribution to achieving End TB goals in the State.

EP17-764-15 Public private partnership in India: What models exist and what works

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Background and challenges to implementation: Diagnostic services are crucial for patient clinical care pathway. The Private sector caters to 60% of the market share in diagnostics market in India. The public private partnership approach is broadly categorized into three: (a) Hub (b) Hub and Spoke, and (c) Reagent Rental Model. There is dearth of comprehensive understanding of PPP diagnostic models in India. The objective of this study was to evaluate the enablers and barriers of different models.
Intervention or response: The study adopted a sequential mixed method approach. Six states were shortlisted where diagnostic PPP projects are operational with geographical representativeness: Himachal Pradesh (**HP**), Uttar Pradesh (**UP**), Madhya Pradesh (**MP**), Jharkhand, Odisha, and Maharashtra. Contract agreements were evaluated, followed by quantitative data analysis to measure service delivery and coverage at different level of health facilities before and after signing of contract. A qualitative approach was employed to understand barriers and enablers in implementing PPP lab service delivery both from private and public sector perspectives and document their recommendations through semi-structured interviews.
Results/Impact: We surveyed 25 health facilities across 6 states in India and 103 qualitative interviews were conducted. Of the six states, MP, Maharashtra and HP followed the hub and spoke model where all levels of health care facilities were getting services through the PPP model. For Orissa and Jharkhand, they followed the hub only model had the test availability via PSP only at the secondary or tertiary level of care. UP followed the reagent rental model. After the PPP arrangement, there was an increase of ~ 30-40% in the availability of diagnostic tests in these states.
Conclusions: These findings can help understand the enablers and barriers in establishing and sustaining different PPP models. It can help develop best practices for contracting, tendering etc. which can be used by states across the nation to ensure a successful PPP arrangement.

EP18 Access to quality TB care and services

EP18-765-15 Zero-TB initiative in Buddhist monasteries: A two-pronged strategy for TB elimination in Ladakh, India

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Background and challenges to implementation: Buddhist monasteries in Leh district, Ladakh are religious and spiritual centres of learning which are beacons of belief for Ladakhi communities. Until 2021, notification rates for tuberculosis (TB) were high in congregate settings of monasteries. Zero-TB initiative was launched in 2022 to honor the demands of Buddhist preachers to accelerate TB elimination efforts.
This study aims to assess the impact of this two-pronged initiative on early detection of TB and implement TB preventive treatment (TPT) in monasteries.
Intervention or response: Mapping of 15 monasteries and their linkage to the nearest health facility was completed in January 2022. Liaison with health teams of peripheral health facility and *Lamas* of monasteries was established. Residential monks were screened for TB disease and TB infection (TBI) by district health teams of medical officer and community volunteers. Upfront mo-

lecular testing was offered, and all diagnosed for TB were put on treatment. Similar framework was used for on-site Mantoux test for TBI and TPT roll-out. Senior monks were designated as treatment supporters. The impact of this initiative was assessed in terms of coverage, diagnostic yield, and completion of TPT. Data was extracted from Ni-kshay (India's TB surveillance system) and analyzed in SPSS ver21.

Results/Impact: Annual TB notification rate in Leh was 124 per 100,000 in 2021. Screening was conducted among 6428 residents between January 2022-March 2023. Among them, 254 presumptive were given upfront molecular testing and 26 were diagnosed as drug-sensitive TB, giving a diagnostic yield of 10.2% (Ladakh average:9.3%, z-score:0.43, p-value:0.6). 254 out of 4311 screened (6%) tested positive for TBI (yield: 5.9%), of which 91% were initiated on TPT and successfully completed it.

Conclusions: As an impact of Zero-TB initiative, no new persons with TB have been reported since September 2023, thus signifying an urgent need to replicate the efforts to end TB in similar hard-to-reach congregate settings.

EP18-766-15 Screening vulnerable populations using artificial intelligence aided portable handheld X-ray machine in Himachal Pradesh, India

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Background and challenges to implementation: Community-based screening efforts with artificial intelligence (AI) aided portable X-ray devices have the potential to bring about additional yield in tuberculosis (TB) detection rates and identify people early in their disease course, especially among vulnerable communities in resource-limited geographies. Utilization of a portable handheld X-ray machine with an AI tool for interpretation was examined in three districts of Himachal Pradesh in the year 2023.

Intervention or response: In 2023, a battery-operated X-ray machine was used for screening active TB cases in districts Una, Hamirpur, and Kinnaur of Himachal Pradesh. Vulnerable populations of industrial zones, migrant populations, urban slums, and remote areas were screened for TB. Standard program algorithms were supplemented with operational definitions. Interim parameters analysed on SPSS ver 22 to understand the utilization of the portable handheld X-ray machine were

i. Early TB detection,
ii. Expanded clinical coverage,
iii. Test turnaround time, and;
iv. Impact on potential expenditure incurred by persons with TB.

Results/Impact: Out of 15623 people screened with the handheld X-ray device in the year 2023, AI tool showed 8.2% (1290) chest X-rays as presumptive TB. Additional yield of 5% was obtained on further evaluation with molecular tests (NAAT) which resulted in expanded clinical coverage by 1.2 times. The entire process from registration to AI interpretation of the X-ray image was completed within sixty seconds. The intervention showed significant improvement in access to service delivery and a reduction in potential expenditure incurred by patients (1100 INR) ($p<0.5\%$) where the most common occupation observed was daily wage labour (43%).

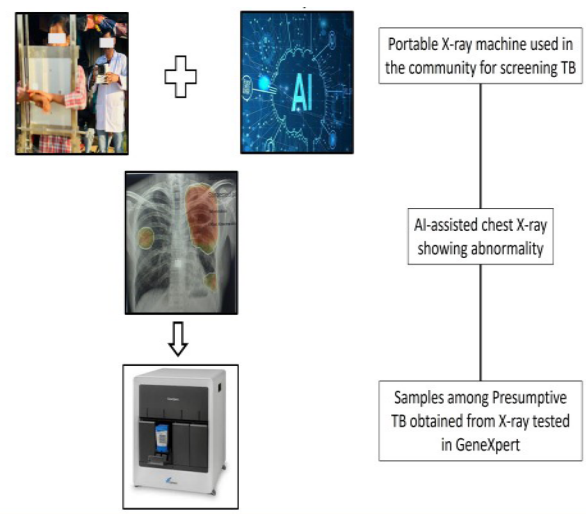

Figure. Process flow of artificial intelligence-aided portable handheld X-ray machine in Himachal Pradesh, India.

Conclusions: A handheld portable X-ray machine equipped with AI tool is an essential last-mile health technology in remote and resource-constrained settings, which helps to bridge TB service delivery gaps and promotes equitable access to TB care in vulnerable population groups.

EP18-767-15 The yield of TB diagnosis using chest X-ray in General Hospital Langtang, Plateau state north-central Nigeria

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Background and challenges to implementation: General Hospital (GH) Langtang is the biggest health facility in Langtang north Local Government Area (LGA), Plateau state, Nigeria. The average TB yield in GH Langtang for 10 quarters from 2021 is 27 cases per quarter. The aim of this study is to demonstrate how the use of chest x-ray for TB diagnosis increased TB notification in the facility and the entire LGA.
Intervention or response: In Q3 2023, with the support of TB partners in the state, the state TB program (STP) signed a memorandum of understanding with GH Langtang to provide free chest x-ray to patients. The service was funded through the STP. Clinicians in the facility were mentored on clinical diagnosis and the need to send patients who show symptoms of TB but are Xpert MTB Rif negative and those that cannot produce sputum, for chest x-ray.
Also, during community led activities, presumptive cases who show signs and symptoms of TB but could not produce sputum were referred to the facility for chest x-ray. Their physical addresses were collected to ensure complete linkage. Data were aggregated from the quarterly LGA TB surveillance data and analyzed using Excel.
Results/Impact: Figure 1 below shows that TB notification increased from 41 in Q3 2023 to 140 in Q4 2023 resulting in over 200% increase in Q4 compared to Q3 2023. Contribution of TB cases from GH Langtang to Langtang LGA increased from 55% in Q3 to 83% by Q4 2023. The availability of a free chest X-ray service contributed to the increased notification in GH Langtang.

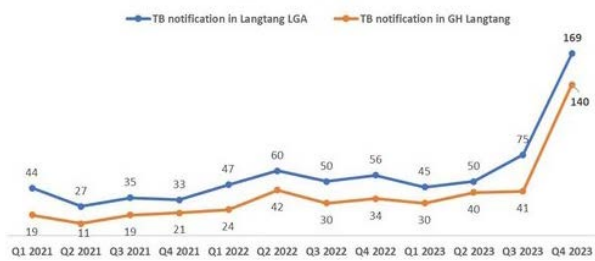

Figure 1. Trend of TB notification in Langtang LGA and GH Langtang: Q1 2021 to Q4 2023.

Conclusions: The deployment of the free chest x-ray services for TB diagnosis should be scaled up across the state as this has demonstrated the potential to increase TB notification. However, a detailed cost effectiveness analysis should be conducted to inform this decision.

EP18-768-15 Mind the gap and close the gap: Contribution of the TB programme quality efficiency (PQE) on TB notification in DR Congo

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Background and challenges to implementation: In 2022, the NTP of DRC, reported 246,119 incident cases, with estimated 67,881 missing people with TB. To address the TB treatment coverage gap, the NTP, with the support of the TB Strategic Initiative of the Global Fund, has gradually implemented the TB program quality efficiency (PQE) approach. The main objectives were to integrate TB systematic screening in each entry points of selected health facilities and to improve the entire TB cascade.
Intervention or response: The PQE implementation process included a situational analysis to identify barriers and best practices in TB diagnosis and care and the development of a strategic PQE plan and tools. The approach was piloted in 2022 in 30 health facilities in Kinshasa. PQE focal points were established, health staff were trained to perform active TB screening at each entry point, and to strengthen the linkage between entry points, laboratory and TB staff. Monthly meetings were held to evaluate TB indicators. In 2023, the approach was extended to 70 additional sites in Kinshasa.
Results/Impact: During the pilot phase, the number of notified TB patients in the 30 health facilities in Kinshasa increased from 4,957 in 2021 (before the PQE intervention) to 7,841 in 2022 (during the intervention) with 58% increase on TB notification. Furthermore, data from the 100 PQE health facilities in Kinshasa showed 42.5% increase in TB notification in 2023 compared to 2022 (17,526 in 2022 and 24,965 in 2023). TB cascade data (Table) are available for each PQE health facility and analysis are regularly performed to improve results.

	PQE pilot phase January to December 2022	PQE expansion phase January to December 2023
Health facilities included in the PQE	30	100 (70 new and 30 of the pilot phase)
Number (%) of people screened/ registered in the PQE health facilities	383,730/465,413 (82%)	660,851/824,226 (80%)
Number (%) of people with presumptive TB identified among people screened	32,062 (8%)	111,124 (17%)
Number (%) of people tested for TB among presumptive TB	23,427 (73%)	82,763 (74.5%)
Number (%) of people tested with molecular tests among the people tested	Not available during the pilot phase	32,453 (39%)
Number (%) of people with TB (all forms)	7,841 (33%)	24,965 (30%)
Number of people with TB started on TB treatment	7,568 (97%)	23,949 (96%)
Number Needed to Screen (NNS)	49	26

Conclusions: The PQE implementation in DRC can contribute to filling the gap in TB treatment coverage. The NTP plans to scale up the approach to cover a total of 400 health facilities in 11 provinces.

EP18-769-15 Leveraging, Engaging and Advocating (LEAD) initiative to augment TB care cascade among marginalised urban communities of Delhi, India

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Background and challenges to implementation: The complexity of fast-paced urbanization in diverse setting along with high burden of Tuberculosis (TB) makes provision of healthcare a pertinent challenge among the marginalized groups, who have limited access to formal infrastructure in Delhi. Leveraging on existing social infrastructure helps to address the social determinants of TB. This study aims to explain how linkages between existing social infrastructure and healthcare services can impact health outcomes, especially with respect to TB in urban settings.
Intervention or response: Government of Delhi in collaboration with Humana People to People India conceptualised the LEAD initiative in August 2023, for marginalised urban communities which include the homeless, migratory, and urban slums. LEAD initiative leveraged the existing social infrastructure to develop an advocacy voice for persons with TB (PwTB) in homeless communities.
Components of TB care cascade such as one-to-one sensitization, TB and comorbidity screening, sputum sample transportation, treatment initiation and follow-up were implemented. Mobile and migratory patients were linked to community stakeholders for public shelter and continuum of TB care. Parameters assessed include proportion of presumptive TB identified diagnostic yield obtained, treatment initiation and continuum of TB care to which appropriate tests of significance were applied.

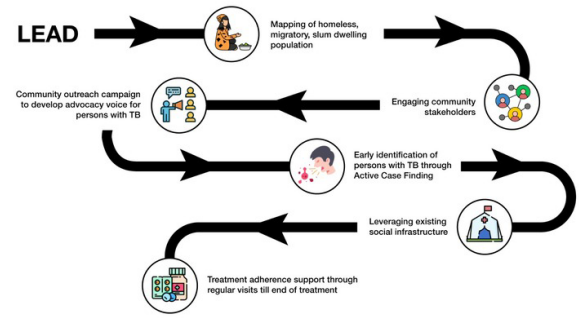

Figure 1: Schematic representation of LEAD initiative in Delhi.

Results/Impact: Between August 2023-March 2024, this initiative resulted in identification of 4830 (3.8%) presumptive TB among the 1,27,584 individuals screened. The diagnostic yield obtained was 33.5% (State average: 16%, z-score: 29.4, p-value: <0.001).
Of those diagnosed, 1346 (97%) were initiated on treatment. Adherence support in the form of regular visits till end of treatment resulted in no loss to follow up in the care cascade.
Conclusions: LEAD initiative has successfully demonstrated how leveraging and engaging with existing social infrastructure and health care services engenders positive TB program outcomes. Strong policy inducements are therefore required to promote replication of such initiatives among marginalized urban communities.

EP18-770-15 Assessing the gaps in cascade of TB care in the Greater Accra Region, Ghana

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Background and challenges to implementation: The Greater Accra Region is one of the 16 regions of Ghana and host the capital city. The region is one of the high burdened regions in terms of Tuberculosis control in the country with a yearly notification of around 2000. In the Region, several techniques have been applied to boost case detection and treatment. Strategies include raising awareness of TB in the community, active screening of TB, providing diagnostic tools, ensuring a steady supply of medications, increasing the capacity for TB treatment and control, and using task-shifting officers to directly support patient care.
The study is to assess gaps associated with care of the disease in Ghana.
Intervention or response: 200 bacteriologically confirmed patients attending 22 facilities were interviewed between March and June 2022 in the Greater Accra Region, Ghana. Structured questionnaire was used to collect data from participants.

Results/Impact: Of the 200 participants (70%male and 30% female), 74% and 26% attended public and private health facilities respectively. 54% reported late to the health facility for diagnosis, 62.1% of patients were diagnosed in the same facilities they were taking treatment whilst 37.9 were diagnosed in different facilities from their treatment facilities. Receipt of results was between 24hours (37.5%), a week (55%) and 2 weeks (7.5%). 38% of gap was found for late diagnosis and 46% late treatment start date. Analysis of the results showed 35% reported late due to stigma and 15% had late treatment as a result of staff attrition.
Conclusions: Gaps in cascade of care was attributed to low education, limited diagnostic tools, stigma associated with the disease and high attrition rate. A proposed interventions to bridge gaps would result in early diagnosis and reduced transmission.

EP18-771-15 Determinants of attrition in the treatment cascade for elderly people with multi-drug- or rifampicin-resistant TB in eastern China: A 7-year retrospective cohort study

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Background: Elderly patients with multidrug- or rifampicin-resistant tuberculosis (MDR/RR-TB) are at risk of poor healthcare in high TB burden countries. This study identified gaps and determinants associated with attrition in the MDR/RR-TB treatment cascade for patients above 60 years of age in Zhejiang Province, China.
Design/Methods: A retrospective cohort study was conducted on MDR/RR-TB patients diagnosed during 2015-2021. The treatment cascade for MDR/RR-TB consists of four steps: diagnosis confirmation, treatment initiation, treatment continuation at the 6th month, and treatment success, with three gaps between the successive steps due to patient attrition. Cochran-Armitage test and logistic regression analysis were used for data analysis.
Results: Among 3156 patients with MDR/RR-TB, 804 (25.48%) were aged 60 years and above. Sixty-three percent of all patients finally achieved treatment success, with the highest treatment success rate being 79.13% in 2021. Compared to the younger group, the elderly patients had significantly higher proportion of attritions in treatment initiation (22.51% vs. 15.05%, P<0.001), treatment continuation at the 6th month (12.84% vs. 3.85%, P<0.001), and treatment success (31.68% vs. 15.56%, P<0.001). The overall attrition rate for the elderly patients was 53.86%, higher than 31.04% of the younger group (P<0.001). During 2015-2021, the rates of treatment initiation and treatment success among those who continued treatment at the 6th month had increased significantly over time in elderly patients. Multivariable analyses showed that old age, conventional bacteriological diagnosis, and no health insurance increased the risk of attritions in treatment initiation, while long visit distance and no regimen adjustment affected the discontinuation of treatment.

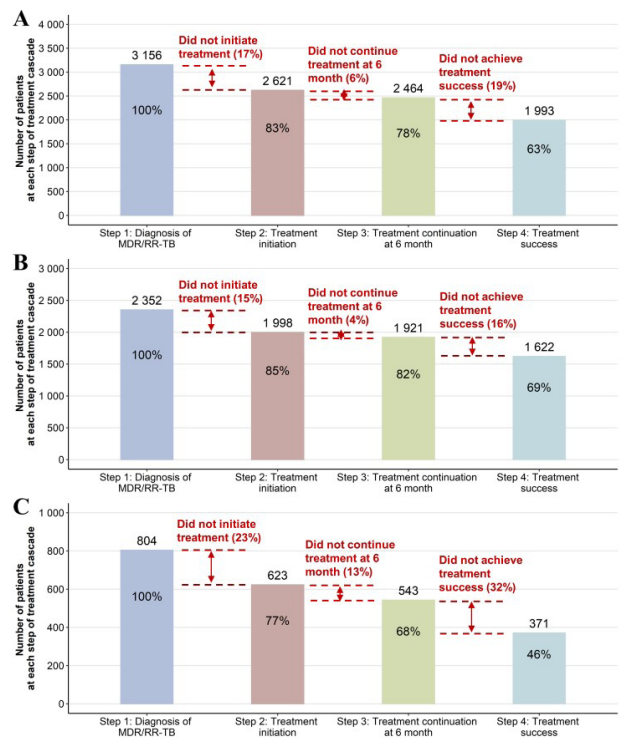

Figure 1. Treatment cascade for (A) all patients, (B) patients aged <60 years, and (C) patients aged ≥60 years with MDR/RR-TB from 2015 to 2021 in Zhejiang Province, China

Conclusions: Larger gaps were identified in the MDR/RR-TB treatment cascade for elderly patients in comparison with younger group, despite improvement was observed over the years. Our findings indicate that more actions should be taken with the priority on improving access to and quality of full-course MDR/RR-TB care for the elderly population.

EP18-772-15 Pre-treatment evaluation in people with drug-sensitive TB for reducing mortality: A proof of concept study from India

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Background and challenges to implementation: The estimated Tuberculosis (TB) deaths in India, as per the Global TB Report 2023, were 3,42,000 (~26.3% of the global burden). The Differentiated TB Care (DTC) guidelines aim to reduce mortality by early identification and management of high-risk patients. The guidelines were piloted to understand the feasibility of implementation in achieving mortality reduction.
Intervention or response: USAID funded, Tuberculosis Implementation Framework Agreement Project through JSI Research and Training Institute, was undertaken to pilot DTC guidelines in 55 high-case load facilities in the Ahmedabad district of Gujarat state and 132 health-staff were trained.
Out of 3,391 eligible patients, 2,564(76%) were comprehensively assessed at the start of treatment; 71 of whom were referred to higher facilities for treatment and the remaining were managed within the facility. The major reasons for 24% not being assessed were patients who could not or didn't wish to come to the facility or were missed by the system.
We compared the treatment outcomes of patients who were assessed vs those who were not assessed within the 55 facilities.

Sl. No.	Patient Cohort[1]	Number of eligible[5] patients	Number of deaths[6]	Mortality rate[7]	p-value	Treatment completion/ cure rate[8]
(1)	Pre-treatment evaluation done[2]	2,564	100	3.90%		85.10%
(2)	Pre-treatment evaluation not done[3]	827	109	13.18%	p< 0.001	51.39%
(3)	Total (1) + (2)	3,391	209	6.16%		76.88%
(4)	District Average in the eligible cohort[4]	5,108	323	6.32%		75.29%

[1] All the cohorts are TB patients diagnosed during the period January'23 to September'23.
[2] Pre-treatment evaluation entails a comprehensive assessment of patients based on 16 nutritional, clinical, and lab parameters defined in the Differentiate TB Care guidelines along with any other diagnostic tests that may have been recommended by the designated medical officer. Though the pre-treatment evaluation should ideally be completed before initiating TB treatment, in practice however, TB treatment is not forestalled, and in some cases, the evaluation may get completed after treatment initiation.
The comprehensive assessment is to be followed by more focused co-morbidity management, linkage to other health services, and referrals as needed. Thereafter, the patients are to be assessed comprehensively every month till the treatment is ongoing.
[3] The cohort in which pre-treatment evaluation was not done received treatment in the same manner as was the case before the intervention.
[4] Pulmonary, drug-sensitive, and Adult TB patients were diagnosed between January'23 to September'23 in all public health facilities of the Ahmedabad district.
[5] The Differentiate TB Care guidelines apply to Pulmonary, Drug Sensitive, and Adult TB patients.
[6] Source: As per Ni-kshay (National Reporting Platform for TB in India).
[7] Mortality Rate= [Patients whose outcome was declared as "died"/ Total patients in the cohort]*100
[8] Treatment completion/cure rate = [Patients whose outcome was declared as "treatment complete" or "cured"/ Total patients in the cohort]*100.
"treatment complete" or "cured" may be assigned as the outcome for a drug-sensitive TB case after the 6-month treatment regimen is completed.
Source: As per Ni-kshay (National Reporting Platform for TB in India).

Results/Impact: After 6 months of treatment, mortality rates were 3.9% vs 13.1%, and treatment completion/cured rates were 85.1% vs 51.3% among patients assessed vs those who were not. Part of this difference may be due to some higher-risk groups (like bedridden and unreachable patients) being a part of the non-assessed cohort. However, the mortality rates in the assessed cohort were 2.4% lower, and treatment completion/cured rates were 9.8% higher than the district average indicating an impact.
Conclusions: The pilot study indicates that implementation of these guidelines has the potential to lower mortality and improve treatment completion/cure rates among TB patients. Although these findings are based on focused implementation in a district with a strong health system, similar positive outcomes can likely be attained nationwide through tailored strategies.

EP18-773-15 Introducing diagnostics on wheels in prison to screen vulnerable inmates in Bangladesh

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Background and challenges to implementation: Tuberculosis (TB) still remains as a significant public health problem in Bangladesh as many TB cases remain undetected, particularly in prisons. Implementing active case finding by using mobile diagnostic vans in prison offers a novel approach to address healthcare issues among vulnerable inmates, notably in resource-limited settings like Bangladesh. It gives easy & door step diagnostics for the inmates which help in early TB detection.
This initiative underscores the necessity of such interventions, citing prisoners' unique challenges and limited healthcare access. Most difficult issues were to get access in these high security jails, multi-sectoral agreement, high turnover of inmates, etc.
Intervention or response: To streamline the missing cases, mobile vans were deployed in 03 of the most overburden prisons in Bangladesh during late 2023. Mobiles Vans were equipped with digital X-ray and Xpert machines. Prisons' health staffs mobilized the inmates for TB presumptive. X-ray are used to screen the presumptive first, followed by the collection of the sputum samples for molecular test. The results are generated within the same day and X-ray reporting is done using teleradiology.
Results/Impact: During December 2023, two vans were engaged in 03 over-crowded prisons. Total 688 inmates were tested and 26 found positive with TB. A number of 534 inmates were screened with X-ray and 180 of them found abnormal. At Cox's Bazar prison, X-ray could not perform due to security issues. So direct 145 Xpert test were performed.

	X-ray	Abnormal X-ray	Xpert	Case
Central Prison, Keraniganj, Dhaka	426	141	64	08
Cox'sBazar prison			145	03
Chattogram Prison	117	39	109	15

Conclusions: Despite the challenges, it was an eye-opening learning to screen the inmates in prison. Considering the outcome, the prison authority is now aware and agreed to screen inmates on a regular basis. All relevant stakeholders should work together to execute this intervention in prisons nationwide.

EP18-774-15 Using short message service reminders, phone calls and mobile money incentives to enhance TB diagnosis completion among presumptive patients in Uganda: A randomised controlled trial-MILEAGE4TB

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Background: Major challenge in meeting the WHO's End tuberculosis (TB) Strategy- reducing TB deaths by 95% and incidence by 90% is cascading patient loss-to-follow-up along the continuum of care. Globally, of the 10 million people who got infected with TB in 2022, 3.1 million were not notified to TB programs. Some of these missing patients are lost during the process of diagnosis- need to be found- linked to treatment.
Design/Methods: We conducted an individual randomized controlled trial- five arms; standard of care (SC); SMS reminders only (SMS), phone call only (PC), SMS and mobile money (SMM) and phone call and mobile money (PMM) among 2,389 study participants. The study was conducted in five selected high-volume health facilities. Presumptive TB patients aged >=18 years identified within the study facilities who did not complete TB diagnosis same day were enrolled in the study and followed for 30 days.
Results: Overall, a total of 2,235 (98.6%) participants were enrolled in the trial; median (IQR) age was 31(24-42) years, majority were females (73.3%), and two-thirds lived within 5km to the nearest health facility. Of 2,356 participants, 415 (18.5%) were co-infected with HIV, 422 (18.9%) had ever been presumed for TB, of which 114 (27.0%) had ever been diagnosed with TB, and 108 (94.7%) received TB treatment. Overall, TB diagnosis completion was 70.5% (1,661/2,356); SC [64.3% (410/638)], SMS [63.5% (350/551)], PC [74.3% (434/584)], SMM [77.9% (219/281)], and PMM [81.6% (248/304)].
Compared to SC, TB completion was similar in the SMS (OR=0.97 95%CI: 0.76, 1.23) but significantly higher PC (OR=1.61 95%CI: 1.26, 2.06), SMM (OR=1.96 95%CI: 1.42, 2.72), and PMM (OR=2.55 95%CI: 1.83, 3.57).
Conclusions: In high-burden settings like Uganda, supplementing standard of care with reminders and incentives such as SMS reminders, phone calls and mobile money for transport enhance optimal diagnosis completion among presumptive patients.

ABSTRACT PRESENTATIONS SATURDAY 16 NOVEMBER 2024

ORAL ABSTRACT SESSION (OA)

OA48 TB prevention and care: Community engagement

OA48-482-16 Strengthening TB case finding through enhancing community TB screening approaches in Zimbabwe

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Background and challenges to implementation: Zimbabwe remains a high TB burden country with an estimated 33,000 incident TB cases reported in 2022. Only 55% TB cases were notified, against a national target of 90% notified TB cases. This deficit calls for intensified efforts to identify the undiagnosed TB cases and minimize TB treatment delays, thereby mitigating disease progression at individual level and TB transmission at community level.
Intervention or response: With support from USAID, OPHID is implementing the TB-Treatment Access Prevention (TAP) project in 24 high burden districts in Zimbabwe. The project aims to strengthen community TB case-finding through 383 training community outreach agents who screen and refer identified presumptive TB clients using an ODK mobile phone-based WHO four-symptom TB screening tool. Clients and household TB contacts identified with presumptive TB symptoms are referred to health facilities for further screening and sputum collection. Community TB screening activities are conducted at i) household level ii) HIV outreach clinics in hard-to-reach rural settings iii) mines and identified hot-spot areas and iv) extended-program-for-immunisation (EPI) outreaches for scaling up childhood TB diagnosis.
Results/Impact: Between 01 January and 28 February 2024, 177,142 clients were screened in the community of whom 4,872(3%) were referred to the health facilities. Overall, of the clients referred 1,386(28%) had presumptive TB and of these 190(14%) clients were diagnosed. Additionally, 6,032 clients were screened for TB during targeted community outreach clinics of whom 282(5%) were TB presumptive and 19(7%) were diagnosed with TB.
Overall, 12% of notified TB cases were from the community of whom 97% were ≥15 years. There were more males identified through the community compared to facility-based TB diagnosis (78% versus 69%, p=0.039).
Conclusions: Community TB screening approaches are pivotal for early TB detection and for reaching clients such as adolescent boys and men who are less likely to visit and be identified through health facilities.

OA48-483-16 Empowering communities: A novel approach to active TB case detection in Nigeria

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Background and challenges to implementation: Involving communities in the planning and implementation of tuberculosis (TB) screening programs, healthcare providers can ensure that screening services are accessible and acceptable to community members. This can include setting up screening sites in convenient locations, providing information in local languages, and addressing cultural beliefs and practices that may influence healthcare-seeking behaviour. This paper therefore presents the outcome of engaging and empowering communities to increase active TB case findings in Nigeria.
Intervention or response: Community active case finding is being implemented in 103 Local Government Areas (LGAs) in Oyo, Osun, Ogun and Lagos States, Nigeria. Religious leaders, Community-Based Organizations (CBOs) and Community Volunteers (CVs) were engaged with the support of the Tuberculosis and Leprosy Supervisor (TBLS) at the LGA to conduct designated numbers of outreaches monthly in prisons, remand homes, schools, and rehabilitation centres, male-targeted screening, as well as daily house-to-house TB screening in identified hotspots using mobile portable digital X-rays. This was also supported by Breakthrough Action Nigeria (BAN) through monthly motorized campaigns to create demand for TB screening in 15 LGAs.

Results/Impact: Between October 2022 and September 2023, a total of 934,490 clients were eligible for screening out of which 933,691 (99.9%) of them were screened. Among these, 114,227 (12.2%) presumptive TB were identified and 114,139 (99.9%) were evaluated. From the total number evaluated (114,139) for TB, 9,231 (8.1%) cases were diagnosed and among these, 8,764 (94.9%) were placed on treatment. The number needed to screen (NNS) was 101 and the number needed to test (NNT) was 12.
Conclusions: This study showed that community engagement is vital for effective tuberculosis screening programs and by working closely with communities, implementing partners can enhance the impact of tuberculosis screening efforts and contribute to the global goal of ending the TB epidemic.

OA48-484-16 Adapting community-based TB care in Myanmar: The role of the Myanmar Medical Association TB Consortium in addressing the TB burden

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Background and challenges to implementation: The reviving of the public health system from the COVID-19 pandemic and political turmoil has seriously limited TB diagnosis and treatment in Myanmar. Myanmar has a huge gap in the TB notification rate of 217, with a TB incidence of 475/100,000 in 2022. As Yangon is populated with migrants and crowded slums, the Myanmar Medical Association (MMA) TB consortium in Yangon is crucial in addressing the TB burden, and its adaptation in times of health crisis seems a promising approach.
Intervention or response: MMA leads the Myanmar Anti-TB Association (MATA) and Pyi Kyi Khin (PGK) in addressing community-based TB care with volunteer-based and mobile team approaches. As the travel restriction imposed for patient referrals and mobile team arrangements, the Consortium adapted the TB mobile team into TB diagnostic centers run as primary health clinics and has been applying computer-aided detection; CAD (Qure.ai) in backstopping diagnosis from chest X-ray readings since 2022.
Results/Impact: The TB clinic and mobile team establishments achieved 33,161 health consultations in the peri-urban Yangon. Among these patients, 32,297(97%) had undergone TB diagnosis, and 1,588 were identified as having TB. Of these cases, 1,211 cases with a high score of CAD correlate 64.4%; 72% in 2022, and 57% in 2023 with CXRs with features suggestive of TB. TB case notification increased from 418 in 2021 to 968 in 2022 and 1,244 in 2023, contributing to TB prevention and care.
Conclusions: Establishing primary health care clinics at the community doorsteps means that people with presumed TB are easily approachable and increased access to TB prevention and care without stigma and discrimination.
This adaptation of community clinics is a viable TB intervention where humanitarian actions are at the challenge. This use of CAD ensured TB diagnosis in the peri-urban setting, while the national TB interventions experienced resource limitations.

OA48-485-16 Empowering tribal communities: A comprehensive approach to TB elimination

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Background and challenges to implementation: Despite concerted efforts, challenges such as limited healthcare infrastructure, cultural barriers, and geographical remoteness posed significant obstacles to effective TB control in tribal areas. Therefore, in order to address the high burden of tuberculosis (TB) among tribal population of India, the Ministry of Tribal Affairs (MoTA), Government of India (GoI) and the Ministry of Health and Family Welfare (MoHFW), GoI jointly launched the Joint Tribal TB Initiative in 2021.
Intervention or response: In line with the India Government's goal to End TB by 2025 and part of the Celebration of 75 Years of India's Independence - Azadi ka Amrit Mahotsav, the Tribal TB Initiative 2.0 was launched in 2022 aiming to establish 75 TB-free tribal districts by 2025. This initiative employed a multi-pronged approach, focusing on community empowerment and health system strengthening. To this end, MoHFW engaged actively with MoTA and Ministry of Panchayati Raj, with Piramal Swasthya being the implementing partner.
Results/Impact: Between April 2022 and September 2023, across 75 tribal districts of India, the initiative sensitized 30,896 community influencers on TB including 17,220 panchayat members (local elected members) who referred 4449 persons with presumptive TB. 4,313 of those referred were tested (97%), leading to the diagnosis of 196 TB-positive cases (4.5%). The TB Mukt Panchayat module was simplified for ease of understanding

and implementation and 5,879 panchayats (68% of total panchayats in 281 intervention blocks) were oriented on the same.

Conclusions: The Tribal TB Initiative 2.0 exemplifies a comprehensive approach to TB elimination among tribal populations in India where sustained efforts and continued collaboration between government agencies, community stakeholders, and development partners would facilitate progress towards achieving TB-free status in targeted districts by 2025.

OA48-486-16 Targeted interventions to overcome the challenges for TB among key and vulnerable populations in Bangladesh: A review of special initiatives and barrier mitigation strategies

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Background and challenges to implementation: Bangladesh, one of the high burden countries for tuberculosis (TB), faces significant challenges in providing quality TB services to key and vulnerable populations due to socioeconomic barriers. Prevalence of TB is notably higher among urban dwellers, including those in slums, geriatric individuals, children, pregnant women and rural inhabitants, especially in coastal areas. Lack of service accessibility, poor health seeking behavior, and catastrophic costs hinder effective disease management among these people, emphasizing urgent need for targeted interventions to enhance healthcare access for ending TB.

Intervention or response: BRAC, a development organization, implemented targeted interventions, focusing on screening individuals in key and vulnerable populations through distribution of cough pots to potential persons with presumed TB. Special TB campaigns, including sputum collection centers, were conducted among urban dwellers, transport and brick field workers. Children under 15 years, elderly and pregnant women were screened within communities.

Additionally, special outreach sputum collection centers were established to intensify TB screening in rural hard-to-reach areas. Samples collected were transported to nearest facilities for testing through GeneXpert or microscopy, ensuring timely diagnosis and treatment initiation.

Results/Impact: A total of 195,424 persons with presumed TB were tested among urban dwellers, transport and brick field workers, resulting in 10,797 confirmed TB patients. 10,574 persons with presumed TB among children, elderly, and pregnant women were tested, leading to 1,050 TB patients' detection.

Furthermore, 61,747 TB persons with presumed TB were tested by special outreach initiatives in rural remote communities, resulting in 3,912 TB patients' identification.

Conclusions: According to World Health Organization (WHO), inclusion of key and vulnerable populations is crucial to achieve END TB Strategy. Targeted interventions play a vital role in ensuring equitable access to TB care, especially for these groups. Expansion of activities to serve underserved people, prioritizing accessibility and inclusivity will be a key to achieving goals for reducing TB prevalence in Bangladesh.

OA48-487-16 Breaking barriers: Targeting TB in the workplace for men

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge globally, with workplace environments posing unique hurdles to TB control. In Kenya, despite concerted efforts, TB control faces obstacles like stigma, limited resources, and stockouts of commodities.

Engaging workplaces in Public-Private Mix (PPM) initiatives presents an opportunity to overcome these challenges and enhance TB control.

Intervention or response: Our intervention aimed at fostering partnerships between county health management teams (CHMTs), private companies, and communities. Through capacity building, workplace policy development, awareness campaigns, regular screenings, and infection control measures, we targeted TB prevention, early diagnosis, and treatment adherence. Workplace-based directly observed therapy (DOT) and support mechanisms were implemented to ensure comprehensive care.

	2022	2023
Counties engaged in PPM Workplace	3	10
Companies engaged	40	80
TB Active Case Finding at Workplace –Cascade		
Workload	12,115	452,519
Screened	7,710	206,892
Done X-Ray	-	3,747
Presumed to have TB Symptoms	213	7,822
Sputum Collected and Tested	184	5,376
Bacteriologically Confirmed TB	7	176
Clinically Diagnosed	4	167
Total Diagnosed with TB	11	343
Children Diagnosed	0	15
Started on TB Treatment	11	336
Number of TB Diagnosed Persons Notified	11	336
Segregation by		
Male	8	219
Female	3	124
Total Diagnosed with TB	**11**	**343**

Results/Impact: From 2022 to 2023, our intervention expanded significantly, engaging more counties and companies. TB Active Case Finding at Workplace demonstrated substantial workload and impact, with a considerable number diagnosed and initiated on treatment. Segregation by sex revealed a higher burden among men, underscoring the importance of targeting this demographic in workplace TB interventions.
Conclusions: Engaging workplaces in TB control through PPM initiatives has yielded promising results, albeit with challenges. Strong partnerships, community involvement, and adaptability are crucial for success. Addressing stigma, resource constraints, and treatment adherence barriers remain imperative. This model showcases the potential of workplace interventions in advancing TB control efforts and underscores the need for sustained commitment and funding for long-term impact.

OA48-488-16 Scaling up targeted TB screening among miners and construction workers in Malawi: A collaborative approach towards TB elimination

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Background and challenges to implementation: Malawi faces a significant burden of TB, particularly among miners and construction workers. Despite the prevalence of pulmonary TB among miners reaching 14%, efforts to address TB in these high-risk populations remain limited.
Intervention or response: In 2023, the National TB and Leprosy Elimination Program (NTLEP), in partnership with mining and construction companies conducted targeted TB screening across the country. The MDUs equipped with digital X-ray systems with computer aided diagnostic for TB and Xpert platform were deployed to facilitate TB screening and early detection of TB. The screening activities involved comprehensive mobilization of workers and host communities, followed by rigorous parallel symptom and digital X-ray screening aided by Artificial intelligence. Xpert was used to evaluate active TB among all presumptive TB cases.
Results/Impact: A total of 5,641 clients were screened, resulting in the identification of 342 (6%) presumptive TB cases. Among these presumptive, 51 (14.9%) were diagnosed with active TB, with 31 (60.7%) confirmed bacteriologically. Notably, 88% of active TB cases were among workers, highlighting the occupational risk. All diagnosed TB cases were promptly linked to TB treatment, demonstrating the effectiveness of the screening initiative in improving case detection and management.
Conclusions: The targeted TB screening with high yield of TB underscores the urgent need for expanded TB case detection efforts among key population group, particularly among high-risk occupational groups nationwide.
To achieve the goal of TB elimination by 2030, concerted efforts are required to ensure equitable access to TB screening, diagnosis, and treatment for all populations.

OA48-489-16 Enhanced community-based contact investigation improved finding missing people with TB in three districts in Malawi

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Background and challenges to implementation: In 2022, TB incidence in Malawi was estimated at 125 per 100,000 persons, with 25% of people with TB undiagnosed and 14% of the TB burden among children aged 0-14. Contact Investigation (CI) is one means to identify new cases of active TB. WHO recommends tuberculosis preventive treatment (TPT) for all contacts with active TB ruled out. In 2022, Malawi had 25% CI coverage gap and the CI yield has been consistently lower than the targeted 2%.
Intervention or response: The US Agency for International Development through Local Organization Network (LON2) project implemented by Development Aid from People to People(DAPP) Malawi is supporting the National Tuberculosis and Leprosy Elimination Program in active case-finding and TB infection prevention & control.
In October 2021, 21 CHWs were recruited and trained (1 per health facility) in three high TB burden districts (Mangochi, Machinga, and Mulanje). They identify and systematically screen contacts of pulmonary TB in households or at nearby clinics to find undetected TB in their communities including all children under 5 (CU5). CHWs are provided airtime and bicycles for household visits and appointments. CHWs are mentored and provide psychosocial support and stigma reduction to persons with TB and their families.
Results/Impact: During 2021-2023, 7413 of 8754 estimated contacts were identified. Among these, 85% were screened for TB, a 22% increase in contact screening. By

2023, the total estimated contacts screened (3662) exceeded the 95% target with 96% screened (Figure 1). Of those screened, 1421 (19%) presumptive pulmonary TB cases were reported, and 3% (37) were diagnosed with active TB, exceeding the 2% target, 41% (12) of notifications were CU5. TPT coverage for CU5 improved from 50% in 2021 to 74% in 2023.

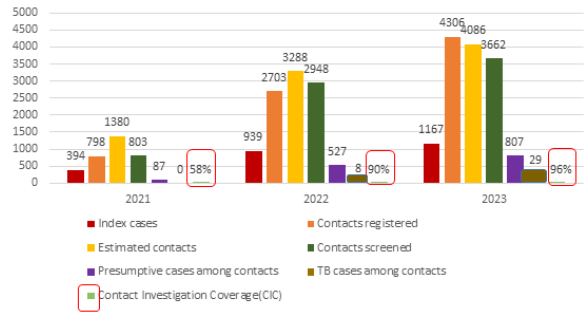

Figure. Contact investigation.

Conclusions: A multi-disciplinary approach with mentored personnel, good documentation, psychosocial support, and stigma reduction improved CI coverage and yield in communities including CU5.

OA49 Filling in the TB knowledge gaps: Research in action from new drugs to operational research

OA49-490-16 Investigating heteroresistance in M. tuberculosis: Findings from the endTB trial

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Background: The multi-country endTB trial investigated optimal combination therapy to enhance treatment outcomes for multidrug-resistant tuberculosis. In the DeepMTB substudy, we investigate the occurrence of heteroresistance, the coexistence of susceptible and resistant bacteria in the same population, for bedaquiline (BDQ), clofazimine (CFZ), fluoroquinolones (FQs), linezolid (LZD), and pyrazinamide PZA), key drugs in endTB experimental regimens.

Design/Methods: Among 754 endTB trial participants, specimens from a subset of 383 underwent analysis of the baseline remnant decontaminated sputum sediments at the Institute of Tropical Medicine. We assessed the presence of variants and their allele frequency distributions in candidate resistance gene targets included in Deeplex Myc-TB: *gyrA* and *gyrB* for FQs, Rv0678 for BDQ/CFZ, *rrl* and *rplC* for LZD, and *pncA* for PZA. Using the automated Deeplex analysis tool, we assessed the occurrence of high-confidence resistance-associated and uncharacterised variants and their allele frequencies.

Results: Of the samples with interpretable Deeplex Myc-TB results, considered per target, almost all had wild-type sequences for *gyrA* and *gyrB* (92%, 334/362), *Rv0678* (95%, 345/363), and *rrl* (96%, 350/361), while only 41% (219/374) had wild-type sequences for *pncA*. Of the 16 resistance-associated variants detected in genes of interest for FQ, BDQ/CFZ and LZD, 7 (44%) occurred at fixed allele frequencies (>90%). In contrast, of the 41 uncharacterized variants in genes of interest for FQ, BDQ/CFZ and LZD, only 4 (10%) were fixed (p=0.0039). Minority variants present at ≤10% occurred for 5 of the 16 (31%) resistance-associated variants versus 30 of 41 (73%) uncharacterized variants (p=0.0038).

			Number of frug resistant-variants with allele frequencies:			Number of uncharacterised (other) variants with allele frequencies:		
Drug	Target	Wild type	1-10%	10-90%	>90%	1-10%	10-90%	>90%
FQ	gyrA/B	334	2	1	6	17	1	1
BDQ/CFZ	Rv0678	345	2	3	1	9	1	2
LZD	rplC/rrl	350	1	0	0	4	5	1
PZA	pncA	155	9	11	185	1	5	8

Conclusions: Genotypic resistance to FQs, BDQ/CFZ, and LZD was infrequent in baseline samples of participants in the endTB trial and heteroresistance [C1] [AD2] was uncommon. The association with phenotypic resistance of minority populations in uncharacterized variants should be assessed to allow accurate clinical interpretation of the Deeplex results.

OA49-491-16 Fourteen-day treatment responses in participants with rifampicin-susceptible pulmonary TB receiving ganfeborole in combination with delamanid or bedaquiline: A phase 2a open-label, randomised trial

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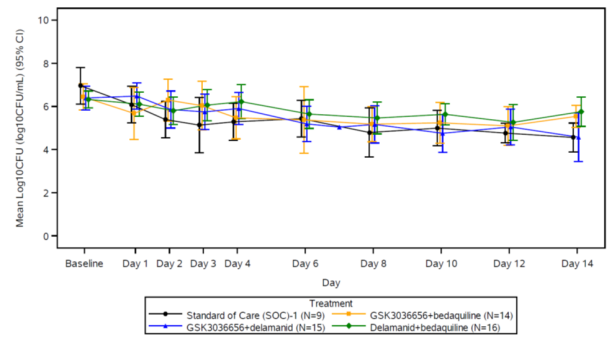
Background: Ganfeborole (G) previously GSK656, is a novel first-in-class benzoxaborole inhibiting the *Mycobacterium tuberculosis* leucyl-tRNA synthetase. We report results of an interim analysis performed following completion of the first three investigational treatment arms of a study evaluating the early bactericidal activity (EBA), safety and tolerability of ganfeborole in combination with delamanid (D) or bedaquiline (B), and D in combination with B.
Design/Methods: 54 adults newly diagnosed with rifampicin- and isoniazid-susceptible pulmonary TB were randomized (3:3:3:2) to receive 14 days of G in combination with B (GB), D (GD) or BD. HRZE was the microbiological control. EBA was assessed by the change in colony-forming units (CFU-$EBA_{0\text{-}14}$) and time to positivity (TTP-$EBA_{0\text{-}14}$) on serial overnight sputum collections. Serum concentrations of G were explored in a pharmacokinetic model simulation. Treatment-Emergent Adverse Events were assessed daily.



Note: Standard of Care (SOC)-1 represents Rifafour from Cohort 1.

Figure: Mean (95% CI) Log10CFU Over time by Treatment

Results: Overall, 54 people living with or without HIV were randomized. CFU-$EBA_{0\text{-}14}$ and TTP-$EBA_{0\text{-}14}$ were observed in all arms. Based on the results of a MMRM model, mean rates of change in 0-14 log10CFU/mL was -0.105 (-0.231, 0.022), -0.049 (-0.177, 0.079) , -0.025 (-0.152, 0.102), -0.081 (-0.225, 0.064) and log_{10}TTP-$EBA_{0\text{-}14}$ (95% CI) was estimated to be 0.036 (-0.001 – 0.072), 0.036 (-0.001 – 0.072), 0.035 (-0.001 – 0.072) and 0.032 (-0.004 – 0.068) log_{10} hours for GD, GB, BD and HRZE, respectively. HRZE activity was as expected. PK was as expected in line with published data. No SAEs were reported for the groups. Adverse event rates were comparable across groups; all events were mild Grade 1 or moderate grade 2.
Conclusions: Ganfeborole has demonstrated activity and an acceptable safety profile in combination with delamanid or bedaquiline, without apparent antagonism or drug-drug interactions.
This study supports these combinations as potential building blocks for longer treatment studies for pulmonary tuberculosis. ClinicalTrials.gov: NCT05382312.

OA49-492-16 High rate of on treatment acquired resistance to WHO group A MDR-TB drugs in people with failure of programmatic MDR-TB treatment in Republic of Moldova

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Background: High rates of successful treatment outcomes with a regimen administered for six months consisting of bedaquiline, pretomanid, linezolid with or without moxifloxacin (BPaLM) has revolutionized the treatment of patients affected by multidrug-resistant (MDR) tuberculosis (TB). Very recently, concerns have been raised about emergence of *Mycobacterium tuberculosis* drug resistance against medicines of the BPaLM regimen.
Design/Methods: We conducted a retrospective longitudinal cohort study involving adults with culture-positive pulmonary MDR/preXDR-TB who initiated treatment under National Tuberculosis Response Program (NTRP) in the Republic of Moldova (RM) between January 1st, 2021 and December 31st, 2022 and experienced treatment failure as evidenced by the lack of bacteriological response (no sputum culture conversion). Sputum samples were programmatically collected at treatment initiation and monthly thereafter to monitor treatment response according to national guidelines. Phenotypic drug susceptibility testing (DST) was done using the BACTEC MGIT960 culture system, with WHO-recommended critical concentrations applied.
Results: During the study period 1032 MDR/preXDR-TB patients started treatment under NTRP in the RM. Among them, 52(5.0%) did not achieve sputum culture

conversion. Six of these patients were excluded from analysis due to lack of DST data at baseline or follow up. At baseline 6/46(13.0%) of patients were infected with *M. tuberculosis* resistant to bedaquiline, 11/46(23.9%) to linezolid and 31/46(67.4%) to fluoroquinolones.
Follow-up DST revealed additional acquired resistance to bedaquiline in 13/40 (32.5%), to linezolid in 6/35(17.1%) and to fluoroquinolones in 5/15(33.3%) in initially susceptible strains of *M. tuberculosis* from patients with MDR/preXDR-TB.
Conclusions: Under programmatic conditions in a high-burden country of drug-resistant TB we observed high rates of baseline *M. tuberculosis* drug resistance and of acquired drug resistance to components of the BPaLM regimen in patients who failed MDR/preXDR-TB treatment. These results call for urgent action to upscale molecular DST for the prediction of *M. tuberculosis* drug resistance to provide adequate treatment regimens for each affected patient.

OA49-493-16 TBAJ-587 CL001: Pharmacokinetics and safety data from a Phase 1 trial of TBAJ-587, a novel 2nd generation diarylquinoline, in healthy participants

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Background: TBAJ-587 is a next-generation diarylquinoline being developed as alternative to bedaquiline. Data from preclinical studies suggest that TBAJ-587 may have a better safety profile and superior efficacy compared with its analog bedaquiline.
Design/Methods: Phase 1, first-in-human, partially-blinded, placebo-controlled, two-part (single ascending dose [SAD] and multiple ascending dose [MAD]), randomized trial designed to evaluate pharmacokinetics (PK), safety and tolerability of TBAJ-587 in healthy adults. The SAD part enrolled 6 cohorts of 8 participants (N=8, 6 active and 2 placebo), with single oral doses escalating from 25 mg to 800 mg, taken fasting, plus a food effect cohort (200 mg) of 18 participants (9 fed, 9 fasted). All SAD participants were followed up to 126 days. The MAD part enrolled 3 cohorts of 12 participants (N=12, 9 active and 3 placebo) dosed in the fed state with oral doses of 50 mg, 100 mg, or 200 mg daily for 28 days, and followed up to 168 days.
Results: TBAJ-587 exhibited a terminal half-life of around 16 weeks. Under single-dose, fasting conditions, exposure increased slightly less than proportionally over the 25-800 mg range. Under multiple-dose, fed conditions, exposure increased proportionally over 50-200 mg. Food increased exposure by approximately 2-fold. There were no early withdrawals due to adverse events (AEs) or serious AEs , and no safety signals were identified. Approximately 90% of the AEs were mild in intensity and the AE profile was similar to that of placebo.

Dose	Day	Cmax Parent (ng/mL)	AUC Parent (ng.h/mL)	Cmax M2 (ng/mL)	AUC M2 (ng.h/mL)	Cmax M3 (ng/mL)	AUC M3 (ng.h/mL)
50 mg	14	288	3290	5.58	107	14.3	294
	28	338	4620	9.94	202	23.7	491
100 mg	14	525	6120	12.0	233	31.7	658
	28	571	7470	20.4	420	55.2	1130
200 mg	14	950	11800	29.4	573	68.1	1420
	28	1110	16900	45.6	941	119	2440

Table 1 Means of observed exposures in the MAD part.

Conclusions: TBAJ-587 was generally safe and well tolerated in a Phase 1 SAD-MAD study. Food increased exposure by approximately 2-fold and AUC was dose proportional when administered over 28 days. The mean terminal half-life was shorter than that of bedaquiline, approximately 16 weeks. These results along with *in vitro* efficacy data support TBAJ-587 continued evaluation in Phase 2.

OA49-494-16 QT-interval prolongation in children receiving clofazimine and moxifloxacin for treatment of rifampicin-resistance TB: A multi-country study

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Background: Clofazimine (CFZ) and moxifloxacin (MFX) are key components of shorter WHO-recommended regimens for rifampicin-resistant tuberculosis (RR-TB) treatment in children; both can cause QT prolongation. CATALYST was a pharmacokinetic, safety and acceptability trial of new child-friendlier formulations of CFZ and MFX. We present QT data from children over time, by combination of QT-prolonging drugs received.
Design/Methods: CATALYST enrolled children on RR-TB treatment for <16 weeks in South Africa, India and the Philippines. Treatment regimens varied but all children received CFZ and a fluoroquinolone; children on levofloxacin were switched to MFX at trial entry. Monthly electrocardiograms (ECGs) were done over 24-weeks.

Fridericia's QT-correction was used, QTcF grading was protocol-specific and QTcF>480ms required interruption of QT-prolonging drugs and close follow-up. A repeated measures MANOVA was done to assess if serial QTcF differed by combination of QT-prolonging drugs and post-hoc analysis was with Wilk's λ multivariate test.

Results: Thirty-six children were enrolled, median age 4.8 years (IQR 2.4, 8.1). RR-TB treatment regimens included three combinations of QT-prolonging drugs: CFZ/MFX n=12, 33%, CFZ/MFX with bedaquiline (BDQ) n=15, 42% and CFZ/MFX with delamanid (DLM) n=9, 25%.

Mean QTcF over follow-up was higher in children on CFZ/MFX/BDQ than in children on CFZ/MFX or CFZ/MFX/DLM ($F(9, 23)=6.98$, $p=0.0001$; Wilk's $\lambda=0.268$ and $F(9, 23)=3.08$, $p=0.0141$; Wilk's $\lambda=0.453$, respectively).

Seven children (19%) had ≥1 episode of QTcF >480ms (n=3 >500ms); 6/7 were taking CFZ/MFX/BDQ. No children developed arrhythmia or cardiac symptoms; MFX was discontinued in five children, and CFZ in one child.

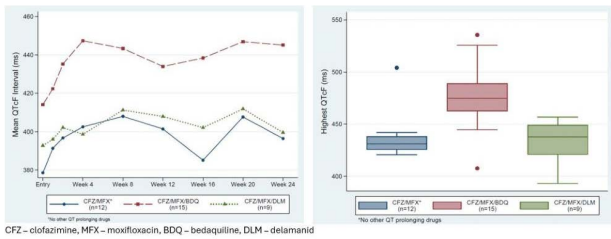

Figure 1. Mean QTcF over the trial period (left) and highest QTcF per participant (right), by combination of QT-prolonging drugs.

Conclusions: Children taking MFX/CFZ/BDQ for treatment of RR-TB had higher mean QTcF, and a higher proportion had QTcF≥480ms compared to children taking MFX/CFZ or MFX/CFZ/DLM. This necessitated additional clinical visits and switching of drugs, in some. In routine programmatic care, the MFX/CFZ/BDQ combination should be avoided if alternatives are available and careful ECG monitoring is recommended.

OA49-495-16 Moxifloxacin preventive treatment in children who were exposed to multi-drug-resistant TB

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Background: Recent randomized controlled trials V-QUIN and TB-CHAMP demonstrated the benefit of levofloxacin TB preventive treatment over placebo in children and adults at risk of developing multi-drug resistant TB (MDR-TB) post close contact. The Arhangelsk region in Northwest Russia has a high burden of MDR-TB and a well-established contact tracing programme.

Our study aimed to evaluate the effectiveness and safety of moxifloxacin TB preventive treatment (Mfx-TPT) in children who were exposed to MDR-TB.

Design/Methods: In this prospecive single-arm study, 339 children, aged <18 years, were identified and screened for TB as part of contact tracing for 625 patients with microbiologically-confirmed MDR-TB, between January, 1 2011 and December, 31 2021. Of these, 34(10%) children were diagnosed with TB and were started on anti-TB treatment. Among the remaining 305, 281 were in contact with fluoroquinolone-sensitive MDR-TB and were invited to participate in the Mfx-TPT study.

Results: Of those approached, 220/281(78%) agreed to to receive 6-9 months of Mfx-TPT, and 61/281 declined Mfx-TPT but consented to data collection. Results were compared between children who received Mfx-TPT and those who did not. Of 220 children treated with Mfx-TPT (median age (IQR) 7.3 (3.4-12.6) years), nobody developed TB within 12 months, whereas of 61 children (7.3 (3.5-13.0) years) who did not receive MFX-TPT, one child (1.6%) developed confirmed pulmonary non-severe TB (similar resistance to the index case).

Overall, 52 adverse reactions (AR) occured in 47/220 (21.3%) children on Mfx-TPT, with most being DAIDS grade 1-2. Seven ARs were grade 3 (3 hepatotoxicity; 2 prolonged QT, 1 raised eosinophils, 1 allergic reactions), none requiring hospital admission. In 4/47(8.5%) children an AR led to Mfx-TPT discontinuation.

Conclusions: Mfx-TPT was effective, however, one in 12 children had treatment discontinued due to an adverse reaction. Families need to be well informed of risks and benefits of Mfx-TPT.

OA49-496-16 N-acetylcysteine to reduce kidney and liver injury associated with drug-resistant TB treatment

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Background: New drug classes have shortened drug-resistant tuberculosis treatment to 6 months, yet morbidity persists due to adverse events and organ toxicity; N-acetyl cysteine (NAC), known for reducing kidney and liver toxicity and enhancing antimycobacterial effects, requires further study in drug-resistant tuberculosis treatment.
Design/Methods: A randomized control trial (PACTR20200077368541) pilot study conducted at Kibong'oto Infectious Disease Hospital in Tanzania from 2020 to 2023 assessed N-acetyl cysteine (NAC) efficacy in reducing adverse effects in rifampin-resistant-TB patients on a six-month multidrug regimen. With blinded allocation, participants were randomized to receive an oral placebo, NAC 900 mg daily, or NAC 900 mg twice daily.
Clinical and laboratory assessments were conducted monthly, including nephrotoxicity and hepatotoxicity rates, and classified using Common Terminology Criteria for Adverse Events National Cancer Institute. Comparison of onset of events between NAC and control groups utilized incident ratios and Kaplan Meier curves.
Results: Among 66 patients, with 22 in each group, predominantly male and with a mean age of 47+/-12 years, 158 adverse events were observed, distributed similarly across the placebo and NAC groups. Renal injury incidents were higher in the placebo group (45%) compared to the NAC group (23%), though not statistically significant.
While serious adverse events occurred in all groups, NAC showed potential renoprotective effects in the 26-week survival curve, but no significant impact on hepatotoxicity was observed.
Conclusions: In Tanzanian adults undergoing rifampin-resistant tuberculosis treatment, N-acetyl cysteine (NAC) at either 900 mg once daily or twice daily did not significantly decrease adverse events over the initial six months compared to placebo. Although NAC showed renoprotective potential, further investigation for broader benefits and larger sample sizes is warranted.

OA50 Holistic approach towards curative and preventive measures

OA50-497-16 Impact of an education program for persons with TB and caregivers on treatment outcomes in Madhya Pradesh, India

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Background: Tuberculosis (TB), the second leading infectious cause of death poses a significant global health challenge. To address this, India aims to eliminate TB by 2025 – 5 years ahead of global End-TB targets. To achieve this, the Indian government aims to integrate TB care with expanded range of services at Health and Wellness Centers (HWCs) - the peripheral most public health facility, led by mid-level health care providers called Community Health Officers (CHOs).
Jhpiego's USAID-funded NISHTHA project implemented „Family Caregiver Model for TB (FCM)" in selected facilities of 2 districts of Madhya Pradesh, India; to enhance this effort.
The intervention included training CHOs for identifying and counselling caregivers of persons with TB in various aspects of care like ADR management, nutrition, infection prevention and mental health support with regular handholding and project support for CHOs.
Design/Methods: We conducted a secondary data analysis using India's TB portal, NIKSHAY, comparing treatment outcomes between FCM clients and a comparison group matched for geography, time-period, age, gender, HIV and diabetes status in a 1:3 ratio. Chi-square tests compared outcomes. Sub-group analyses were conducted based on TB site, type and regimen.
Results: Outcomes of 370 FCM clients were obtained. The comparison arm included 1110 persons with TB. FCM demonstrated significant (p-value 0.002) treatment successes (94.6%) versus the comparison arm (89%).
Sub-group analysis revealed higher success rates in pulmonary TB (94.7% vs 88.6%, p-value 0.004), drug-sensitive TB (94.6% vs 89.4%, p-value 0.004) and those newly diagnosed with TB (94.9% vs 89.3%, p-value 0.006) in FCM arm.
Successful outcomes were higher for drug-resistant TB (94.3% vs 80%), and those being retreated for TB (94.3% vs 88.3%), though not statistically significant.

Sub-group	Intervention Arm		Comparison Arm		P-value
	N	Successful outcomes (%)-Cured + completed	N	Successful outcomes (%)-Cured +completed	
Overall	370	350 (94.6%)	1110	995 (89.3%)	0.002
Newly Diagnosed TB	312	296 (94.9%)	919	824 (89.7%)	0.009
Re-treatment TB	53	50 (94.3%)	171	151 (88.3%)	0.206
Pulmonary TB	262	248 (94.7%)	881	781 (88.6%)	0.004
Extra-Pulmonary TB	39	36 (92.3%)	227	208 (91.6%)	0.887
Drug-Sensitive TB	335	317 (94.6%)	1090	975 (89.4%)	0.004
Drug-Resistant TB	35	33 (94.3%)	20	16 (80%)	0.102

Conclusions: The Family Caregiver Model shows improved treatment outcomes for persons with TB with potential to strengthen TB care delivery by empowering families in their caregiving role.

OA50-498-16 Advancing equity and access: The hub and spoke model in TB service delivery within the public-private mix (PPM) initiative in Kano State, Nigeria

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Background and challenges to implementation: Engaging health providers through Public-Private Mix (PPM) approach is essential to reach the millions of people with TB who miss out on access to quality care each year either due to under-reporting or under-diagnosis. PPM improves access to treatment by involving health care providers from whom the poor, marginalized and most vulnerable seek care. The involvement of all providers in PPM enhances access of closer-to-home health services for children, women, and men.
We present result of hub and spoke model in advancing equity and access in TB control through the ppm initiative.
Intervention or response: KNCV Nigeria with funding from USAID implements the hub and spoke model across five Local Government Areas (LGA) in Kano. Thirty patent medicine vendors (PMVs) from each LGA were trained to provide TB screening services to walk-in clients, refer presumptive TB to nearby public facilities for evaluation and treatment. These PMVs were mapped as spokes and clustered around public facilities, these public facilities serve as hubs where positive TB patients are referred to receive treatment. Thus, each cluster consists of five spokes.
In 2022, KNCV Nigeria expanded its coverage to twenty LGAs to enhance access and TB case finding. Data from 2021 to 2023 was collated and analyzed from the DHIS 2 Platform.
Results/Impact: After expanding coverage in 2022, total case finding increased by 59%, with a further increase by 91% in 2023. TB case finding in children was 6times higher in 2023 compared to 2021, likewise the case finding for women and men was 2times higher compared to 2021 case notification.

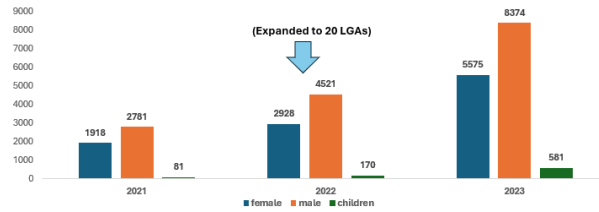

Figure. Three years PPM TB case finding across gender and age.

Conclusions: Our results bespeak notable improvement in TB case finding post expansion, showcasing increased equitable access to TB services across gender and age. We recommend this hub and spoke model being scaled up to all 44 LGAs in Kano state to ensure equitable access to the most vulnerable.

OA50-499-16 District-based public-private mix (DPPM) approach to increase TB case notification and improve quality of TB care at all healthcare facilities in Indonesia

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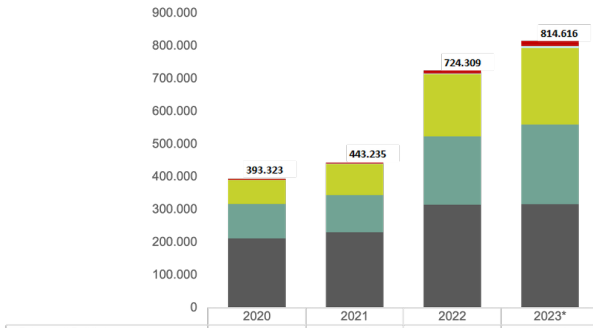
Background and challenges to implementation: Indonesia is the second-highest country with tuberculosis (TB) burden globally (GTB, 2023). Despite this, it is estimated 30% of TB cases were not reported to NTP between 2017 to 2020. According to Patient Pathway Analysis (2017), 74% of TB patients initially seek care from private providers. Given a desentralized country with numerous and fragmented private healthcare facilities (HF), a district-based public-private mix (DPPM) approach is required to ensure TB care access to all healthcare facilities.
Intervention or response: Between 2021 to 2023, the Global Fund supported the DPPM approach by providing additional PPM staff and intensifying PPM activities in 19 provinces and 80 priority districts.
One to three PPM staff members were assigned to each district to rule out PPM interventions, including:

1. Mmapping potential HFs;
2. Engaging HFs through MoU signing;
3. Providing diagnostic and logistic access, community support, and TB information system;
4. Capacity building; and,
5. Regular supervision and feedbacks.

Results/Impact: Compared to 2020, the number of TB case notifications from private providers increased by 316%, from 76.042 to 240.246 in 2023. The number of private hospitals and GPs reported TB cases increased from 1.084 to 1.661 and 85 to 2.319, respectively. The number of presumptive TB cases tested with the mWRD test at private providers increased by 395%, from 81.333 to 321.230 cases tested. Strong leadership from district authorities and local stakeholders is critical to the success of the DPPM approach.



	2020	2021	2022	2023*
Private GP/Clinics	3.152	3.685	9.298	15.893
Public Clinics	1.051	1.232	2.354	6.523
Private Hospitals	72.890	94.624	189.527	232.870
Public Hospitals	104.570	113.774	209.079	243.758
Puskesmas (PHC) & Lung Center	211.660	229.920	314.051	315.572

Conclusions: DPPM approach, which includes the secondment of PPM staff and intensified PPM intervention at district level, is effective in improving the involvement of all healthcare facilities in TB program, resulting in an increase of TB case notification and quality of TB care at healthcare facilities.

OA50-500-16 Engaging Amchis from the traditional Buddhist medical system to augment the TB care cascade in Ladakh, India

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Background and challenges to implementation: For centuries, Buddhist people in the hilly areas of Ladakh have sought health care from the *Amchis* (traditional practitioners of Buddhist medical system) as their first point of care in remote areas with difficult terrain and extreme weather conditions. Tuberculosis (TB) program in Ladakh engaged with *Amchis* as its last-mile initiative while progressing towards TB elimination.

The study aims to assess the impact of engagement of *Amchis* on referral of persons presumed to have TB and on the TB care cascade.

Intervention or response: In April 2022, health teams listed all *Amchis* in the coverage area of each primary health center of Ladakh. Medical officer and field staff sensitized each *Amchis* to engage them in one/all of the following roles: TB screening, referral of persons with presumed TB, treatment adherence and TB preventive treatment (TPT). TB program impact parameters assessed were (i) referral of persons presumed to have TB (ii) TPT initiation (iii) diagnostic yield (iv) annual TB notification (iv) favourable treatment outcomes and follow-up. Data from April 2022-December 2023 was analyzed using SPSS ver21.

Results/Impact: Several community meetings (104) were held by *Amchis* with representatives from local monastery and Ladakhi communities. Between 2022-23, 2759 persons were identified as presumptive TB by *Amchis* which contributed to 11.4% of presumptive TB testing in Ladakh. Among them, 78 persons were diagnosed with TB using standard diagnostic modules, thus contributing to a diagnostic yield of 2.8%. This intervention contributed to 12.5% annual notification for Ladakh for 2023 (Ladakh average:1.4%, z-score: 5.79 p-value:<0.001). *Amchis* supported 86% (67 persons with TB) successful treatment completions in addition to provision of counselling and TPT to their families.

Conclusions: Engaging *Amchis* from the traditional Buddhist medical system has been successful in augmenting TB care cascade, thus signifying the need for such engagements in similar settings which are in their last-mile towards ending TB.

OA50-501-16 Integration and decentralisation: PWID-centric solutions in TB-HIV care

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Background and challenges to implementation: Myanmar remains a high-burden country for TB and HIV. According to the Global TB Report 2021, 2,900 of 22,000 TB deaths were TB-HIV co-infected. People who inject drugs (PWID) in Myanmar, with a 34.9% HIV prevalence, face heightened risks of both TB and HIV. Stigma, fear of exposure and healthcare disparities hinder their access to care, leading to delayed diagnosis and treatment.
Intervention or response: In its dedicated service to PWID, the Asian Harm Reduction Network (AHRN) operates Key Population Service Centers (KPSCs) with a tailored approach to TB-HIV co-infection. Utilizing a personalized and inclusive strategy, AHRN adopts a „screen-for-all" approach, offering diagnostic evaluations for presumptive TB cases on-site or via referrals. People diagnosed with TB receive anti-TB treatment at AHRN and are offered HIV testing, addressing dual health concerns seamlessly. Moreover, AHRN provides Cotrimoxazole prophylaxis (CPT) to people with TB-HIV co-infection. In 2018, AHRN decentralized antiretroviral therapy (ART) services through the ART satellite model, enhancing PWID's access to essential treatment in collaboration with national programs.

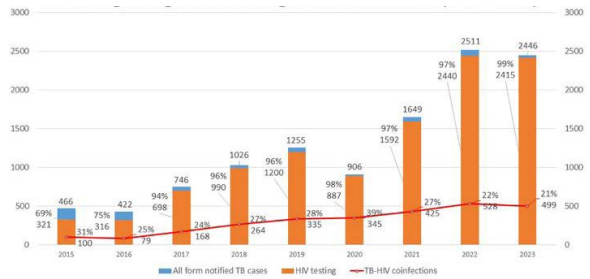

Figure. HIV testing among all form TB diagnosed in AHRN KPSCs (2015 - 2023).

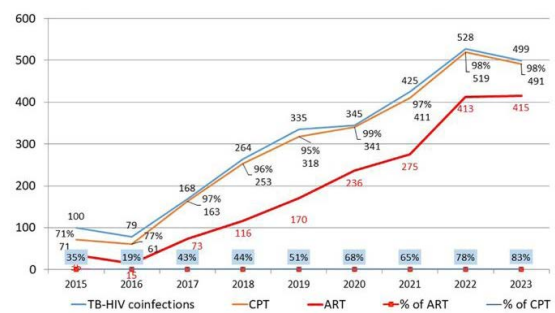

Figure. TB/HIV collaborative activities in AHRN KPSCs (2015 - 2023)

Results/Impact: In our PWID-centered KPSCs, individuals receive integrated care, including TB and HIV screening, diagnosis, and treatment, all in decentralized settings. From 2016 to 2023, the percentage of TB-diagnosed individuals with HIV test results rose from 75% to 99%, CPT coverage increased from 77% to 98%, and ART coverage rose from 19% to 83%. This approach minimizes care barriers like stigma and transportation issues, fostering higher engagement and retention. By streamlining services, PWID spend less time seeking healthcare, avoiding multiple facility visits, enhancing convenience, and accessibility.
Conclusions: The results from AHRN's PWID-centered KPSCs demonstrate significant progress in addressing TB-HIV co-infection among PWID, with decentralized integrated services leading to increased HIV testing rates, enhanced coverage of CPT and ART, and improved engagement in treatment. Recommendations include scaling up this model in high HIV/TB burden areas to enhance comprehensive care access.

OA50-502-16 Person-centered mental health interventions to improve psychosocial well being of people with drug-resistant TB

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Background and challenges to implementation: Mental health (MH) problems are commonly comorbid with chronic illnesses and associated with adverse clinical and psychosocial outcomes. From a psychosocial point of view, depression and anxiety can lead to poor adherence to taking medications, thereby affecting tuberculosis (TB) treatment outcomes. MH interventions have a positive impact in improving treatment adherence and psychosocial well-being of drug-resistant tuberculosis (DR-TB) patients.
Intervention or response: This cross-sectional study (April 2022-June 2024) explored both the prevalence of depression and the impact of mental health (MH) interventions on adult MDR-TB patients (over 15 years old) as part of the TB REACH Wave 9 project.
All participants received a comprehensive three-month MH program that included individual counseling, support groups, art therapy, educational entertainment, and workshops on income generation. Researchers assessed depression levels using a validated Bengali translation of the PHQ-9 questionnaire at the beginning and end of the intervention period.
Results/Impact: We conducted pre-intervention survey with 398 enrolled DR-TB patients to assess the level of depression; of these 275 (69%) were identified with moder-

ate to severe depressive symptoms. Depressive symptoms were more common in males (64.7%) and patients aged ≥35 years (78.0%) at baseline. However, among the 123 patients (31%) who did not show depressive symptoms at baseline, among them 47 (17%) developed moderate to severe symptoms after one month. The prevalence of probable depressive symptoms (PHQ-9 score≥5) was significantly higher at baseline than post-intervention (69% vs. 27%, p<0.001). Only 1.2% of patients enrolled in this study were defaulted from treatment, compared to 6.8% of all patients in 2021.

Conclusions: TB REACH Wave 9 interventions significantly improved the psychosocial well-being of DR-TB patients and their treatment adherence. Data indicates that psychosocial counseling/support and education should be a crucial component alongside DR-TB treatment to improve adherence to long-term treatment and enable psychosocial rehabilitation after treatment.

OA50-503-16 Patients line list: A tool for data quality improvement and management of people with TB - The Bauchi State experience

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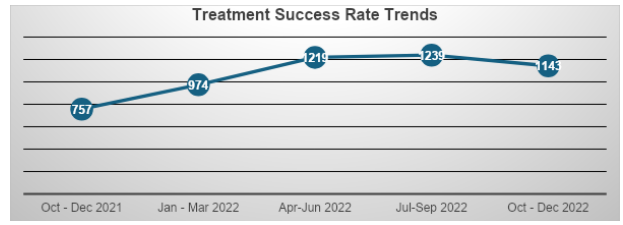
Background and challenges to implementation: Tuberculosis (TB) is a major public health issue in Nigeria, especially in Bauchi State, where TB programmatic documentation is presents a formidable challenge. KNCV Nigeria, with USAID support, is undertaking six interventions aimed at bolstering TB control efforts in Bauchi state.
These efforts include intensified case Finding (ICF) in public facilities, PPM, Contact Investigation, Community TB screening, Active case Finding (ACF) using Wellness on Wheels (WOW), and ACF in Special Populations. Without proper documentation, TB detection and treatment efforts is severely compromised leading to issues like double reporting, follow-up oversight and poor treatment outcomes.

Intervention or response: The Patient line list as a tool was designed with indicators that capture information of TB patients from diagnosis period and updated throughout the course of treatment till an outcome is assigned. The tool's major function is to ensure intentionality and conscientious efforts by DOTs officers and health workers in keeping track and managing Patients. The tool serves as a tracker which is periodically updated to contain information about TB patients during treatment.

Results/Impact: Over two years of implementation, this tool has improved TB management in notable ways. It has reduced treatment enrolment gaps, rectified discrepancies in treatment card and registers, enhanced TB case notification, increased treatment success rates within the state, and improved contact investigation procedures. State quarterly treatment success rate increased from 76% to 82% during implementation.



Conclusions: Patient tracking efficiency improved with the implementation of the patient line list in public, private, and community interventions. Treatment success rates have also increased significantly in the state after its implementation. This tool could improve tuberculosis case management, lowering the disease's burden on the population with regular use.

OA50-504-16 Harnessing leadership across sectors: Strengthening multisectoral collaboration to end TB in India

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Background and challenges to implementation: The National Strategic Plan (2017-25) developed by the Ministry of Health and Family Welfare, Government of India envisages strengthening of Multisectoral Collaboration as a vital strategy. The aim is to improve awareness, enhance access to healthcare, provide social protection, provide nutritional support, and reduce stigma related to tuberculosis in the community.

Intervention or response: Over the past few years, there has been a paradigm shift in the contributions made by various sectors in the fight against TB. An effective multi-departmental collaborative working mechanism has been developed ensuring efficient execution of assigned responsibilities, and implementing robust monitoring mechanism to assess progress.

Results/Impact: The National Program's diversified approach has showcased the following multi-stakeholder engagement nationwide, exemplified by inter-ministerial collaborations, interactions with corporates, public sector undertakings, and associations:

1. Established Inter-Ministerial Committee for TB elimination with 25 ministries
2. 11 MoUs and 4 Joint action plans signed with Government Ministries.
3. 360 Corporates have joined the initiative and have supported to initiate more than 150 different projects for TB at both workplace and community.
4. 1,56,738 Institutions, corporates, NGOs, political parties etc adopted 9,34,955 TB patients.

Conclusions: By aligning policies, addressing social determinants, strengthening health systems, and mobilizing resources, we can achieve sustainable progress towards TB elimination and improve the overall health and well-being of people. Multisectoral approach reflects a commitment to leave no-one behind in achieving Universal Health Coverage.

OA51 DM theme "Double Trouble": Addressing the epidemiological and treatment challenges of diabetes and TB

OA51-505-16 The use of fructosamine and the glycation gap as indicators for TB treatment outcome

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Background: Tuberculosis (TB) patients with diabetes mellitus (DM) experience poorer treatment outcomes than those without DM, sparking interest in using glycemic levels as predictors of TB treatment outcomes. However, distinguishing between chronic diabetic-hyperglycemia and TB-induced stress-hyperglycemia presents challenges. In addition to the commonly used marker HbA1c, which reflects glucose control over a three-month period, fructosamine provides a summary of control over three weeks.

Based on clinical insights from pneumonia and critical care management, the concept of the glycation gap—the difference between measured HbA1c and the HbA1c predicted from the fructosamine level—has emerged as a valuable tool for distinguishing between chronic diabetic-hyperglycemia and stress-hyperglycemia.

Yet, despite its potential utility, the TB research community has not explored the concept of the glycation gap concerning TB treatment outcomes. In this study, we assess the relationships between various glycemic indicators—HbA1c, fructosamine, and the glycation gap—and TB treatment outcomes.

Design/Methods: Based on a cohort study of 4,500 incident TB patients enrolled between 2009 and 2012 in Lima, Peru, we conducted a nested case-control study that included 21 patients with poor treatment outcomes and 149 with good outcomes.

We retrospectively measured serum HbA1c and fructosamine levels in stored blood collected when these patients were diagnosed with TB. The glycation gap was calculated as the difference between serum HbA1c and predicted HbA1c levels from fructosamine.

We standardized these glycemic variables using z-transformation, enabling direct comparison of the effect sizes of the associations between these glycemic variables and treatment failure on an odds ratio scale.

Results: After multivariable adjustment, each unit increase of standardized baseline glycation gap led to a 2.82-fold increased odds of treatment failure (95%CIs=1.09-7.26). We did not find evidence supporting an association between fructosamine or HbA1c and treatment failure (HbA1c:OR=0.97;95%CIs=0.29-3.24; fructosamine:OR=0.19,95%CIs=0.03-1.34).

Conclusions: Glycation gap may better indicate TB treatment outcome than HbA1c or fructosamine alone.

OA51-506-16 Suboptimal TB treatment outcomes among adults with diabetes in Eswatini: A prospective cohort study

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Background: Tuberculosis (TB) is a significant public health problem in Eswatini, which has the highest HIV prevalence globally. People newly diagnosed with TB often have comorbid diabetes (DM), which can result in suboptimal TB treatment outcomes, including treatment failure and death.

Design/Methods: The DETECT study assessed DM/preDM prevalence and DM impact on TB treatment outcomes among adults with TB treated in 10 health facili-

ties in Manzini, Eswatini. Adults with TB were screened with lab-based glycated hemoglobin (HbA1c) assay for DM (HbA1c ≥6.5%) and preDM (HbA1c 5.7-6.4%). TB treatment success was defined as cure or completion; suboptimal outcomes included treatment failure, lost-to-follow-up, and death. We present descriptive statistics, Chi-square or Fishers Exact tests, and adjusted odds ratios (aOR) from logistic regressions.

Results: Between 06/2022 and 02/2023, 667 adults were diagnosed with TB, with 56.1% (374 individuals) tested for DM ≤2 months after diagnosis. Among 374 screened, 13.4% had DM (72% newly diagnosed, 28% known/prior DM) and 41.7% preDM. Those screened for DM had median age of 39 (IQR 31-47); 54.0% were male, 22.1% were overweight/obese, 76.5% were living with HIV, 11.6% were previously treated for TB, 12.4% had extrapulmonary TB, 3.8% had drug-resistant TB, and 85% had TB treatment success. Compared to HIV-negative individuals, individuals with HIV were more often female (52.8% vs. 23.9%, p<0.001) and overweight/obese (24.8% vs. 13.1%, p=0.023); DM rates were similar. Individuals with DM were 3.53 times more likely to have suboptimal treatment outcomes (95%CI 1.72-7.23), controlling for age (aOR=1.04, 95%CI 1.01-1.06), living with HIV (aOR=2.36 95%CI, 0.99-5.59), and previous TB treatment (aOR=2.61, 95%CI 1.17-5.82).

Conclusions: High prevalence of mostly newly diagnosed DM and preDM was found among adults with TB in Eswatini, irrespective of HIV status. Integrating DM and TB/HIV services is urgently needed to mitigate the negative impact of DM on TB treatment outcomes.

OA51-507-16 Glycemic control and treatment outcome in rifampicin resistant tuberculosis patients with diabetes mellitus: a prospective cohort study in China

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Background: Treatment in rifampicin-resistant tuberculosis (RR-TB) patients with diabetes mellitus (DM) remains challenging with an increased risk of unsuccessful treatment outcome. Understanding the association between glycemic control and treatment outcomes is critical.

Design/Methods: Patients aged over 16 and had pulmonary RR-TB were prospectively enrolled. Regimens were all-oral, 9–11 month, containing five of the following drugs: bedaquiline, fluoroquinolones, linezolid, cycloserine, clofazimine, pyrazinamide. The diagnosis of DM was based on a previous history or a baseline HbA1c ≥6.5%. Persistent hyperglycemia 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. The 2022 WHO definitions for treatment outcomes were applied. The association between glycemic control and treatment outcomes was analyzed with logistic regression modelling methods. This is a preliminary analysis with ongoing data collection. All patients included have completed follow-up during treatment period.

Results: Of 319 RR-TB patients, 54 (16.9%) were diagnosed with DM. Overall, the average age was 49.9 and 41 patients (75.9%) were male. Ten (18.5%) patients had fluoroquinolone resistance and cavity was present in 43 (79.6%) patients. Of 54 patients with DM, 27 met the criterion of persistent hyperglycemia. The demographic characteristics were balanced in patients with or without persistent hyperglycemia. Treatment success rate in patients with persistent hyperglycemia was relatively low (51.9% vs. 85.2%, P = 0.008), with more treatment failure (22.2% vs. 0%, P = 0.023) and loss to follow-up (25.9% vs. 3.7%, P = 0.050). Odds of treatment success was significantly reduced in RR-TB patients with persistent hyperglycemia (adjusted OR = 0.187, 95% CI 0.051–0.689, P = 0.012).

	Overall (N = 54)	Without persistent hyperglycemia (N = 27)	With persistent hyperglycemia (N = 27)	P value
Age, Mean ± SD	49.9 ± 10.3	50.6 ± 12.4	49.2 ± 7.7	0.628
Male — no. (%)	41 (75.9)	18 (66.7)	23 (85.2)	0.111
BMI — no. (%)				0.267
Underweight	5 (9.3)	4 (14.8)	1 (3.7)	
Normal weight	37 (68.5)	19 (70.4)	18 (66.7)	
Overweight	10 (18.5)	4 (14.8)	6 (22.2)	
Obesity	2 (3.7)	0	2 (7.4)	
Smoker — no. (%)	15 (27.8)	6 (22.2)	9 (33.3)	0.362
Alcohol abuse — no. (%)	6 (11.1)	2 (7.4)	4 (14.8)	0.669
Fluoroquinolone resistant — no. (%)	10 (18.5)	5 (18.5)	5 (18.5)	1.000
Bilateral disease extent — no. (%)	45 (83.3)	22 (81.5)	23 (85.2)	1.000
Cavitation — no. (%)	43 (79.6)	23 (85.2)	20 (74.1)	0.311
Treatment outcome— no. (%)				0.008
Treatment success	37 (68.5)	23 (85.2)	14 (51.9)	
Treatment failure based on clinical judgement¶	6 (11.1)	0	6 (22.2)	
Relapse	1 (1.9)	1 (3.7)	0	
Lost to follow-up	8 (14.8)	1 (3.7)	7 (25.9)	
Death	2 (3.7)	2 (7.4)	0	

¶ Treatment failure was determined based on symptoms and chest radiography, and participants were switched to longer regimen.

Conclusions: This interim analysis suggested that persistent hyperglycemia was associated with unsuccessful treatment outcomes in RR-TB patients. However, due to the small sample size, more data is needed to further clarify the underlying causes.

OA51-508-16 Impact of diabetes mellitus on tuberculosis recurrence

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Background: The burden of tuberculosis and diabetes is remarkably high and has been a global public health issue. The interaction between tuberculosis and abnormal blood glucose levels has aroused widespread concern. This study aims to explore the recurrence risk and related factors of active tuberculosis, explicitly focusing on the impact of diabetes.

Design/Methods: We conducted a retrospective cohort study in eastern China by recruiting 12509 individuals with newly diagnosed pulmonary tuberculosis during

2011-2020 and followed for recurrence. We used the Kaplan-Meier curves to illustrate the relative risk and Cox proportional hazard models to identify recurrent risk factors. The hazard ratio (HR) and 95% confidence interval (CI) were used to estimate the strength of the association between diabetes and tuberculosis recurrence.
Results: After a median follow-up period of 5.46 years, we observed 439 recurrent cases, with an incident recurrence rate of 6.62 per 1000 person-years. The three-year cumulative rate was 72.9%. Patients with diabetes had a significantly increased risk of recurrence (HR: 2.47, 95% CI: 1.72-3.54). A gender-specific association between diabetes and tuberculosis recurrence was also observed.
Conclusions: Recurrence in tuberculosis patients who have diabetes should be a concern. Controlling blood sugar and continuous monitoring can help reduce the risk of recurrence.

OA51-509-16 Assessment of post-TB disease outcomes based on glycemic status: a follow-up study in Bangladesh

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Background: Tuberculosis (TB) is a major health concern in Bangladesh despite effective treatment regimens. However, monitoring post-TB outcomes, especially with comorbidities like diabetes (DM), is crucial. Individuals with DM and TB face increased risks of recurrence as well as treatment complications. Yet, research on post-TB outcomes concerning glycemic status in Bangladesh is scarce. Data regarding association between impaired hyperglycemia, and TB relapse is also limited. Understanding this interplay may improve disease outcomes among individuals who suffered from TB previously and inform healthcare policies.
Design/Methods: We followed-up with a cohort of 429 individuals who had TB and were successfully treated from 2018 to 2019 at Dhaka's TB Screening and Treatment Centers (TBSTCs). Participants were invited to their nearest TBSTC and interviewed, after taking informed written consent, we collected demographic data including, a history of recurrent TB post-treatment and a point-of-care glycosylated hemoglobin A1c (HbA1c) test. Descriptive statistics (frequency and mean) were used to report socio-demographic details for analysis.
Results: 203 participants with mean (±SD) age 38.8 (±14.8) years were enrolled. Of them, 51 (25%) were known diabetics and 13 (6%) were newly diagnosed with DM range hyperglycemia (HbA1c>6.5). Among the participants, 11 (5.4%) were diagnosed with TB recurrence (7 pulmonary TB and 3 extra-pulmonary TB) and the mean time from treatment completion to relapse was 3.5 years (±1.2 years). Five (45.5%) of them had hyperglycemia of which three (27%) had a prior history of DM. Rate of recurrence among 64 people with known DM or newly diagnosed hyperglycemia is much higher (7.8%) than that among the non-diabetics (4.3%).
Conclusions: In this study, our preliminary findings reveal concerning rates of TB relapse among individuals with hyperglycemia, underscoring the importance of comprehensive post-TB follow-up care. Continued research in this area is essential to inform targeted healthcare interventions and improve outcomes for this vulnerable population.

OA51-510-16 Sensitivity and specificity of tuberculosis screening tools in people with diabetes

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Background: Tuberculosis (TB) remains a global health concern, particularly among individuals with diabetes, who are at higher risk of TB disease. Systematic screening for TB disease is recommended for timely diagnosis and management in this population; however, data on the accuracy of screening tools are lacking. We assessed the sensitivity and specificity of various TB screening tools among people with diabetes.
Design/Methods: We consecutively enrolled 673 adults with diabetes attending routine primary care in Khayelitsha, South Africa. Baseline assessments for active TB included screening for symptoms and signs and chest X-ray (index tests). A single spot sputum specimen was collected from all participants regardless of symptoms and chest X-ray findings, and tested by Xpert Ultra (reference standard).
Results: The cohort had a median age of 54 years (Interquartile range [IQR] 47-60 years), with a predominance of females (430). HIV positivity was observed in 116 (17.24%) participants. The majority of participants had type 2 diabetes (658) and were on diabetes treatment. Median HbA1c was 9.4%(IQR 7.7-11.5%). TB was diagnosed in 9 participants (1.33%). Notably, 29 participants (4.31%) presented with TB symptoms, and 114 participants had a previous history of TB.

Any cough had a sensitivity of 22.2% (95% confidence interval [CI] 2.1-60.0%) and a specificity of 97.5% (95%CI 96.0-98.6%), while the presence of any of cough, fever, weight loss, or night sweats had a sensitivity of 22.2% (95%CI 2.1-60.0%) and a specificity of 96.0% (95%CI 94.2-97.0%) (Table).
Chest X-ray TB suggestive abnormalities demonstrated a sensitivity of 55.6% (95%CI 21.2-86.3%) and a specificity of 95.4% (95%CI 93.4-97.0%), while any lung abnormality exhibited a sensitivity of 55.6% (95%CI 21.2-86.3%) and a specificity of 93.5% (95%CI 91.1-95.4%).

Screening tool	TP	FN	FP	TN	Sensitivity, % (95%CI)	Specificity % (95%CI)
Any cough	2	7	16	625	22.2 (2.81-60.0)	97.5 (96.0-98.6)
Any TB symptom	2	7	26	625	22.2 (2.81-60.0)	96.0 (94.2-97.4)
Chest X-ray (TB suggestive abnormality)	5	4	26	542	55.6 (21.2-86.3)	95.4 (93.4-97.0)
Chest X-ray (Any lung abnormality)	5	4	37	531	55.6 (21.2-86.3)	93.5 (91.1-95.4)

TP: true positive; FN: false negative; FP: false positive; TN: true negative; CI: confidence interval

Table. Sensitivity and specificity symptom and chest X-ray screening.

Conclusions: We found a low yield of TB disease in these individuals routinely attending diabetes care. Our screening methods had a pattern of low sensitivity and high specificity.

OA51-511-16 Latent tuberculosis infection in a large adult East African population with diabetes mellitus: prevalence, clinical characteristics, and determinants

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Background: People living with diabetes mellitus (DM) have an increased risk of developing latent tuberculosis infection (LTBI) and progression to active TB disease (ATB). This study aimed to investigate the prevalence, clinical characteristics, and determinants of LTBI in adult persons living with DM in East Africa (EA).

Design/Methods: 1910 adults living with DM were screened for LTBI at four sites in Uganda and Tanzania using the tuberculin skin test (TST) and QuantiFERON-TB plus (QFT-plus) test. LTBI was diagnosed using a positive TST using a cutoff of ≥10 mm and or a positive QFT-plus after excluding ATB.
Results: The overall age-standardized prevalence of LTBI was 61.7% (95% CI 51.6%-71.7%), with a higher prevalence noted in Uganda (76.9% [95% CI 73.3-80.6]) compared to Tanzania (46.4% [95% CI 35.7-57.1]). 39.5% of participants had a positive TST, 44.0% had a positive QFT-plus and 26.1% had both a positive TST and QFT-plus. The agreement between the tests was 71.6% (k=0.42; 95% CI: 0.38-0.46).
On multivariable analysis, increasing age above 35 years [(AOR 1.08, 95% CI 1.02-1.15, p=0.004)], male sex (AOR 1.86, 95% CI 1.47-2.37, p<0.0001), increasing log BMI (AOR 4.96, 95% CI 1.41-17.42, p<0.0001), a history of ATB (AOR 1.87, 95% CI 1.11-3.14, p<0.0001), being a contact person (AOR 1.46, 95% CI 1.10-1.94, p=0.01), and living with HIV (AOR 0.45, 95% CI 0.31-0.66, p<0.0001) were independently associated with LTBI. Factors such as the presence of a BCG scar, smoking, alcohol consumption, and duration of DM were not associated with LTBI in this population.

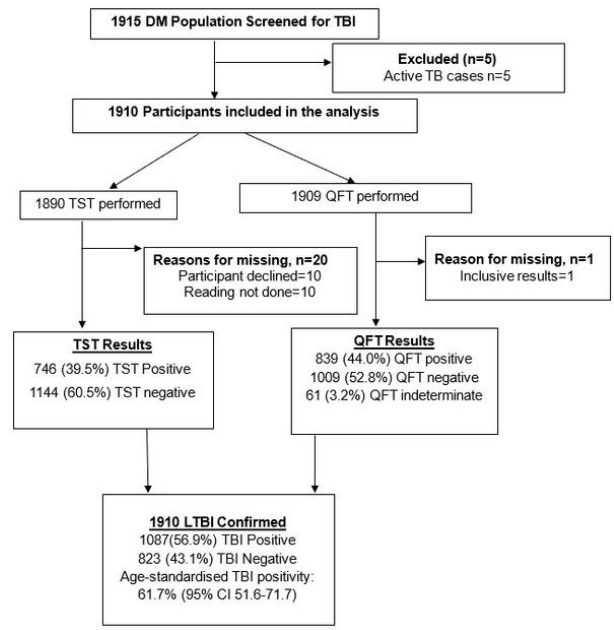

Figure 1. Particpant flow-chart.

Conclusions: The burden of LTBI among people living with DM is high in EA. Screening for LTBI in this population is feasible and they should be targeted for early detection and treatment of LTBI to prevent the progression to active TB thus reducing morbidity and mortality associated with TB.

OA51-512-16 Body Mass Index trajectories and association with tuberculosis risk in a cohort of household contacts in southern Africa

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Background: Undernutrition and tuberculosis (TB) are syndemic, both being archetypal diseases of poverty. Undernutrition is both a cause and consequence of TB, but this complex relationship is poorly understood.
We evaluated the baseline nutritional status of TB household contacts (HHCs), longitudinal trajectories, and association with incident TB.
Design/Methods: ERASE-TB is a prospective longitudinal cohort study of TB HHCs aged ≥10 years in three countries in southern Africa (Zimbabwe, Tanzania, and Mozambique), with 6-monthly follow-up for up to 24 months.
Nutritional status was assessed separately for adults (body mass index [BMI]) and adolescents (BMI-for-age Z-scores). Undernutrition was defined as BMI<18.5 or BMI-for-age Z-score<-1.
The associations between nutritional status and incident TB were investigated with a Cox proportional hazards model and reported as hazard ratios (HR) with 95% confidence intervals (95%CI).
Growth mixture modelling (GMM) was used to model longitudinal latent trajectories and a Chi² test or ANOVA was used to test associations between socio-demographic characteristics and latent groups.
Results: Of the 2,109 recruited HHCs (621 [29.5%] adolescents and 1,312 [62.2%] female), 517 (24.5%) were undernourished. There were 43 incident TB cases, 14 (22.5%) among the undernourished.
Baseline undernutrition (aHR: 2.42, 95% CI: 1.18-4.97) and >10% negative change in BMI during the study (aHR: 7.21, 95% CI: 3.21-16.2) was associated with increased risk of TB (Table 1).

		PY	n[1]	Crude HR (95% CI)	p*	Adjusted# HR (95% CI)	p*
Baseline BMI	Normal/overweight	2007	31	1		1	
	Underweight/mild underweight	498	12	2.01 (1.03 – 3.92)	0.040	2.42 (1.18 – 4.97)	0.016
Change in BMI (6 months)	0-10% change	2145	31	1		1	
	>10% positive change	110	2	1.14 (0.27 – 4.76)	0.861	1.39 (0.32 – 5.99)	0.655
	>10% negative change	44.8	1	1.48 (0.20 – 10.9)	0.699	1.80 (0.24 – 13.5)	0.565
Change in BMI (total time)##	0-10% change	1967	26	1		1	
	>10% positive change	434	2	0.38 (0.09 – 1.62)	0.193	0.40 (0.09 – 1.73)	0.203
	>10% negative change	107	8	6.25 (2.83 – 13.8)	<0.001	7.21 (3.21 – 16.2)	<0.001

Nutrition categories are defined as follows; underweight (BMI < 16 for adults and BMI-for-age Z-scores < -2 for adolescents), mildly underweight (BMI between 16-18.5 for adults and BMI-for-age Z-scores between -2 and -1 for adolescents), normal (BMI between 18.5 and 24.9 for adults and BMI-for-age Z-scores between -1 and 1 for adolescents), and overweight (BMI over 25 for adults and BMI-for-age Z-scores over 1 adolescents).
Abbreviations: BMI: body mass index, HR: hazard ratio, CI: confidence interval, PY: person-years
n[1] Number of TB cases (events); the total number of incident TB cases in the study is 43, though some were not included in analyses involving change in BMI as subsequent weight and height measurements were not always available (e.g. participant diagnosed outside of study)
Adjusted for age at baseline, sex, site, and HIV status
Change in BMI (total time) is calculated by subtracting the baseline BMI from a participant's BMI at their last visit
* p-value calculated with a likelihood ratio test

Table 1.

Three latent groups were defined in the GMM: increasing, decreasing, and stable nutritional status. Age, sex, baseline BMI, and TB-related outcomes were associated with latent class allocation.
Conclusions: Low baseline BMI and decreasing BMI are strong predictors of TB risk among HHCs. Despite BMI being a crude assessment, prone to misclassification due to measurement error, it is easy-to-collect and should be part of routine TB assessments. Low or deteriorating BMI is an opportunity to intervene to reduce TB risk among household contacts.

OA52 Lung health and air quality

OA52-513-16 Effects of meteorological factors, air pollutants and their interactions on the incidence of tuberculosis in urban China: a time series analysis

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Background: The association between tuberculosis (TB) incidence, ambient air pollutants, and meteorological factors remains controversial. Moreover, the joint effects between air pollutants and meteorological factors are also less well-established.
Design/Methods: We performed the distributed lag nonlinear model (DLNM) model to investigate both individual and interactive impacts of air pollutants and meteorological factors on the daily TB case during 2013–2018 in Shanghai, China. Interacting multiplicative terms were employed to examine the association between TB and air pollutants or meteorological factors at different levels of another variable. Stratified analyses were applied to explore vulnerable subpopulations.
Results: Overall, there were four factors related to TB incidence. In the single-factor model, after a 10 μg/m^3 increase, the maximum lag-cumulative relative risks (RR) of particulate matter with an aerodynamic diameter of 2.5 μm or less ($PM_{2.5}$) was 1.039 [95% confidence interval (CI): 1.002-1.079, lag: 0–21 days]. As for sulfur dioxide (SO_2), the RR was 1.063 (95% CI: 1.003-1.127, lag: 0–12 days). Relative humidity was negatively associated with TB, with the minimum lag- cumulative RR of 0.986 (95% CI: 0.973-0.999, lag: 0–1 days). Total precipitation (TP) was positively related to TB with the maximum lag-specific RR of 1.008 (95% CI: 1.001-1.016, lag: 11 days) for a 10 mm increase, but the cumulative risk was not significantly associated. All associations mentioned above, except RH and TP, remained significant in multi-pollutant models. The associations tended to be stronger in females and aged 15-65 years-old population and differed with seasons. $PM_{2.5}$, RH, and TP significantly interacted with various meteorological and air pollution factors impacting TB incidence.
Conclusions: $PM_{2.5}$, SO_2, and TP were positively associated with TB incidence, while RH was negatively correlated. Air pollutants and meteorological factors have a significant effect on TB incidence. These findings are essential for the development of TB prediction and prevention strategies.

OA52-514-16 Long-term effects of coarse particulate matter and modifications by temperature and relative humidity on all-cause mortality in a multidrug-resistant tuberculosis cohort

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Background: The association between ambient coarse particulate matter ($PM_{2.5-10}$) and mortality in multi-drug resistant tuberculosis (MDR-TB) patients has not yet been studied. The modifying effects of temperature and humidity on this association are completely unknown.
This study evaluated the effects of long-term $PM_{2.5-10}$ exposures, and their modifications by temperature and humidity on mortality among MDR-TB patients.
Design/Methods: A Chinese cohort of 3,469 MDR-TB patients was followed up from diagnosis until death, loss to follow-up, or the study's end, averaging 2,567 days per patient. $PM_{2.5-10}$ concentrations were derived from the difference between PM_{10} and $PM_{2.5}$.
Cox proportional hazard models estimated hazard ratios (HRs) per 3.74 ug/m^3 (interquartile range, IQR) exposure to $PM_{2.5-10}$ and all-cause mortality for the full cohort and individuals at distinct long-term and short-term temperature and humidity levels, adjusting for other air pollutants and potential covariates. Exposure-response relationships were quantified using smoothed splines.
Results: Hazard ratios of 1.733 (95% CI, 1.407, 2.135) and 1.427 (1.114, 1.827) were observed for mortality in association with $PM_{2.5-10}$exposures for the full cohort under long-term and short-term exposures to temperature and humidity. Modifying effects by temperature and humidity were heterogenous across sexes, age, treatment history, and environment.
Nonlinear exposure-response curves suggested a cumulative risk of $PM_{2.5-10}$-related mortality starting from a low exposure concentration around 15 ug/m^3.
Conclusions: Long-term exposure to $PM_{2.5-10}$ poses significant harm among MDR-TB patients, with effects modified by temperature and humidity. Immediate surveillance of $PM_{2.5-10}$ is crucial to mitigate the progression of MDR-TB severity due to co-exposures.

OA52-515-16 Ambient particulate matter and latent tuberculosis infection: a time-series study among 198,275 students

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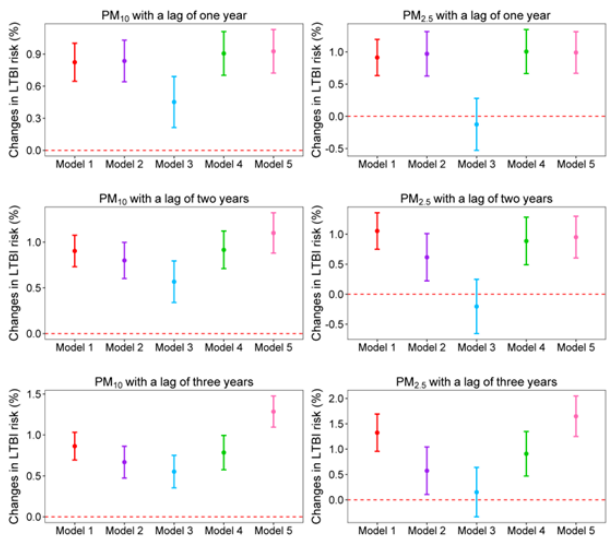
Background: Numerous studies have estimated the impact of outdoor particulate matter (PM) on tuberculosis risk. Nevertheless, the association between ambient PM and latent tuberculosis infection (LTBI) risk remains uncertain.

Design/Methods: We collected the basic information and LTBI test results of students who underwent the freshmen enrolment physical examination in 68 middle schools from six prefecture-level cities located in eastern China between 2018 and 2021. Data on air pollutant concentrations and meteorological factors in six cities between 2015 and 2021 were also extracted. We applied the generalized additive model (GAM) to assess the effect of PM on LTBI risk.

Results: A total of 198,275 students were included in the final analysis. Among them, 11,721 students were diagnosed with LTBI. The LTBI group exhibited higher proportions of males, individuals of Han nationality, and higher body mass index compared to the non-LTBI group (all P <0.001).

For one-unit increase in PM_{10} with a lag of one year, two years, and three years, the LTBI risk increased by 0.82% [95% confidence interval (CI): 0.65, 1.00], 0.90% (95% CI: 0.73, 1.08), and 0.86% (95% CI: 0.69, 1.03), respectively; while for $PM_{2.5}$, the LTBI risk increased by 0.91% (95% CI: 0.63, 1.20), 1.05% (95% CI: 0.75, 1.36), and 1.32% (95% CI: 0.96, 1.69), respectively.



Conclusions: Outdoor PM concentration was positively correlated with LTBI risk. Considering many developing countries confront the dual challenges of high LTBI rates and serious ambient air pollution, reducing outdoor PM concentration would contribute to alleviating tuberculosis burden in these countries.

OA52-516-16 Non sporulating molds: lesser known evil in respiratory mycosis

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Background: Nonsporulating molds (NSMs) are emerging fungal pathogens with a propensity for causing invasive fungal infections(IFI).

Rising use of anti-Aspergillus prophylaxis along with increase in immunosuppressed patients, has partly driven the emergence of non-Aspergillus mould infections. Amongst these NSMs are not as widely studied and are associated with high mortality. This is due to lack of awareness, delayed diagnosis and misidentification.The objective of this study was to identify the frequency of NSMs in patients with respiratory infections, predominantly Post TB Sequelae and study their antifungal susceptibility patter[AFST].

Design/Methods: For the period 2021-2023, 75 hyaline NSMs isolated from respiratory samples were identified by phenotypic methods, specialized biochemical tests .Pure white, sterile moulds showing substantial growth on Saboraud dextrose agar tube at 37C but susceptible to cycloheximide, were considered. species level identification was done by demonstration of clamp connection and basidiocarp and biochemical tests. Phenotypically identified NSMs were confirmed by sequencing internal transcribed spacer (ITS) region and D1/D2 domain of the larger subunit (LSU) . The MIC to anti-fungals done by CLSI (Clinical and Laboratory Standards Institute) micro-broth dilution technique for Filamentous Fungi.

Results: Basidiomycetes were the predominant NSMs, of which *Schizophyllum commune* was the most common agent in Post TB sequel and allergic bronchopulmonary mycosis (ABPM), followed by *Ceriporia lacerata* in invasive fungal disease. *Aspergillus terreus* ,*Aspergillus fumigatus* ,*Microascus gracilis* were the other molds observed. The AFST data revealed that all basidiomycetes tested were susceptible to Amphotericin B and resistant to Caspofungin, Fluconazole, and Voriconazole. All basidiomycetes had low MICs for itraconazole, fluconazole, and voriconazole. Basidiomycetes were isolated from patients with ABPM, invasive pulmonary mycosis, Post Tb sequelae.

Conclusions: NSMs are frequently ignored and are poorly understood as species level identification by phenotypic methods is challenging due to lack of sporulation and needs molecular confirmation. Their Identification can affect treatment and prognosis as they are treatable.

OA52-517-16 Accuracy of the novel Phefumla mobile phone reflectance pulse oximeter during hypoxemia in healthy adults

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Background: In low- and middle-income countries (LMICs) the burden of low blood oxygen levels (hypoxemia) among children is high but access to accurate, quality pediatric pulse oximeters is limited. The Phefumla mobile phone reflectance pulse oximeter was co-designed with LMIC end-users to address this gap. In this study we evaluated whether Phefumla meets the current (2017) International Organization for Standardization accuracy criteria required for clinical use.

Design/Methods: The accuracy of Phefumla was evaluated at a research laboratory in the United States among 10 healthy, non-smoking 18–40-year-olds who provided written consent and had hemoglobin levels >10g/dL. After indwelling radial artery cannula placement laboratory staff followed a controlled desaturation protocol achieving 7 arterial oxyhemoglobin saturation (SaO_2) plateaus between 70%-100% measured by a Hemoximeter. The Phefumla device was placed on the subject's forehead and the peripheral arterial oxyhemoglobin saturation (SpO_2) was recorded at pre-specified SaO_2 plateaus. Laboratory staff visually assessed participants with the Monk Skin Tone Scale. SpO_2 and SaO_2 were compared to calculate mean bias (SpO_2-SaO_2), precision (bias standard deviation (SD)), and performance (root mean square error (A_{RMS})). Random effects linear regression evaluated the relationship of bias to SaO_2 (Figure).

Results: Participants were 60% (n=6) female, an average of 26.8 years (SD 4.3), and 30% (n=3) had dark pigmentation (Monk-HIJ). Phefumla measurements correlating with 229 blood samples were analyzed. The mean bias of Phefumla measurements was 0.1%, precision 2.2%, and A_{RMS} 2.2%. Phefumla bias versus the gold standard SaO_2 is plotted (see Figure). Phefumla A_{RMS} did not differ by SaO_2 or sex.

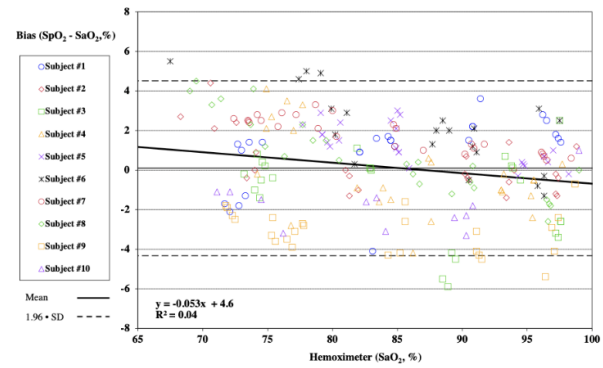

Figure. Phefumla bias versus gold standard arterial oxyhemoglobin saturation measurements.

Conclusions: The Phefumla mobile phone reflectance pulse oximeter meets current regulatory accuracy requirements for clinical use. Evaluating Phefumla accuracy in a larger and more diverse cohort in anticipation of more equitable regulatory guidance updates as well as usability and accuracy in children in LMICs are key next steps.

OA52-518-16 Implications of alternative reference equations on interpretation of spirometry among members of TB-affected households in three African countries

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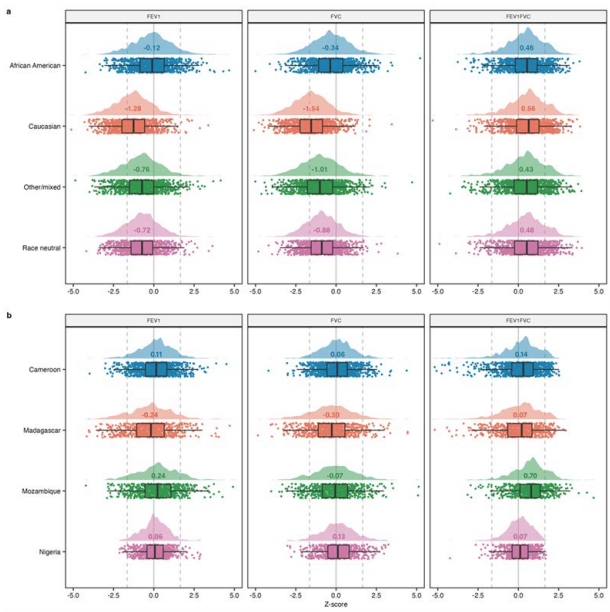
Background: The Global Lung Initiative (GLI) and American Thoracic Society have recently endorsed a race-composite reference standard ("GLI Global") for spirometry interpretation. The underlying dataset does not include individuals from East/southern Africa and GLI Global has not been evaluated in the region. We evaluated the fit and diagnostic implications of different reference standards among healthy people in three east/ southern African countries.

Design/Methods: We performed post-bronchodilator spirometry on participants aged ≥10 years from TB affected households in Mozambique, Tanzania and Zimbabwe.

Among healthy participants, we measured forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and derived FEV1/FVC z-scores using reference equations produced by GLI, or others derived from African populations (identified by scoping review), and the proportion of people with impaired spirometry by different standards. Healthy was defined as: non or minimal smoking; no previous lung disease and normal body mass index.

Results: From March 2021 to March 2024, 1004 healthy participants had good-quality spirometry. Median age was 22 years (IQR 15-34 years), 61% were female, and 12% were living with HIV (80% on ART). Across different GLI reference standards 'African American' fitted best (mean FEV1 Z-score -0.11 [standard deviations [SD] 1.22], mean FVC Z-score -0.33 [SD 1.15] figure 1). Compared to 'African American', GLI Global resulted in almost twice as many people having preserved-ratio impaired spirometry (PRISm, 11% vs 21%) but a similar proportion having obstruction (4.0% vs 4.7%). Other African-derived reference standards conferred similar fit compared to GLI 'African American' with reference standards from Cameroon fitting best (mean FEV1 Z-score 0.15 [SD 1.20] / FVC 0.13 [SD 0.97]). Mean Z-scores varied across study sites.



Conclusions: Choice of reference standard has clinical and public health implications that need careful consideration, particularly in resource-constrained environments. Further work is needed to ensure that GLI Global is indeed globally-representative.

OA52-519-16 Results from a feasibility pilot for integrated TB & lung cancer screening in Vietnam

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Background and challenges to implementation: An integrated TB and lung cancer screening model was piloted in Vietnam, using artificial intelligence (AI) software to identify potentially malignant nodules on chest X-ray (CXR) when people were initially being screened for TB, in order to indicate further lung cancer screening using a computed tomography (CT) scan.

Intervention or response: From October 2022 to March 2024, CXR images were collected from community-based TB screening events in Ho Chi Minh City (HCMC) and Hai Phong, as well as from individuals undergoing clinical consultation at the Pham Ngoc Thach Hospital in HCMC and the Hai Phong Lung Hospital. CXR images were processed using qXR AI software (Qure.ai, India) to identify those eligible for a CT referral. An on-site radiologist reviewed CT scans, confirmed the presence of malignant nodules and indicated follow-on testing in line with Vietnam social health insurance policy. Follow-on testing, lung cancer diagnosis and treatment data for people with malignant nodules were exported from each hospitals medical record system.

Results/Impact: 136,629 people were screened by CXR, resulting in the detection of 2,366 (1.7%) potentially malignant nodules by the AI software. 745 (35.1%) of these individuals were diagnosed with TB or already had a lung cancer diagnosis, leaving 1,376 (64.9%) eligible for a CT referral. A total of 518 (21.9%) participants got a CT scan, and 324 (62.5%) had radiologist-identified malignant nodules. Follow-up tests were completed for 259 (79.9%) participants, resulting the diagnosis of 122 (47.1%) and treatment of 79 (64.8%) for lung cancer.

	Total	Community	Hospital
Participants screened by CXR	136,629	47,577	89,052
AI-detected nodules on CXR	2,366 (1.7%)	245 (0.5%)	2,121 (2.4%)
Eligible for CT referral	1,597 (67.5%)	221 (90.2%)	1,376 (64.9%)
CT scan peformed	518 (32.4%)	113 (51.1%)	405 (29.4%) *
Radiologist-identified malignant nodule on CT	324 (62.5%)	28 (24.8%)	296 (73.1%)
Follow-on tests conducted (e.g. bioposy)	259 (79.9%)	15 (53.6%)	244 (82.4%)
Diangosed with lung cancer	122 (47.1%)	3 (20.0%)	119 (48.8%)
Started on a lung cancer treatment	79 (64.8%)	1 (33.3%)	78 (65.5%)

*CT scan referrals were stopped in the pilot during the week when 500 CT scans were achieved due to funding constraints.

Conclusions: AI-assisted CT scan referrals for lung cancer screening were feasible to implement within community- and facility-based TB screening programs. However, community screening suffered from lower yields and more loss in the referral and post-CT scan cascade.
Future studies may evaluate the added value of the AI software to detect potentially malignant nodules and early lung cancer detection.

OA52-520-16 Respiratory symptoms after TB treatment: a qualitative study of survivor and provider experiences in Malawi

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Background: Pulmonary TB survivors experience a high burden of residual and recurrent respiratory symptoms after TB treatment completion in relation to post-TB lung disease, broader cardio-respiratory disease, or recurrent TB disease. However, guidelines for the investigation and management of symptomatic TB survivors are limited. Qualitative TB research has mostly focused on health seeking and care during TB disease and treatment. Little is known about how TB survivors and providers understand or approach residual or recurrent symptoms.
We explored survivor and provider experiences around these symptoms after TB treatment.
Design/Methods: Using qualitative methods, we conducted in-depth interviews with 23 TB survivors with respiratory symptoms (cough, chest pain, breathlessness) after successful TB treatment completion, and 2 focus group discussions and 18 in-depth interviews with healthcare providers and programme officers in urban Malawi. Thematic analysis identified common themes.
Results: People with residual or recurrent symptoms after TB treatment completion described anxiety about the cause of ongoing symptoms, uncertainty about a return to care, and fear of recurrent TB disease.
Our data suggest four critical time points or practices which shape this experience including: the limited counselling provided during and at the end of TB treatment completion; the lack of clear pathways and support for a return to care; the TB-focused nature of investigations when people do return to care; and the heterogeneous and opaque approaches to decision making around TB retreatment.
Conclusions: The period beyond treatment completion is a critical part of a person's experience of TB. Existing practices lead to negative survivor experiences, and carry (public) health risks including delayed diagnosis of TB relapse, missed diagnosis of cardio-respiratory disease, and misuse of antimicrobials and TB retreatment. There is a clear need for formative guidelines to improve the care of symptomatic TB survivors, and for further qualitative research to inform these.

OA53 Mycobacteria detection and control under the one health approach

OA53-521-16 Prevalence, distribution, and risk factors of mycobacterium other than tuberculosis among tuberculosis presumptive patients in Karonga district in Malawi

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Background: Besides Tuberculosis (TB), there are also other mycobacterium other than tuberculosis (MOTT) with the same clinical signs and symptoms as tuberculosis. If not promptly found and treated, these organisms may affect the TB program control and elimination campaign.
The study sought to establish the prevalence, distribution, and factors contributing to MOTT infections among presumptive TB patients in Karonga District.
Design/Methods: A descriptive cross-sectional study research design was employed. A total of 196 participants were included in the study using a census approach. Data was collected through the administration of a questionnaire by the health care worker, and a sputum specimen was collected from the participants; this specimen was used to examine the presence of mycobacterium via microscopy, a molecular method using GeneXpert platform in Karonga.
Regardless of the results at the district-level laboratory, all the specimens were then sent to the Mzuzu TB culture laboratory to isolate mycobacterium tuberculosis and MOTT.
Results: From the 196 samples collected, 14(7.1%) were positive at the district-level, amongst the 14, 12(86%) were AFB positive on microscopy, and 12(86%) were detected on the GeneXpert platform. Amongst the positive results, 3(21%) disagreed with both tests.

When sent for culture, 195 (99.5%) had culture results, and 23(12%) had growth in culture. Out of the 23 (100%) culture-positive results, 12 (52%) were MOTT-positive while 11(48%) were MTB complex. There were more men, 7 (58%) with MOTT-positive than women, 5 (42%), and more in the age group of 15-39 years old, with 6 (50%) and less in more than 60 years old, 2 (16.7%).
Conclusions: The results show the presence of MOTT infections among presumptive TB patients who submitted samples in the study. The distribution by sex shows that more men had MOTT infection compared to women. However, all the risk factors listed for the study had no significance to MOTT infections.

OA53-522-16 A mathematical model at the wildlife-livestock-human interface to predict the implications of animal and zoonotic tuberculosis control measures

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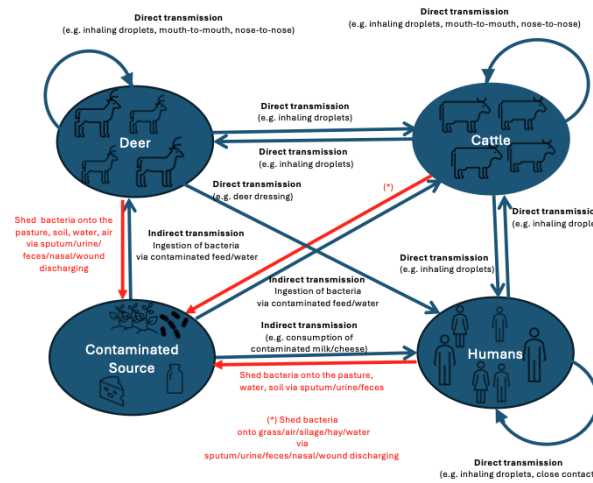
Background: The complex and dynamic interactions among wildlife, livestock, and humans create environments conducive to the emergence of new diseases or the reemergence of existing ones. Such outbreaks pose a significant threat to multiple host species. In particular, the presence of *Mycobacterium bovis* (the main cause of animal tuberculosis) in a wildlife reservoir compromises disease control efforts in the livestock sector and increases the risk of zoonotic infection in humans involved in livestock (e.g. animal handling and/or ingesting contaminated milk) and/or wildlife activities (e.g., hunting), leading to possible human-to-human transmission.
Design/Methods: To understand the transmission dynamics of *M. bovis* among wildlife, livestock, and human populations, we propose a multi-host compartmental mathematical model that incorporates transmission between the three host types, as well as transmission through contaminated environments, to investigate the impact of mitigation strategies on the dynamics of tuberculosis in the three populations. The novelty of our model lies in its integration of multiple host species (three distinct populations) with vaccination strategies and an external, heterogeneous environmental transmission source. Model parameters and disease prevalence for the three populations are a compilation of estimates from studies performed in different world regions.
Results: From the sensitivity and scenario analysis, we identified the key drivers of disease endemicity and observed that increasing the efficacy of vaccination and culling strategies in wildlife, as well as enhancing surveillance and vaccination efficacy in livestock, reduces the transmission of *M. bovis* among wildlife, livestock, and human populations.



Conclusions: Due to the chronic nature of animal and zoonotic tuberculosis, introducing vaccination efficacy and increasing surveillance strategies in both wildlife and livestock are important to reduce the overall disease burden at the wildlife-livestock-human interface.

OA53-523-16 Are *Mycobacterium avium* complex in lung diseases from the environment?

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Background: Nontuberculous mycobacteria infections (NTM) are on the rise globally, resulting in poor outcomes despite long drug regimens. The state of Virginia in the United States has a relatively high burden of NTM disease with an estimated annual prevalence of 2.37 cases of *Mycobacterium avium* complex (MAC)/*Mycobacterium abscessus lung disease* per 100,000 population.
Design/Methods: This study recruited participants from a state-wide clinical cohort of patients with *positive MAC cultures from respiratory specimens,* to understand the features such as species and subtype of the organism in the host and the environment. Host demographics and clinical characteristics were collected, along with their sputum culture isolates. Patients enrolled also collected water and soil samples from their homes. Whole genome sequencing (WGS) was performed on clinical isolates and household samples.
Results: A total of 100 patients are enrolled in the study (enrollment ongoing). 173 sputum culture isolates from 65 patients versus 191 environmental isolates from 30 patients have been analyzed so far. *Mycobacterium intracel-*

lulare emerged as the predominant (52%) species in the patient isolates whereas, *Mycobacterium chimaera* was the most commonly (31%) observed species in household sources. At the *Mycobacterium* species level, 43% of cases exhibited discordance between the host and the environment (i.e., of 100 patients, 13 of 30 had a household environmental MAC isolate which was a different species) with only 30% of the host isolates showing concordance with the environmental organism (i.e., of 100 patients, 9 of 30 had a household environmental MAC isolate which was the same species). WGS of patient and household isolates is ongoing to determine whether concordant species are the same strain.

Conclusions: These findings underscore a disconnection between patient and household samples, displaying discordant speciation through WGS. Understanding the potential infection sources of NTM infections is crucial for effective surveillance, prevention, and management strategies.

OA53-524-16 Universal Identification of mycobacterial pathogens at subspecies resolution by the PEP-TORCH algorithm

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Background: Mycobacterial infections represent a significant and escalating public health issue, both in the United States and globally. Additionally, infections from non-tuberculous mycobacteria (NTM), including prevalent clinical strains such as *M. avium*, *M. intracellulare*, *M. kansasii*, and *M. abscessus,* manifest symptoms resembling those of tuberculosis. However, they necessitate different treatment approaches.

Therefore, precise identification at the species or subspecies level is vital for effective treatment and management of these infections.

Design/Methods: To overcome the delays in mycobacteria diagnosis due to lengthy sub-culture methods, we've developed a method for preparing culture filtrate protein (CFP) samples from mycobacterial growth indicator tube (MGIT) growth cultures for LC-MS/MS analysis.

Additionally, we introduced an automated Peptide Taxonomy/Organism Checking (PEP-TORCH) pipeline to detect species/subspecies-specific mycobacterial peptide markers. The weighted scoring system of our PEP-TORCH enables the identification and quantification of co-infection cases.

Results: Our study employed MGIT culture filtrates from a total of 73 mycobacterial suspects. PEP-TORCH enables the identification of mycobacterial species, subspecies, and co-infections through a single streamlined process and could potentially eliminate the need of sub-culture methods currently used for clinical mycobacterial diagnosis. Our pipeline yielded 100% accuracy at species and subspecies level and further clinical and mixed cultures containing multiple mycobacterial species. Additionally, we developed a targeted proteomics method and validated taxa-specific peptides selected by PEP-TORCH, in a total of 43 samples to be readily used as biomarkers in clinical set-up.

ID reference	Species IDs			Sub-species IDs		
	MALDI (Sequencing)*	PEP-TORCH	Agreement	WGS	PEP-TORCH	Agreement
***M. tuberculosis* Complex**						
M. tuberculosis	24/26 (2/26) *	26/26	100%			
M. bovis				2/2	2/2	100%
M. bovis BCG				1/1	1/1	100%
M. africanum				2/2	2/2	100%
NTM						
M. abscessus	20/20	20/20	100%			
M. abscessus subsp. *abscessus*				7/7	7/7	100%
M. abscessus subsp. *massiliense*				5/5	5/5	100%
M. kansasii	1/7 (6/7) *	7/7	100%			
M. avium	4/4	4/4	100%			
M. intracellulare/Chimaera	4/4	4/4	100%			
Co-infection	1/1	1/1	100%			
Total	**62/62**	**62/62**	**100%**	**17/17**	**17/17**	**100%**

*Table. Comparison of PEP-TORCH results with reference identification. *Sequencing is performed either by polymerase chain reaction or whole genome sequencing.*

Conclusions: Our method offers the potential to decrease patient morbidity by quickly and accurately identifying mycobacteria in MGIT cultures at both species and subspecies levels, as well as co-infections, simultaneously, unlike current methods that do so sequentially.

OA53-525-16 Long-term outcomes of people with baseline NTM isolation and drug-resistant tuberculosis from 2015 to 2021 in Ghana, a retrospective observational study

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Background: Nontuberculous mycobacterial pulmonary disease (NTM-PD) is increasingly recognized in sub-Saharan African countries, with rising NTM isolation in sputum samples of people with presumed tuberculosis(TB). Despite limited documentation on TB/NTM coinfection and lack of guidelines, documenting TB outcomes in clinical settings is crucial.

Our study aims to detail clinical characteristics, common NTM isolated, and TB management outcomes in persons with TB/NTM coinfection.

Design/Methods: We retrospectively analysed patient records from twelve of sixteen regions in Ghana. Sputum samples underwent sputum smear microscopy culture using mycobacterial growth indicator tube(MGIT) and drug susceptibility testing. Positive NTM cultures were subtyped using GenoType CM/AS and Sanger sequencing using 16sRNA and rpoB probes. Medical records of persons with baseline NTM were further assessed for their clinical characteristics and DRTB outcomes.

Results: Over seven years, 908 patients provided 2133 samples. 756(35%) were for diagnosis, 1377(65%) for follow-up. Among 41 patients with NTM (53 species), 14 had NTM at diagnosis. All 14 had TB/NTM coinfection with Xpert/MTB results: MTB Detected and Rifampicin Resistant Detected. Of the 14, 12(85%) were male, 9(64%) had Previous TB and 2(14%) were HIV-positive. 10(71%) had *Mycobacterium intracellulare*, 3(21%) *M. fortuitum* and 1(7%) *M. abscessus complex.* Medical records of 11 of the 14 clients were retrieved. All patients were initiated on a DRTB regimen approved nationally at the time of diagnosis. Of these, 7(64%) had favourable DRTB treatment outcome. During the two-year follow-up period, five could not be traced, one had died, and one remained alive but experienced residual breathlessness.

Sociodemographic	Year diagnosed	Previous TB treatment	HIV Status	Baseline NTM	SSM	Other isolation of NTM	Treatment given	Treatment outcome
45, M, Security personnel	2015	No	Negative	*M. intracellulare*	Scanty	*M. intracellulare at month 4*	Cm, Lfx, Cfz, E, Z, hH	Cured
42, M, Farmer	2016	2HRZE/4HR	Negative	*M. fortuitium*	Negative	None	Cm, Lfx, E, Z, Cfz	Treatment completed
54, M, Farmer	2016	2HRZE/4HR	Unknown	*M. intracellulare*	+++	None	Cm, Lfx, E, Z, Cfz, Pto	Lost to follow up
53, M, Unemployed	2017	2HRZE/4HR	Negative	*M. intracellulare*	Scanty	None	Cm, Lfx, E, Z, Cfz, Pto, hH	Lost to follow up
61, F, Trader	2017	2HRZE/4HR	Positive	*M. fortuitium*	Negative	*M. fortuitium* Month 11	Cm, Lfx, E, Z, Cfz, Pto. hH	Treatment completed
58, M, Farmer	2017	2HRZE/4HR	Unknown	*M. intracellulare*	Negative	*M. intracellulare at month 3*	Cm, Lfx, E, Z, Cs, Pto, hH	LTFU
54, M, watchman	2019	2HRZE/4HR	Negative	*M. abscessus complex*	Negative	None	Lfx, Lzd, Cfz, E, Z, Pto, hH	Death
44, M, security	2020	2HRZE/4HR	Positive	*M. fortuitium*	++	*M. intracellulare at month 8*	Bdq, Lfx, Lzd, Cfz, E, hH, Z	Cured
25, M, student	2021	No	Negative	*M. intracellulare*	Negative	None	Bdq, Lfx, Lzd, Cfz, E, hH, Z	Cured
54, M, farmer	2021	2HRZE/4HR	Negative	*M. intracellulare*	Negative	None	Bdq, Lfx, Lzd, Cfz, E, hH, Z	Cured
37, M, Miner	2021	2HRZE/4HR	Negative	*M. intracellulare*	Negative	*M. intracellulare at month 3*	Bdq, Lfx, Lzd, Cfz, E, hH, Z	Cured

Table 1. Clinical characteristics and treatment outcomes of persons with DRTB/NTM coinfection.

Conclusions: We present the first DRTB/NTM coinfection data in Ghana and SSA, combining Xpert and culture data. Favourable DRTB outcome was noted, even for those with multiple isolates of the same NTM species. However, it is not possible to determine the clinical relevance of repetitive NTM species, requiring further investigation of persons with post-TB and persistent clinical symptoms.

OA53-526-16 Isolation and characterization of a mycobacteriophage KIT-AB2023/2766-16 infecting *Mycobacterium* species

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Background: Interest in bacteriophage therapy is increasing due to concerns about the rise of drug-resistant pathogens. Despite global research efforts on bacteriophages, progress in the study of mycobacteriophages, which are viruses that infect *Mycobacterium* species, in South Korea has been stagnant.

Design/Methods: This study introduces a novel mycobacteriophage, KIT-AB2023/2766-16, isolated from a sewage treatment plant, which infects *Mycobacterium abscessus*. The phage's morphology was assessed using transmission electron microscopy, and its genome was sequenced via next-generation sequencing. Thermal stability tests were conducted within the 40–70 ℃ range, and its host range was evaluated using a spot test.

Results: KIT-AB2023/2766-16 belongs to the *Siphoviridae* family, featuring a genome of 47,784 bp and a GC content of 58.73%. It demonstrated high thermal stability, enduring temperatures of up to 70 ℃.

This phage exhibited specific lytic activity against *Mycobacterium* species, including laboratory strains of *Mycobacterium smegmatis*, *Mycobacterium kansasii*, *Mycobacterium avium* complex, *Mycobacterium bovis* BCG, *Mycobacterium tuberculosis* H37Ra/Rv, and a clinical isolate of *Mycobacterium abscessus*.

However, it showed no activity against various gram-negative and gram-positive bacteria, such as *Escherichia coli*, *Salmonella enterica*, *Bacillus* species, and *Staphylococcus* species.

Conclusions: In conclusion, KIT-AB2023/2766-16 shows promise for phage therapy against *Mycobacterium* species, warranting further research into its therapeutic potential.

OA54 Finding unanswered questions and unquestioned answers: The role of epidemiology

OA54-527-16 Environmental factors associated with tuberculosis incidence and mortality: a systematic review and meta-analysis

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Background: Globally, tuberculosis (TB) is the leading infectious cause of morbidity and mortality, with the risk of infection affected by both individual and ecological-level factors. While systematic reviews on individual-level factors exist, there is limited evidence on ecological-level factors associated with TB incidence and mortality.
Design/Methods: A systematic search for analytical studies reporting ecological factors associated with TB incidence or mortality was conducted using four databases from the inception to October 2023. A narrative synthesis of evidence and meta-analysis, when applicable, was conducted to estimate the effects of each factor on TB incidence rates.
Results: A total of 52 studies were included in this study. Existing studies reported that TB incidence was positively associated with temperature (n=10), humidity (n=9), precipitation (n=4), rainfall (n=4), sulfur dioxide (SO2) (n=6), particulate matter (n=6) nitrogen dioxide (n=6), population density (n=8), poverty (n=4), immigrant population (n=3), urban population (n= 3), male population (n=2). By contrast, wind speed (n=5), air pressure (n=3), sunshine duration (n=3), and gross domestic product (GDP) (n=3), had a negative association. Particulate matter (n=1), social deprivation (n=1), ethnicity (n=1), and population density (n=1) were positively associated with TB mortality, whereas household income (n=2) was negatively associated. Our meta-analysis showed that relative humidity (%) (RR=1.45, 95%CI:1.12, 1.77), rainfall (mm) (RR=1.56, 95%CI:1.11, 2.02), population density (people/km^2) (RR=1.01, 95%CI:1.01, 1.02), SO2 (µgm–3) (RR=1.04, 95% CI:1.01, 1.08) and particulate matter (PM2.5) (RR =1.33, 95% CI: 1.18, 1.49) were associated with increased risk of TB incidence.
Conclusions: The results of our narrative synthesis and meta-analysis highlighted the importance of considering climatic and environmental factors in the current TB control programs. Existing evidence suggests the need for evidence-based policy to mitigate the impacts of climatic and air quality-related factors on TB, particularly in high TB burden countries.

OA54-528-16 An evaluation of a tuberculosis case finding and treatment outcomes among Afghan migrants living in the refugee's camps of Pakistan

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Background: Since 1979, Pakistan is hosting one of the largest populations of Afghan refugees globally. 3.7 million Afghans are living in Pakistan, of these, 2.2 million refugees are registered and are settled throughout Pakistan, leading to the establishment of refugee camps. It is assumed that the burden of Tuberculosis (TB) is high among migrants residing in refugee camps compared to the local population with more missing cases.
Design/Methods: This study evaluates the case finding intervention implemented by NTP Pakistan during 2019-23 with focuses on Active case-finding (ACF) and treatment outcomes. ACF being implemented in 45 refugee camps in Khyber Pakhtunkhwa and Baluchistan Provinces, Pakistan, by trained Field staff, conducting symptom screenings at the facility level and contact tracing of pulmonary-positive TB patients. Presumptive TB cases identified were referred to the nearest TB health facility for diagnosis, and confirmed cases were registered for treatment with regular follow-up.
Results: A total of 402,999 individuals were screened for TB, with 41,640 (10%) identified as presumptive, of which 3,662 (9%) were confirmed cases. Of confirmed TB cases, 51% were female, 68% pulmonary and among pulmonary, 65% were bacteriologically confirmed cases. The proportion with unfavorable treatment outcomes was lower in patients identified from refugee camps through ACF (3.9%) when compared to routine cases (6%) of local population ($P < 0.05$).
Among bacteriologically confirmed TB cases, there was a higher contribution of cure to treatment success in the ACF group (86.5%) when compared to routine cases (69%).
Conclusions: The active case finding strategy at community-level TB screening, 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.
Furthermore, the treatment outcomes among cases detected in the project were better to those for patients detected by routine TB program.

OA54-529-16 Effect of population aging on pulmonary tuberculosis burden in Zhejiang Province, China: a population-based study

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Background: China's aging population poses a growing challenge to disease burden. This study evaluated the impact of aging on pulmonary tuberculosis (PTB) in Zhejiang Province, China.
Design/Methods: Longitudinal analysis of notified pulmonary tuberculosis incidence data from 2005 to 2022 using the National Notifiable Diseases Reporting System. Descriptive analyses of pulmonary tuberculosis incidence were conducted for the overall population and different age groups. Population Attribution Fraction was estimated for people aged 60 years and above. Exponential regression models were used to project pulmonary tuberculosis incidence from 2023 to 2035. And evaluating the decline in new cases attributed to demographic and epidemiological changes.
Results: Between 2005 and 2022, the notified incidence of PTB in the Zhejiang Province declined from 93.5 per 100,000 to 33.99 per 100,000. The highest notified incidence was observed in those aged 60 years and older, with population attributable fraction increasing from 18.76% to 27.92%. During this period, PTB cases decreased by 51.22% compared to 2005, driven by a 23.83% increase due to population growth, a 10.26% increase due to age structure, and an 85.31% decrease due to age-specific incidence. The contribution of age structure to the decrease in the number of cases was -1.92%, -1.69%, 3.28%, and 10.60% in the age groups 0-19, 20-39, 40-59, and ≥60 years, respectively.
Conclusions: Notified incidence of PTB in Zhejiang Province is expected to decrease. However, this decrease may be affected by demographic changes, particularly in the older adults.
Thus, strengthening public health measures and policies is crucial to achieving the End TB Strategy goal by 2035, emphasizing the need to enhance PTB screening in older adults.

OA54-530-16 Recurrent TB in India: evidence from the country's NTP

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Background: The global focus on sustained treatment success has spotlighted the problem of recurrent TB and the importance of post-TB follow-up. It was sought to describe the burden of recurrent TB in India using the data in web-based patient management system (Ni-kshay) of the national TB programme of India.
Design/Methods: Secondary analysis of programmatic data of new TB patients who were diagnosed in the year 2021 and completed treatment successfully in 2021 itself was done, after removing all personal identifiers to maintain confidentiality.
Descriptive analysis was followed by identification of the patient characteristics (or factors) associated with recurrence through initial exploratory data analysis and subsequent use of statistical tests such as Pearson's chi-square and ANOVA.
Statistically significant factors were selected for multiple logistic regression. The management and analysis of data were done on Python 3 and Microsoft Excel 365.
Results: Out of the 480352 new TB patients who were diagnosed in 2021 and completed treatment successfully in 2021 itself, 39288 reported at least one recurrence of TB till the end of 2023. The statistically significant factors found to be associated with risk of recurrence were male gender, pulmonary site of disease in the first instance of TB, use of tobacco, drug-resistance in the first instance, age group of 25-54 years, and cured outcome in the first instance (as opposed to treatment complete).
Among the 39288 patients who reported a recurrence, 47% occurred within the first 6 months and 74% occurred within the first year. The mean duration from outcome in the first instance till recurrence was 254 days while the median duration was 194 days.
Conclusions: The findings of the analysis provide evidence from within the programme for finetuning the implementation of post-TB treatment follow-up. It may be needed to focus on those at higher risk of recurrence at opportune timepoints.

OA54-531-16 Rate of isoniazid-monoresistant tuberculosis among person with rifampin-susceptible tuberculosis by GeneXpert MTB/RIF during active case finding in North Lima, Peru

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Background: GeneXpert MTB/Rif or GeneXpert MTB/Rif Ultra has been implemented and expanded in many countries, displacing the use of other drug susceptibiliy testing (DST), which may cause people affected by isoniazid monoresistant tuberculosis (Hr-TB) will be misdiagnosed and receive inadequate treatment. Robust surveillance of antimicrobial resistance (AMR) of anti-tuberculosis drugs is crucial to monitor the trend of resistance development and ensure timely action to improve the action plans against tuberculosis of National Tuberculosis Programs (NTP).
Design/Methods: We analyzed a secondary database containing the results of DST results from active case finding (ACF) interventions carried out by the Socios En Salud (SES) on poverty areas at north of Lima, Peru, between 2019 to 2023. Sputum samples were processed by GeneXpert MTB/Rif or GeneXpert MTB/Rif Ultra were processed according to the diagnostic algorithm for diagnosis of TB and RR/MDR TB endorsed by WHO.
The algorithm considered testing for all patients with GeneXpert positive result by DST on BD BACTEC™ MGIT™ (Mycobacterial Growth Indicator Tube) 960 system for first-line drugs resistance. All people with TB were referred to TB program at the public health facilities.
Results: Of the 968 GeneXpert positive, 271 (28%) had indeterminate rifampin resistance (7 by GeneXpert MTB/Rif and 264 by GeneXpert MTB/Rif Ultra). Among 697 samples that had an interpretable rifampin DST result by GeneXpert, 83 (11.9%) were rifampin resistant (RR) and 614 were rifampin susceptible. Among these 614, 419 (68.2%) had a result of DST for isoniazid by MGIT, of which 30 (7.2%) were resistant to isoniazid.
Conclusions: The rate of Hr-TB among people diagnosed by TB reporte by this study has been similar to previous reports. New or other WHO-recommended molecular rapid diagnostic test (mWRDT) that include testing for isoniazid should be considered for using during TB ACF activities in the field or implement continuous surveillance activities in settings as Peru.

OA54-532-16 Mixed infections and heteroresistance of multi-drug resistant Mycobacterium tuberculosis in China

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Background: Mixed infections and heteroresistance complicate tuberculosis control efforts by impacting drug resistance detection and transmission inference. This retrospective observational study aimed to illustrate the characteristics of mixed infections and heteroresistance among MDR/RR-TB patients.
Design/Methods: We collected the first isolate and demographic, clinical, and laboratory information of patients diagnosed with MDR/RR-TB before starting treatment from 2005 to 2018. We used QuantTB and an in-house algorithm to identify the occurrence of mixed infections. Heteroresistance was defined as at least ten reads aligning to a resistant-associated variant (RAV) at ≥1 targeted locus, with the frequency of the RAV ranging from 0.1% to 95%.
Results: Of the 936 participants, 116 (12.4%) had mixed infections, and 156 (16.7%) had heteroresistance. The occurrence rate of heteroresistant drugs was ranked as follows: ethambutol (37.8%, 59/156), fluoroquinolones (33.3%, 52/156), rifampicin (30.8%, 48/156), streptomycin (27.6%, 43/156), pyrazinamide (18.6%, 29/156), and isoniazid (15.4%, 24/156).
The multivariable logistic regression analysis found that elder patients (45-59 years: aOR 1.97, 95% CI 1.11–3.48; ≥ 60 years: aOR 2.11, 95% CI 1.16–3.84), drug-resistant patients (Pre-XDR: aOR 2.26, 95% CI 1.47–3.47; XDR: aOR 3.88, 95% CI 2.00–7.56) and mixed infections (aOR 2.83; 95% CI 1.68-4.77) had a higher risk of being heteroresistance.
Mixed infections patients accounted for a higher proportion of heteroresistance (34.5% versus 14.1%, $P < 0.01$) and had a higher count of drugs (2 (IQR 1-4) versus 1(IQR 1-2), $P < 0.01$) with heteroresistance. The allele frequencies for all SNPs in mixed infections showed clustering based on the its number and proportion, while non-mixed infections had a random distribution. The allele frequencies of heteroresistant RAVs echoed the proportion of mixed infection strains in about 32.5% of patients with mixed infection and heteroresistance.
Conclusions: We observed the mixed infection and heteroresistance among MDR/RR-TB patients in Shanghai. Heteroresistance is associated with mixed infections.

OA54-533-16 The use of suboptimal clinical responses to treatment as an indicator for TB treatment failure

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Background: Culture conversion at 2 months following the initiation of tuberculosis (TB) treatment has traditionally been considered the gold standard for evaluating early treatment response. However, emerging evidence indicates the existence of „differentially detectable" unculturable TB. This entity presents challenges in both clinical assessment and in vitro diagnosis, thereby complicating response evaluation.
Our objective was to identify TB patients exhibiting suboptimal clinical responses to treatment (SCRT) – as distinct from microbiological responses – at the 2-month mark and to evaluate its predictive value for treatment outcomes.
Design/Methods: Between 2020 and 2022, we enrolled 2,000 incident TB patients in Lima, Peru. At enrollment and 2 months after treatment initiation, patients underwent chest radiography, clinical assessment (including the SGRQ Questionnaire and 6-minute walk test), and hematological and immunological testing (including hemoglobin, IL-1 Beta, IL-6, retinol-binding protein, C-reactive protein, and alpha-1-acid glycoprotein).
Using latent class analysis, we derived a dichotomous consensus variable for treatment response at 2 months, those that were assigned to the group with fewer member were considered to have a "SCRT."
We evaluated the association between SCRT and treatment failure. We also compared the diagnostic performance between SCRT and culture conversion in predicting treatment failure.
Results: Among 1,389 patients with complete data, 360 (26.0%) had a SCRT at 2 months, and 34 patients (2.4%) experienced treatment failure. Patients with a SCRT had a 13.3-fold increased risk (95%CIs=5.6-32.0) of treatment failure compared to those with an optimal treatment response.
Patients whose cultures remained positive at 2 months had a 4.1-fold increased risk (95%CIs=1.82-9.11) of treatment failure. SCRT demonstrated superior sensitivity compared to culture conversion in predicting treatment failure (88% vs. 22%, p<0.001).
Conclusions: SCRT, integrating radiographic, immunological, and hematological findings, along with health assessment test results, appears to be a more effective indicator of TB treatment response at 2 months than culture conversion.

OA54-534-16 What drives the tuberculosis epidemic in Ethiopia? A paradoxical increase of TB cases amid conflicts and drought

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Background and challenges to implementation: Since 2015, the annual TB incidence has been declining in Ethiopia by an average of 6%. The lowest incidence of 119/100,000 was estimated during the COVID-19 pandemic (2021). After the emergence of conflict and drought, it increased to 126/100,000 in 2023. TB case notifications have also increased from 104,606 in 2021 to 134,088 in 2023. It is therefore essential to describe the drivers of the TB epidemic during shock conditions.
Intervention or response: There has been regular and targeted testing of displaced and malnourished people in conflict-affected areas through TB case finding campaigns and post-conflict TB program activities by the USAID Eliminate TB Project. Routine DHIS2 data was used to describe TB notification, GeneXpert testing, and malnutrition from 2020 to 2023. We used Pearson correlation to examine the correlation between TB notification and malnutrition based on region. Linear regression was also applied to determine the significance of the correlation between TB case notifications, malnutrition, and GeneXpert tests over four years.
Results/Impact: The number of GeneXpert machines increased from 313 in 2020 to 377 in 2023 and the testing increased from 15,840 to 517,760. The proportion of severe or moderate malnutrition increased from 12% in 2021 to 25% in 2023 (Figure).

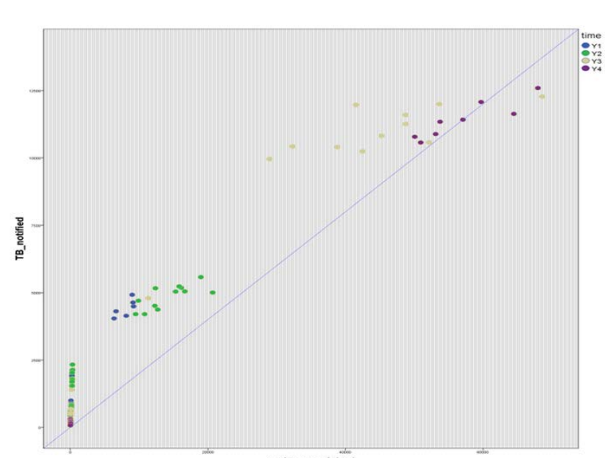

Figure.

Conclusions: The increase in TB notification could be attributable to the emergence of displaced and undernourished populations and the increase in diagnostic capacity. National and subnational prevalence surveys would illustrate the true state of TB incidence and inform the appropriate response to reach vulnerable populations with tailored TB services.

OA55 Behind bars, beyond TB: Integration strategies for TB, HIV management and care in prison centres

OA55-535-16 Modeling strategies for implementation of tuberculosis preventive treatment in prisons

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Background: Tuberculosis preventive treatment (TPT) among incarcerated populations may be an effective strategy to prevent disease and reduce transmission in prisons, but concerns have been raised that its impact may be undermined by re-infection due to ongoing high risk of exposure.

Here we model a number of screening and TPT intervention strategies in Brazilian prisons to project the effectiveness of TPT on TB incidence and identify optimal approaches for its use in incarcerated populations.

Design/Methods: We developed compartmental models of tuberculosis natural history and transmission incorporating population strata for incarceration history. We calibrated the model to longitudinal incarceration and tuberculosis epidemiologic data from Brazil.

We expanded the model to include screening for tuberculosis disease and infection, TB treatment, and compartments for TPT. We compared a baseline scenario (no screening and no TPT) to a one-time comprehensive screening of the prison population with and without TPT and a repeated annual screening in the prison over 10 years.

Results: Compared to the status quo, a one-time comprehensive screening of the prison population for active TB led to a reduction in cumulative TB incidence of 7.8% in the prison population and a 0.3% reduction in the general population after one year, while TPT administration led to a 22.1% reduction in prisons and a 0.9% reduction in the general population.

Implementing annual screening over 10 years without TPT led to a 41% decrease in the prison population and a 4.2% reduction in the general population, while including TPT led to a 62.9% reduction in prisons and a 7.1% reduction in the general population.

Conclusions: Our results suggest that implementing targeted, sustained TPT strategies in Brazilian prisons may not only reduce TB incidence within the prison system but also may have a measurable impact on disease incidence in the general population.

OA55-536-16 Enhancing TB care in the penitentiary system of Tajikistan

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Background and challenges to implementation: TB poses a persistent threat within the penitentiary system in Tajikistan. The NTP recommends regular screening of incarcerated people for TB. However, implementation of annual screening for TB is constrained by limited human resources, chest X-ray facilities (CXR) and coordination required between different departments of the correctional facilities.

Intervention or response: The USAID End TB Tajikistan Activity engaged three CSOs to support NTP in escalating TB care in seven colonies. Since January 2023, CSOs received training on TB detection and care and are collaborating with NTP for planning and well-coordinated implementation of TB screening among prisoners. Ultra-portable X-ray (UPXR) systems with Computer Aided Detection - Artificial Intelligence (CAD-AI) are deployed as per local requirements.

Results/Impact: In 2023, 11,794 prisoners were verbally screened for symptoms of TB in 7 colonies and 11,218 (95%) were tested with CXR. Out of them, 712 (6.3%) people with presumptive TB were identified, 678 (95%) were tested with GeneXpert and 66 (9.7%) were confirmed with TB.

Overall, in 2023, 101 individuals with TB including six with multidrug – resistance were detected in all 19 prison colonies of Tajikistan, which was 40% higher than the 72 who were detected in 2022. The proportion of notified new TB patients out of all TB patients detected in penitentiary system in Tajikistan has also increased from 76% in 2022 to 83% in 2023.

Conclusions: The introduction and use of CXR/CAD in the screening algorithm was critical in for the increased TB case finding yields. There are clear benefits for expand-

ing this screening approach to all colonies in the country. CSOs role for implementation of this approach was also a critical factor and resulted in enhanced detection of TB in these congregate settings.

OA55-537-16 TB epidemic control in Nigeria correctional facilities: An assessment of TB screening protocol among awaiting trial inmates in Delta State, Nigeria

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Background and challenges to implementation: Administrative controls are the most important TB infection control measure and encompass the screening of persons and early isolation, diagnosis, and treatment. Active surveillance involves active screening in the community, aimed at early detection of disease processes. Active surveillance for tuberculosis in high burden settings can reduce delays in diagnosis, reduce transmission and is a pillar of the National Tuberculosis Programme.
The National Tuberculosis Buruli ulcer Leprosy Control Program (NTBLCP) in Nigeria Strategic Plan 2021-2025 seeks to accelerate efforts to eliminate the tuberculosis pandemic in Nigeria by enabling access to comprehensive and high-quality patient-centred and community-owned TB services for all Nigerians.
The Nigeria correctional facilities is a community made up of awaiting trial inmates, sentenced inmates and correctional facilities personnel. Although correctional facilities are often regarded as reservoirs for tuberculosis, little is known regarding the epidemiology and control of tuberculosis in Nigerian correctional facilities.
Intervention or response: The study aims to assess the contribution of correctional facilities in controlling tuberculosis (TB) within five specific facilities (Kwale, Warri, Ogwashi-Ukwu, Sapele, and Agbor) in Delta state. It retrospectively analyses TB cases diagnosed over two years through active screening by partners (KNCV) and correctional facility health personnel.
Results/Impact: Partner-supported active screening conducted bi-annually in Delta state five correctional facilities detected more tuberculosis cases than routine screening by facility health personnel. Partner activities spanned one month, contrasting with health personnel's six-month span. Results reveal partners diagnosed 87 cases, employing modern surveillance and screening equipment and control protocols, while facility personnel diagnosed 3 cases based on a high index of suspicion or accidental findings.

Correctional Facilities Tuberculosis cases		
Period	Partners Supported Active Surveillance & Screening	Correctional Facilities Supported Active Surveillance & Screening
Jan –June 2022	36	1
Jul –Aug 2022	8	0
Jan –June 2023	6	0
Jul –Aug 2023	37	2
Total	87	3

Conclusions: Provision of up to date surveillance and screening equipment, institution of screening and control protocols and engagement of more trained correctional facilities health personnel in Nigeria correctional facilities will help eliminate tuberculosis transmission.

OA55-538-16 Leveraging the support of government institutions and artificial intelligence in finding missing people with TB: Orphanages and correctional centres in Oyo State

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Background and challenges to implementation: Nigeria is among the top 30 high TB burden countries, with an estimated annual incidence of 219 per 100,000 population. The TB treatment coverage has continued to increase since 2020 from 30% to 59% in 2022. Despite the progress recorded in TB notification in the country, the existing gap in case notification needs to be closed.
In Oyo state, 67% of the estimated TB burden was notified in 2023. Government-regulated institutions such as orphanages and correctional centers in low-income settings like Nigeria are congregate settings that provide opportunities to increase TB case finding especially when TB service is combined with available technology.
Intervention or response: The orphanages and correctional centers were engaged through the Oyo State Ministry of Women Affairs and Social Inclusion and Nigeria Correctional Service respectively. Two correctional centers (Agodi and Abolongo) were visited while hotspot mapping through Epidemic control (EPCON) artificial intelligence (AI) was used to select communities in which we identified orphanages to be visited in Ibadan city. People were symptomatically screened using the four TB symptoms and portable digital X-ray with AI (PDX/AI) to identify presumptive TB. The presumptive identified

were linked to a rapid diagnostic platform (Xpert MTB/Rif). Those bacteriologically negative had their films reviewed by radiologists for clinical diagnosis

Results/Impact: From January 2023 to December 2023, 3109 persons were screened for TB and 440 presumptive TB were identified resulting in a presumptive TB yield of 14%. All presumptive TB were evaluated using GeneXpert from which 109 TB cases were detected giving a TB case yield of 24.7%. Clinically diagnosed cases accounted for 62.4% of the identified cases, and Childhood TB was 13.8% of the total TB cases.

Conclusions: Deploying artificial intelligence to map hotspots for TB and partnerships with government-regulated institutions where people congregate can help identify TB cases that would have been missed.

OA55-539-16 Management of TB/HIV/HCV co-infections in penitentiary institutions of Azerbaijan

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Background and challenges to implementation: With the increasing prison population in Azerbaijan and the high prevalence of infections such as tuberculosis (TB), human immunodeficiency virus (HIV) and hepatitis C virus (HCV), effective management of co-infections is an important health challenge in prisons.

Intervention or response: Since April 2023, all patients with Rifampicin Resistant TB and HIV in the Penitentiary Sector (PS) have been given the opportunity to testing and treatment for HCV. All rapid tests, GeneXpert reagents for PCR diagnostics and direct-acting antiviral drugs were purchased in framework of the Global Fund Project implemented in the prisons. Treatment was prescribed considering safe drug interactions.

A PCR test to determine sustained virological response (SVR) was performed 12 weeks after the end of treatment. For effectiveness analysis, treatment adherence and 12 weeks full duration were defined as the primary intervention and treatment success as the primary outcome. For safety analysis, the incidence of serious adverse events (SAEs) is determined.

Results/Impact: All patients with RR-TB and HIV, registered during the enrollment period were screened for HCV and 83 patients (80%) were enrolled in treatment. Refusal to treatment and early release from prison were the main reasons for non-inclusion of 21 patients.

All enrolled patients were male, 53 (64%) were IDUs. Treatment was provided centrally in Specialized Treatment Institution (STI) to ensure adherence and monitoring of treatment safety. 2 schemes were used: Sofobusvir/Velpatasvir and Sofobusvir/Daclatasvir. The treatment course lasts 12 weeks. Out of all patients on treatment, 78 completed and achieved SVR (94%). There were no SAEs recorded during treatment.

Conclusions: HCV treatment performed high treatment success rates among prisoners with RR-TB and HIV patients in Azerbaijan, despite high levels of risk factors such as injection drug use and co-infections.

In addition, the absence of SAEs during treatment indicates satisfactory tolerability of simultaneous treatment of coinfections.

OA55-540-16 Risk factors associated with TB in incarcerated individuals in Indonesia

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Background and challenges to implementation: The prevalence of TB in prisons in Indonesia in 2023 was 2,369 per 100,000 population, higher than the estimated prevalence of TB among incarcerated individuals in the WHO South-East Asia region. A deeper understanding of the risk factors associated with TB is pivotal for the development of targeted screening and early detection strategies, thus reducing transmission and lowering the overall incidence of TB in prisons.

Intervention or response: We captured TB-related risk factors during a comprehensive TB screening to 206,345 individuals in 376 Indonesian correctional facilities from July to November 2023. Systematic screening was performed based on TB symptoms, chest X-ray, and Xpert MTB/RIF. The case definition of TB was bacteriologically confirmed and clinically diagnosed TB.

Risk factors include sex, age, BMI, smoking habits, prior TB treatment, contact with persons affected by TB, CAD4TB score, diabetes, and HIV. Odds ratio (OR), adjusted odds ratio (aOR), 95% CI, and p-value were computed for each factor.

Results/Impact: We identified 4,889 TB cases, with a 2.4% detection rate in the prison, rising to 4.4% among symptomatic individuals. The odds of contracting TB was significantly higher among individuals with the following characteristics: previous history of TB treatment (aOR=4.24, 95%CI 3.67-4.91), male (aOR=3.52, 95%CI 2.63-4.71), malnutrition (BMI<18.5, aOR=2.24 95%CI 2.10-2.40), old age (aOR=1.47 95%CI 2.1-2.4), contact with individual with TB (aOR=1.34 95%CI 1.19-1.51), and those with diabetes (aOR=1.29 95%CI 1.08-1.52),

and a CAD4TB score of 40 or higher presented a stronger association with the incidence of TB (OR=317.65 95%CI 276.6-364-7).

Characteristics	Total	Non-TB	TB	% of TB	Unadjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Male	197,124	192.283	4841	2,5%	4.8 (3.6 – 6.4)	0.000	3.52 (2.63 – 4.71)	0.000
BMI <18.5	21,692	20,545	1147	5.6%	2.31 (2.16 – 2.48)	0.000	2.24 (2.10 – 2.40)	0.000
Close contact with a person with TB	4889	8800	349	4.0%	1.68 (1.50-1.88)	0.000	1.34 (1.19 – 1.51)	0.000
Diabetes	4344	4194	150	3.6%	1.49 (1.26 – 1.75)	0.000	1.29 (1.08 – 1.52)	0.000
History of previous TB treatment	2231	1986	245	12.3%	5.29 (4.62 – 6.06)	0.000	4.24 (3.67 – 4.91)	0.000
Age >=65 years	1658	1596	62	3.9%	1.61 (1.24 – 2.07)	0.000	1.47 (1.14 – 1.91)	0.003
CAD4TB Score >=40	17,638	12,963	4675	36.1%	317.65 (276.66 – 364,72)	0.000	-	-

Table 1. Risk factors associated with TB in prisons

Conclusions: This study reaffirms prisons as hotspots for TB transmission, posing a public health risk. Enhancing routine TB screening with a combination of chest X-ray analysis by CAD4TB and laboratory confirmation is a more significantly effective tool for early diagnosis of TB in a large population who would otherwise go undiagnosed.

OA55-541-16 Integrated STI, HIV, TB, and Hepatitis (ISHTH): A comprehensive and collaborative disease screening campaign in prisons and closed settings in Punjab, India

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Background and challenges to implementation: Congregate settings like prisons, juvenile homes, de-addiction centres, and *Naari Niketans* (women shelter homes) are risk factors and determinants for infectious diseases, especially Tuberculosis (TB). This is due to overcrowding, unsanitary conditions, poor healthcare access, inadequate nutrition, high-risk sexual behaviour, and drug abuse. In Punjab, India, a targeted Integrated STI, HIV, TB, and Hepatitis (ISHTH) screening campaign was launched at the above-mentioned settings.
The study aimed to assess the impact of this collaborative campaign on intensified TB case finding and the yield of other infectious diseases in these settings.
Intervention or response: This campaign covered 25 prisons, 6 juvenile homes, 20 drug rehabilitation centres, and 22 other closed settings for one month in June 2023. High-level multisectoral meetings at state and district levels were undertaken to conceptualise the campaign. Comprehensive health services covered under the campaign were screening and testing for STI, HIV, TB, and Hepatitis, counselling, treatment, and antenatal services. The impact of the campaign was assessed through the following parameters i) coverage ii) additional yield in presumptive TB tested iii) co-morbidity profile iv) yield among other infectious diseases screened. Data was analyzed in SPSS ver22.
Results/Impact: Among 33576 screened, 2077 (6%) were identified as persons with presumed TB and tested, out of which 34 (1.6%) were diagnosed and put on treatment. The campaign provided an additional yield of 3.6% to the state's presumptive TB tests. Of those diagnosed with TB, 41% were found to be underweight (BMI<18), 17% had

HIV co-infection, with higher smoking and alcohol addiction (p<0.005). Yield among other diseases screened and tested were STI (2.7%), Syphilis (0.7%), HIV (3.9%), Hepatitis B (0.7%) and Hepatitis C (23%).
Conclusions: The intervention shows that a comprehensive and collaborative disease screening campaign improves the diagnostic yield of TB and other infectious diseases through optimal utilization of resources.

OA55-542-16 Projected impacts of incarceration policy alternatives on the TB epidemic in Latin America: A mathematical modelling study

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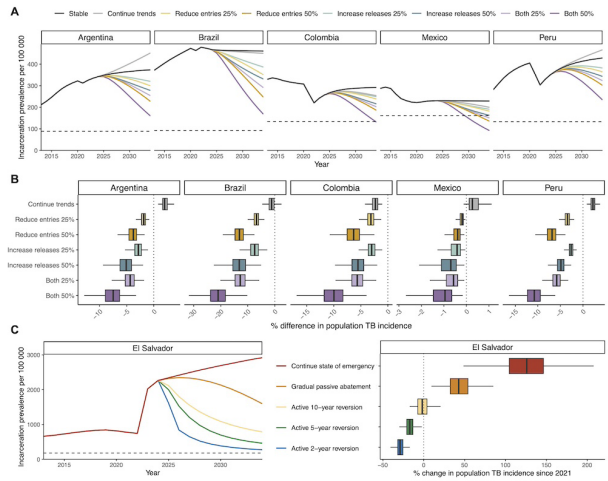
Background: In Latin America, the prison population has quadrupled since 1990, and tuberculosis (TB) risk in prisons is 26 times higher than in the general population. The impacts of alternative incarceration policies on the future TB epidemic in the region are unknown.
Design/Methods: We developed a dynamic compartmental transmission model to simulate TB and incarceration dynamics in six countries in Latin America: Argentina, Brazil, Colombia, El Salvador, Mexico, and Peru. Together these countries comprise over 80% of the region's incarcerated population and TB burden. We simulated base-case and alternative incarceration scenarios over a ten-year period and projected their impacts on future population-wide TB incidence.
Results: Compared to a base-case scenario where incarceration rates remain stable, interventions to gradually reduce incarceration rates to historical levels observed since 1990 could reduce population TB incidence in 2034 by 21.0% (95% UI, 13.8-29.1) in Brazil, 10.8% (7.5-15.6) in Peru, 10.0% (5.8-15.8) in Colombia, 7.5% (4.6-12.8) in Argentina, and 1.0% (0.3-3.0) in Mexico. In El Salvador, where the prison population has nearly tripled since March 2022 under a prolonged state of emergency, we predict that maintaining this regime will yield a 126% (95% UI 71-193) increase in population TB incidence by 2034. In contrast, prompt and active cessation of such policies and reversion to pre-emergency incarceration rates could restore population TB incidence in El Salvador to its pre-emergency level in 2021.



Conclusions: A continuation of mass incarceration policies in El Salvador and elsewhere could exacerbate the already-worsening TB epidemic in Latin America. In contrast, interventions to reduce incarceration rates may be highly impactful in reducing population-wide TB burden and will be critical to re-igniting and accelerating TB progress in the region.

OA56 Understanding Pharmacokinetics for better TB treatment

OA56-543-16 Population pharmacokinetics of a novel paediatric clofazimine formulation in children with rifampicin-resistant TB

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Background: Clofazimine is routinely recommended for the treatment of rifampicin-resistant tuberculosis (RR-TB). A clofazimine 50mg solid tablet (Macleods Pharma) is available which disperses quickly in water and is easier to use in young children compared with current formulations used in routine care (100/50mg gel-capsule or 100mg solid -tablet). We evaluated clofazimine pharmacokinetics (PK) after administration of the study 50mg solid-tablet versus routine formulations.
Design/Methods: CATALYST was a PK, safety and acceptability trial of new paediatric TB drug formulations, including clofazimine, which enrolled children <15 years routinely treated for RR-TB in South Africa, India, and the Philippines. The children underwent intensive PK sampling while taking the routine clofazimine formulations, and again after switching to the study formulation (50mg solid), dispersed in water.
For each formulation, 6 blood samples were collected over 24h if clofazimine was dosed daily, or 7 samples over 48h if dosed on alternate days. Sparse PK samples were collected at study weeks 16 (pre-dose), 20 (post-dose 4h), and 24 (pre-dose). PK data were analysed using population pharmacokinetic modelling.
Results: Thirty-six children were enrolled (median age 4.8 (range 0.4-15) years, n=7 <2 years; median weight 15.6 (range 6.9-42) kg). Incorporating prior information from adults, we developed a 3-compartment PK model with delayed absorption and first-order elimination including allometric scaling, which described data well (Figure 1).
Median time to maximal concentration was estimated to ~6h and terminal half-life to 73 days. No statistically significant difference was found among different formulations at 5% level. The estimated bioavailability ratio of study to routine formulations was 0.96, with 90% confidence interval (CI) 0.83–1.12, fulfilling standard bioequivalence criterion.

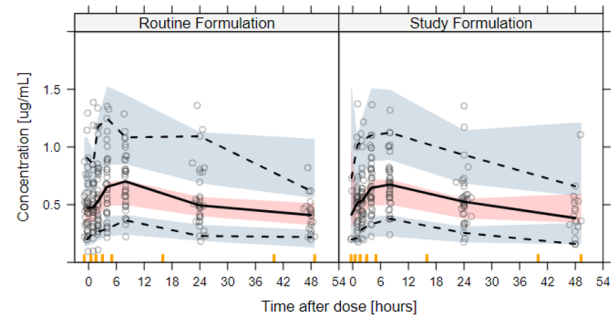

Figure 1: Visual predictive checks on the final model, separated by routine (left, gel-capsule/solid-tablet) and study (right, 50mg solid easy-dispersed) formulations. Observations are represented by open circles. The solid and dashed black lines, respectively, represent the 50th and 5th/95th percentiles of the observations in the data set, with corresponding red and blue areas representing the 95% model-predicted intervals.

Conclusions: These results suggest that the PK between the novel 50mg clofazimine formulation and the existing tablet and gel formulations are similar and the dosing recommendations for them are the same.

OA56-544-16 Pharmacokinetics, safety, and tolerability of higher doses of rifampicin in Tanzanian children weighing less than 25kg

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Background: Rifampicin exposures following the current WHO-recommended dose (15 (10-20) mg/kg) for children are suboptimal. Rifampicin doses of 35-40 mg/kg in adults have been proven to be safe and well tolerated and achieve higher early bactericidal activity and shorter time to culture conversion. We aimed to evaluate the pharmacokinetics (PK), safety, and tolerability of higher doses of rifampicin in Tanzanian children.
Design/Methods: Children with newly diagnosed uncomplicated tuberculosis, aged 1-14 years, were enrolled sequentially in three treatment groups, with escalating doses of rifampicin (20, 30, or 40 mg/kg) for 14 days. The children were admitted under strict safety observation for 14 days. PK sampling was performed on day 14 at predose, 1, 2, 4, 6, and 8 hours post-dose. From day 15 the children continued with regular TB treatment as per national guidelines at their local health center. Bioanalysis of PK samples was done using a validated LC-MS/MS as-

say. PK data were analyzed with non-compartmental PK methods. Safety data were graded using CTCAE guidelines.

Results: Thirty children completed the study, 10 in each treatment group. In the whole group, 53% were men, the median age was 2.9year and the median weight was 13kg. Geometric mean $AUC_{0\text{-}24h}$ (total exposure) values were 51, 141, and 169 h*mg/L ($p<0.001$), and C_{max}(peak concentration) values were 10.8, 20.6, and 25.6 mg/L ($P<0.001$) in the 20,30 and 40 mg/kg groups, respectively. There was no record of nausea, vomiting, abdominal discomfort or other clinical AE reported throughout the study. 7 grade 3 laboratory investigation AEs were recorded: elevated? hemoglobin (n=1), decreased? neutrophils (n=4), elevated total bilirubin (n=1), and increased AST (n=1).

		n=9	n=10	n=10	
Drug	Pharmacokinetic parameter	Group 1= 20mg/kg	Group 2 = 30mg/kg	Group = 40mg/kg	P Value
Rifampin	Dose (mg/kg)	20 (20.0-21.0)	30.0 (30.0-30.1	40 (40-40)	
	$AUC_{0\text{-}24}$, h · mg/liter	51.0 (20.7-81.2)	141.4 (93.8-316.0)	168.7 (38.6-301.9)	<0.001
	Cmax, mg/liter	10.8 (4.1-20.5)	20.6 (14.2-27.0)	25.6 (11.0-39.3)	<0.001
	Tmax, h	2.2 (2.0-5.1)	4.0 (1.1-6.0)	3.4 (1.0-4.0)	0.98
	CL/F, liters/h	4.0 (2.8-8.7)	3.2 (1.5-5.0)	3.3 (1.7-13.7)	0.517
	V/F, liters	9.7 (26.1 - 4.5)	13.0 (4.6-21.6)	13.2 (4.7-30.0)	0.354
	$t_{1/2}$, h	1.7 (1.0-5.3)	2.8 (1.0-6.6)	2.8 (1.4-6.9)	0.069

Table 1. Pharmacokinetic parameters after daily administration of 20, 30, or 40 mg/kg rifampin were recorded at day 14 of treatment. Data represent the geometric mean (range) for all parameters except dose and Tmax, for which they represent the median (range).
P values were determined by one-way ANOVA on log-transformed pharmacokinetic parameters (all parameters except Tmax) P values for Tmax were determined by the Kruskal-Wallis test.
One participant ingroup 1, was excluded in PK analysis.

Conclusions: A dose of up to 40 mg/kg of rifampicin results in a more than proportional increase in $AUC_{0\text{-}24h}$ and C_{max}, can be safely administered and is tolerable in children aged 1-14 years.

OA56-545-16 Pharmacokinetics and dosing of a novel dispersible moxifloxacin formulation in children with rifampicin-resistant TB

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Background: Moxifloxacin is a priority drug for the treatment of rifampicin-resistant tuberculosis (RR-TB). A dispersible 100mg tablet is now available, better suited for use in young children. We assessed the pharmacokinetics (PK) of this novel dispersible moxifloxacin formulation compared to the PK of the standard 400mg moxifloxacin tablet, and evaluated moxifloxacin dosing recommendations.

Design/Methods: CATALYST was a PK and acceptability trial of paediatric TB drug formulations, including moxifloxacin, which enrolled children <15 years with RR-TB in South Africa, India, and the Philippines. Intensive PK sampling was undertaken while children were taking the 400 mg moxifloxacin formulation, and after children switched to the 100 mg dispersible formulation. Six blood samples were drawn over each 24-hour period. PK data was analysed using population pharmacokinetic modelling.

Simulations were performed to evaluate exposures in children compared to an adult reference exposure determined from 10 studies (see caption to figure below), testing both current World Health Organization (WHO)-recommended doses and previously optimised doses (*Radtke et al)*.

Results: Thirty-six children were enrolled (median age: 4.8 years, n=7 <2 years). The difference in bioavailability of the dispersible versus standard formulations fulfilled standard bioequivalence criteria (ratio 1.05 with 90% confidence interval 0.95–1.15).

Simulations showed that current WHO-recommended moxifloxacin doses yielded exposures similar to those in adults in children >10kg, but suboptimal in children <10kg. The *Radtke et al* doses were predicted to result in relatively high exposures compared with reference median, hence we propose a middle option (Figure 1).

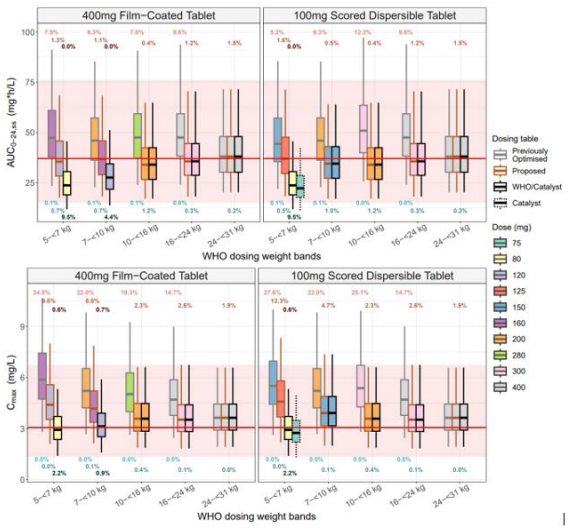

Figure 1: Simulated $AUC_{0\text{-}24,ss}$ (upper) and C_{max} (lower) versus WHO weight bands using the final model, for 400mg tablet (left) and dispersible 100mg tablet (right). In the dosing table legend, "Previously optimised" refers to *Radtke et al.*; "Proposed" refers to the newly proposed dosing in this work; "WHO/Catalyst" refers to WHO dosing which the Catalyst study follows; "Catalyst" refers to the dose in the Catalyst study deviated from WHO dosing for easier practice using dispersible tablets. The reference AUC range is a median 37 mg*h/L (solid red line) with 95% coverage of the adult population from 15 to 76 mg*h/L (shaded area); the reference C_{max} range is correspondingly 3.06 (1.36-6.72) mg/L. The range of boxes represents 25th and 75th percentiles and the range of whiskers represents 2.5th and 97.5th percentiles. The upper percentage in red represents the proportion of simulated patients above the reference range while the lower in cyan represents those below the reference range; numbers from left to right in a weight band correspond to the sequence of dosing tables.

Conclusions: Dosing recommendations for the 100 mg dispersible moxifloxacin and the 400 mg formulation can be the same. The dispersible formulation is preferred as it can be administered in more appropriate dosing increments in young children, and is more palatable. The PK and safety of moxifloxacin doses higher than the current WHO-recommendations should be evaluated in children <10kg.

OA56-546-16 Pharmacokinetic modelling of rifampicin, isoniazid, pyrazinamide, and linezolid in central nervous system: Insights from a rabbit model of TB meningitis

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Background: Treatment for tuberculous meningitis (TBM) is based on pulmonary TB and does not account for drug exposure at the site-of-disease in the central nervous system (CNS). Using a rabbit TBM model, we aimed to describe the extent and timing of drug partitioning for antituberculosis drugs into the CNS.

Design/Methods: Mtb-infected rabbits displaying clinical manifestations of TBM received daily rifampicin, isoniazid, pyrazinamide, and linezolid orally at human-equivalent doses for 3 days. Blood samples were collected up to 24 h post-dose on day1 and day3 until necropsy, which was scheduled at either 2, 3, 6, 10, or 24h post-dose.

Terminal plasma, cerebrospinal fluid (CSF), meninges, spinal cord, brain, and lung tissue samples were collected. Plasma models, with allometrically scaled disposition, were developed for each drug.

CSF/tissue concentrations were modelled using an "effect compartment" approach, estimating a pseudo-partition coefficient (PPC), describing the extent of drug penetration, and equilibration half-life ($T_{1/2eq}$), describing the time taken for plasma concentrations to reflect in tissues.

Results: 16 rabbits provided 230 plasma and 155 CSF/tissue rifampicin concentrations; 4 rabbits provided 50 plasma and 40 CSF/tissue isoniazid/pyrazinamide concentrations; and 13 rabbits provided 117 plasma and 54 CSF/tissue linezolid concentrations.

All drugs followed a one-compartment distribution model, except isoniazid, which was two-compartment. Isoniazid and pyrazinamide had rapid equilibration ($T_{1/2eq}$ 2–4min and 4–12min, respectively) and extensive CNS penetration (PPC: 0.8–1 and 0.5–1, respectively).

Linezolid had moderate CNS penetration (PPC: 0.4 in CSF; 0.1 in brain) and slightly delayed equilibration ($T_{1/2eq}$: 0.5–1h). Rifampicin had the least favourable profile, with PPC in CSF 0.08 and brain 0.07; and $T_{1/2eq}$ 0.6–3h.

Conclusions: CSF drug penetration does not reflect exposures in the CNS, limiting the usefulness of this compartment for predicting the site-of-disease exposures in TBM. Rifampicin, the key drug in pulmonary TB, may not achieve optimal CNS exposures in TBM.

OA56-547-16 Development, validation, and clinical application of a UHPLC-MS/MS method for the determination of 10 anti-TB drugs in human serum

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Background: Linezolid, moxifloxacin, rifapentine, rifabutin, cycloserine, clofazimine, bedaquiline, levofloxacin, prothionamide, and ethionamide are commonly used second-line anti-tuberculosis (TB) drugs. To support therapeutic drug monitoring in regular clinical practice, the authors sought to develop a method based on ultra-high-performance liquid chromatography coupled with tandem mass spectrometry (UHPLC-MS/MS) that would allow the simultaneous quantification of multiple second-line anti-TB drugs in human serum.

Design/Methods: Analytes were extracted from human serum by protein precipitation. UHPLC-MS/MS was performed using a gradient at a flow rate of 0.3 mL/min, and each sample was taken for 7.5 min. The mass spectrometry scanning mode employed was electrospray ionization with multiple reaction monitoring in the positive mode.
Results: Validation showed that endogenous substances in the sample did not interfere with the assay, and the relationship between X and Y was highly linear, with a coefficient of determination (R^2) > 0.9954 for each curve. The accuracy (85.0%–114.7%) and precision (intra-day: 0.27%–9.32%; inter-day: 0.20%–7.66%) were less than 15.0%, the internal standard-normalized matrix effects were consistent (coefficient of variation (CV) ≤ 4.40%).
The analytes were stable in the final extract and human serum under various storage conditions (recovery: 87.0–115.0%).
The clinical applicability of the method was demonstrated by quantitative determination of analytes in serum samples obtained from patients with TB. Reproducibility of the drug concentrations measured in clinical samples was confirmed by incurred sample reanalysis.
Conclusions: A simple and reliable analytical method was developed and validated for the simultaneous determination of ten anti-TB drugs in human serum using UHPLC-MS/MS.
Quantitation of anti-TB drugs in clinical samples confirmed that the assay is suitable for therapeutic drug monitoring in regular clinical practice.

OA56-548-16 The effect of rifampicin on pharmacokinetics of dexamethasone in TB meningitis

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Background: Adjunctive dexamethasone may improve outcomes in tuberculosis meningitis (TBM). Co-administration with rifampicin is expected to reduce dexamethasone exposure and this could be exacerbated with high rifampicin doses currently being evaluated in TBM trials. We aimed to investigate the effect of high-dose rifampicin on dexamethasone exposures among TBM patients.
Design/Methods: This study was nested in a trial assessing intensified anti-tuberculosis therapy in South African adults with HIV-associated TBM. Participants were randomized into a control group receiving $R_{10mg/kg}HZE$ or an experimental group receiving $R_{35mg/kg}HZE$ plus linezolid, with or without aspirin. All participants received dexamethasone orally, starting at 0.4 mg/kg/day with a weekly reduction of 0.1 mg/kg. Plasma samples were collected on day 3 of study enrolment and assayed with validated LC-MS/MS. Data were analyzed with nonlinear mixed-effects modelling.
Results: We included 263 plasma concentrations from 44 participants with median (1^{st}-3^{rd} quartile) age 38 (34–46) years, weight 60 (54–74) kg, and fat-free mass (FFM) 46 (39–51) kg. Efavirenz (8 participants), tenofovir (8 participants), and lopinavir/ritonavir-based regimen (5 participants) were the most common antiretroviral treatments (ART) in the cohort. Dexamethasone pharmacokinetics was best described by a one-compartment model with first-order absorption and elimination. Typical clearance and volume of distribution, best allometrically scaled using FFM, were 132 L/h and 27.5 L, respectively. Lopinavir/ritonavir-based ART significantly affected dexamethasone pharmacokinetics, leading to a notable 91.2% reduction in clearance. No statistically significant differences were observed between the standard- and high-dose rifampicin groups.
Conclusions: Overall, high dexamethasone clearance was observed, likely related to strong induction of CYP3A4 by rifampicin. Clearance was not found to be affected by high-dose rifampicin. Co-treatment with lopinavir/ritonavir greatly reduced the effect of rifampicin on dexamethasone clearance.
These findings suggest that dexamethasone concentrations are greatly reduced by rifampicin and higher doses may be investigated to achieve optimal dexamethasone exposures in TBM patients treated with rifampicin.

OA56-549-16 Cerebrospinal fluid penetration of isoniazid in adults with TB meningitis

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Background: Optimized doses of isoniazid may improve outcomes in tuberculous meningitis (TBM). We aimed to characterize the plasma pharmacokinetics and cerebrospinal fluid (CSF) penetration of isoniazid in TBM patients to inform dosing strategies.
Design/Methods: This study was nested in a randomised controlled trial to evaluate the safety of intensified antituberculosis therapy among adults with HIV-associated TBM in South Africa. All participants received standard TBM therapy including isoniazid 5 mg/kg/day; those in the intervention arms also received additional rifampicin (total oral dose 35 mg/kg/day) plus linezolid with or without aspirin.
Intensive plasma sampling was performed on day 3 and sparse sampling on day 28 after study enrolment, and a single lumbar CSF sample was collected at each visit. N-acetyltransferase 2 (NAT2) acetylator phenotype was established and isoniazid concentrations were measured with liquid chromatography tandem mass spectrometry. Data were analyzed with nonlinear mixed-effects modelling.
Results: We included 414 plasma and 44 CSF concentrations from 49 participants, with median (interquartile range) age 38 (34–45) years, weight 60 (54–74) kg, and fat-free mass (FFM) 46 (39–51) kg. Isoniazid pharmacokinetics was best described by a two-compartment model with first-order absorption through a chain of transit compartments and first-order elimination implemented using a well-stirred liver model. As expected, the model identified a significant effect of NAT2 enzyme phenotype on the pharmacokinetic variability of isoniazid. Predicted typical values of oral clearance, best scaled allometrically using FFM, were 14.3, 34.2, and 63.7 L/h for slow, intermediate, and rapid acetylators, respectively. CSF concentrations equilibrated with plasma with a half-life of 3.7 h and a pseudo-partition coefficient of 1.06, a value that indicates the relative exposure of isoniazid in CSF compared to plasma at steady state.

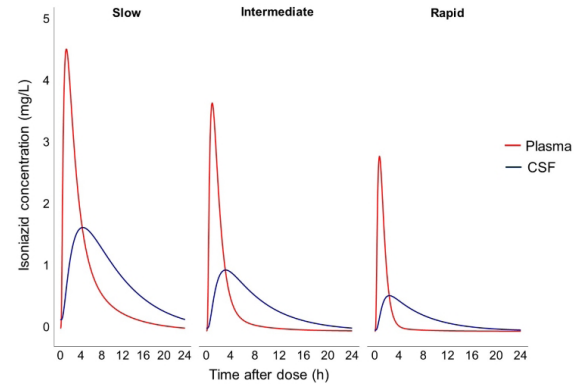

Figure 1. Simulated concentration-time profiles at steady-state for the typical individual of each NAT2 acetylator phenotype (FFM = 46kg).

Conclusions: Our model shows that isoniazid achieves exposure in the CSF similar to plasma, supporting further efficacy evaluations in TBM.

OA56-550-16 Pharmacokinetics of bedaquiline in sputa from adults with drug-resistant TB in Haiti

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Background: When new anti-tuberculous drugs are developed, drug concentrations are tested in plasma and not at the site of disease. Sputa may partially reflect secretions that come from pulmonary cavities; drug concentrations in sputa may be a surrogate for drug penetration into pulmonary lesions. We tested sputa and plasma in adults with pulmonary multidrug/rifampin-resistant tuberculosis (MDR/RR-TB) to evaluate the levels of bedaquiline and companion drugs after 14 days of treatment.
Design/Methods: This study was conducted at GHESKIO, an MDR/RR-TB hospital in Port-au-Prince, Haiti between 2019-2022. Participants were adults diagnosed with MDR/RR-TB based on Xpert MTB/RIF (Cepheid, Sunnyvale, USA) positive for Mtb and with evidence of rifampin resistance who had not yet started therapy. Blood for plasma was collected from each participant on day 14 of treatment at 30 minutes pre-medication and 2, 4, and 6 hours following medication. Spot sputa was collected 4 hours following medication on day 14 of therapy. Samples were shipped to the Center for Discovery and Innovation, Hackensack, NJ, USA.

Drug levels were assessed using liquid chromatography-tandem mass spectrometry with validated LC-MS/MS methods. Plasma and sputa samples were extracted using protein precipitation with stable labeled internal standards for all drugs.

Results: Twenty-two participants were included. Ratio of bedaquiline levels in sputum to plasma were 0.04 (Table 1). The ratio of companion drugs were: clofazimine 0.04, pyrazinamide 0.80, levofloxacin 1.01, and linezolid 0.89. Nine participants had pyrazinamide resistance; none had fluoroquinolone resistance.

Drug, (ng/g)	Sample type, 4 hours after drug administration	Median [Interquartile Range], (ng/g)	Sputum: plasma ratio
Bedaquiline	sputum plasma	81 [32, 332] 2280 [1280, 2670]	0.04
Bedaquiline metabolite (M2)	sputum plasma	98 [59, 1050] 545 [471, 841]	0.19
Clofazimine	sputum plasma	10 [6, 66] 246 [189, 294]	0.04
Pyrazinamide	sputum plasma	29,700 [23,800; 35,300] 37,150 [32,300; 39,100]	0.80
Levofloxacin	sputum plasma	10,030 [6880; 12,300] 9775 [8800; 10,200]	1.01
Linezolid	sputum plasma	9915 [8210; 12,300] 10,850 [9260; 12,700]	0.89

Table 1. Sputum and plasma drug concentrations, 2 weeks after starting treatment from 22 adults with pulmonary MDR/RR-TB (ratio from cumulative median)

Conclusions: Pyrazinamide and levofloxacin partition favorably into sputum, while bedaquiline and clofazimine exhibit low sputum/plasma concentration ratios after two weeks of daily treatment, potentially creating time at the beginning of therapy where there are only 1-2 effective medications in cavity caseum. Given the long duration required to reach steady state for clofazimine and bedaquiline, we hypothesize that higher ratios may be achieved as therapy progresses.

PRINTED POSTER SESSION (PP)

PP37 Closing gaps in finding TB

PP37-1146-16 Tackling TB in Nigeria's marginalised: Tailored interventions amidst economic adversity for improved public health outcomes

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Background and challenges to implementation: In Nigeria, Tuberculosis (TB) persists as a major public health issue, disproportionately affecting vulnerable populations such as female sex workers, individuals with substance abuse disorders, people with alcohol use disorders, and people living in urban slums. Economic hardships exacerbate these challenges, impeding access to healthcare and effective TB control measures.
This abstract investigates TB prevalence within these marginalized groups, highlighting the urgent need for tailored interventions amidst economic adversity to overcome barriers to care and improve public health outcomes.
Intervention or response: The intervention was conducted for 4 days in a closed community in Bauchi State in Nigeria that included brothels, beer parlours, and urban slums. A member of the community who was well-known in the area was recruited and trained to sensitize, mobilize, and educate residents on the importance of participation in the screening exercise. 607 persons were enrolled based on both their cough status and other classical signs and screened for TB using digital chest X-ray with artificial intelligence and GeneXpert. 46 persons were identified as being presumptive for TB.
Results/Impact: Of the confirmed 46 presumptives, 19 persons were bacteriologically diagnosed (GeneXpert positive) with active TB representing 3.1% of the total enrollees screened. The TB prevalence among the enrolled population was also 3.1%, highlighting a significant burden of TB within this vulnerable community.

SCREENING DAY	NUMBER ENROLLED	NUMBER SCREENED	PRESUMPTIVE IDENTIFIED	NUMBER OF DIAGNOSED CASES
1	205	205	16	3
2	202	202	17	9
3	100	100	7	4
4	100	100	6	3

Table.

Conclusions: The prevalence rate of tuberculosis (TB) among the screened individuals, approximately 3.1%, highlights the persistent challenge of TB within Nigeria's marginalized populations. Targeted interventions are imperative for addressing TB transmission and improving public health outcomes, particularly amidst economic adversity.
Expanded access to TB screening, diagnosis, and treatment services is critical, especially for vulnerable groups like female sex workers, individuals with substance abuse and alcohol use disorders, and urban slum residents. Tailored public health strategies are essential for effectively combating TB and mitigating its impact on community health in Nigeria.

PP37-1147-16 Contamination effects in cluster randomised trials of TB interventions: A review of methods and reporting

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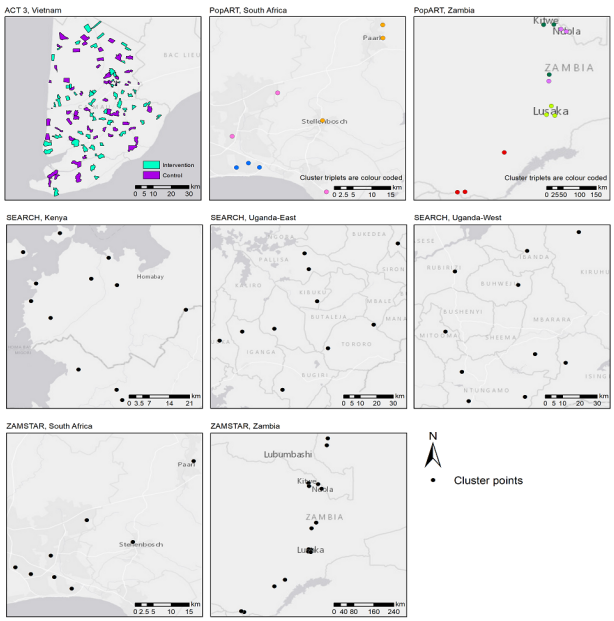
Background: Trials of interventions to reduce tuberculosis (TB) disease incidence have achieved mixed results, with many failing to show significant reductions. One possible contributor to this is the potential for contamination in cluster randomised trials (CRTs), with participant mobility and interactions between clusters and the general population diluting measured intervention impact.
This systematic review examines cluster selection methods in CRTs of tuberculosis interventions and describes the range of information reported in such trials.
Design/Methods: We searched MEDLINE, Embase, and Global Index Medicus for original studies of tuberculosis-related CRTs. Two reviewers independently screened titles, abstracts, and full texts of papers reporting potentially eligible trials. Included trials aimed to capture the population-level effects of the intervention on TB. We extracted and analysed data on trial details, interventions, outcomes, populations, and cluster configurations.
Geographic data were georeferenced and analysed to explore spatial relationships between clusters, including proximity to each other and distribution within the study area.

Results: We screened 1,039 abstracts, 173 full texts, and included 20 reports from 7 CRTs. Cluster selection, allocation, size, and geographic dispersion varied considerably across trials. The median number of clusters was 32 (IQR 23-61) with an average population ranging from about 400 to 50,000 per cluster. Four trials reported spatial data, among which the average distance between clusters was 12.3 (3.71-35.9) kilometres. Several trials acknowledged design limitations, such as small cluster sizes and inherent population mobility, that could have led to underestimations of intervention impact due to contamination.



Conclusions: The trials used various geographic, social, and pre-existing TB measures to select and allocate study clusters. Data reported by the trials on the potential for contamination are inconsistent. There remain gaps in the reporting of methods and results, suggesting necessary improvements to standardised reporting tools. These insights can inform recommendations for improved CRT design and reporting practices.

PP37-1143-16 How to diagnose TB in migrants? A systematic review and decision tree analytical modelling exercise to evaluate properties for single and combined TB screening tests

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Background: For the effectiveness and cost-effectiveness of TB migrant screening programmes, optimising Tuberculosis (TB) testing algorithms it is key. In this study we aimed to estimate pooled TB test properties from the literature and combining them in decision analytical modelling with a specific focus to elicit how tests usually used for TB infection diagnosis might add value to these algorithms.
Design/Methods: We searched PubMed, Embase, Web of Science and Cochrane library and pooled test properties for active TB tests, extracted from original papers included in our systematic review of reviews (RoR). Using these we performed a decision tree analysis to estimate test properties for common migrant screening algorithms.
Results: In our RoR, we included 32 reviews of 1,477 records and extracted data from 437 original studies for 18 TB tests, providing pooled results for 13. In decision tree modelling we showed that algorithms with IGRAs had good sensitivities (fig 1) and the highest positive predictive values and the highest diagnostic odds ratios (e.g., QuantiFERON/Chest X-Ray (CXR, TB abnormalities)/ Xpert dOR 21,527; 95% confidence intervals 10,639-43,561).

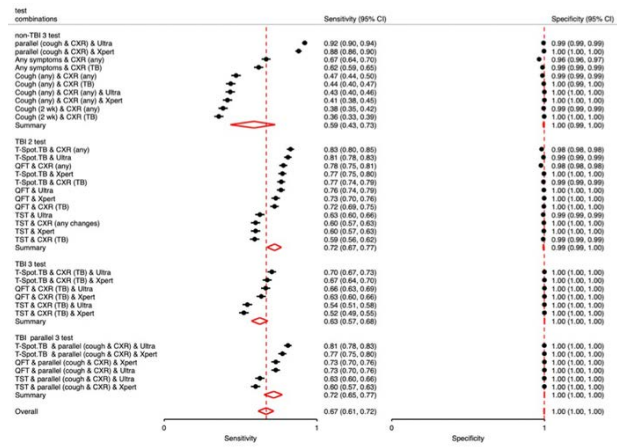

Figure 1: Forest Plot of sensitivity and specificity (with 95% confidence intervals) overall and stratified for two-test and three-test combinations with or without TBI test.

Conclusions: The significant test accuracy benefit of adding IGRAs to an active TB screening pathway will help inform clinicians and policy makers deciding on the most effective screening algorithms.

PP37-1144-16 Assessment of extrapulmonary TB notifications in five states of Nigeria: Trends and implications for healthcare systems

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Background: It is estimated that extrapulmonary TB accounts for 15-25% of all TB cases. In Nigeria, the diagnosis of extrapulmonary tuberculosis (EPTB) requires expertise, typically unavailable in primary healthcare facilities, which accounts for most of the directly observed treatment short-course (DOTS) facilities.
Furthermore, healthcare workers (HCWs) demonstrate a low index of suspicion for EPTB, with greater emphasis placed on pulmonary TB.
Nigeria through intensified efforts from the NTP and partners has increased its TB case notifications from 106, 533 in 2018 to 285, 561 in 2022, decreasing its contribution to the global TB treatment gap from 12% in 2018 to 6.2% in 2022.
However, this gap can be narrowed further through sub-analyses of TB data to identify possible under-notification in sub-groups or sub-categories of TB at sub-national levels.
This will help inform programmatic decisions on where to intensify efforts for greater impact.
This study assesses the trend in EPTB case notifications in five states of Nigeria.
Design/Methods: A retrospective desk analysis of routine data collected from 5 states: Enugu, Anambra, Delta, and Akwa Ibom in Southern Nigeria and Nasarawa in Northern Nigeria between 2020 to 2023 was conducted. Number of EPTB cases was compared with the total number of all forms (AF) of TB cases. Analysis was done using Excel as counts and proportions.
Results: As total AF TB case notifications progressively increased in the 5 states from 2020 to 2023, the number and proportion of EPTB cases steadily declined over the period.
Notably, the proportions of EPTB cases are far below the expected benchmark of 15-25%.

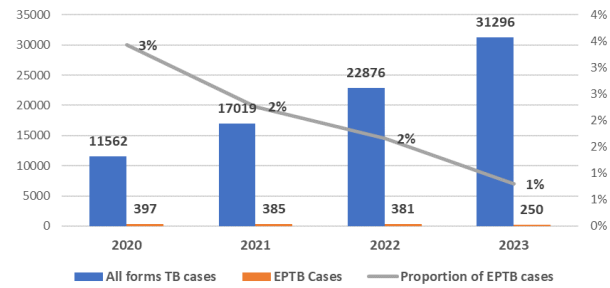

Figure. Trend of EPTB notification in 5 states of Nigeria: 2020-2023.

Conclusions: The result reveals a concerning under-notification of (EPTB) cases, indicating a gap in the current healthcare system's capacity to detect and report these cases. It is imperative to prioritize increased awareness of EPTB among HCWs and strengthen capacity-building efforts for EPTB identification and referral.

PP37-1145-16 A non-randomised evidence for the effect of community engagement on TB case detection and notification in Nigeria

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Background and challenges to implementation: Nigeria ranks sixth globally and first in Africa for tuberculosis (TB) burden, however, challenges persist in identifying and notifying all TB cases, especially from communities. Community engagement (CE) is an approach to building institutional bridges between health systems and citizenry. Communities in this study comprise individuals, groups, organizations, and informal networks that share common characteristics and interests.
This study aims to evaluate the impact of community engagement on TB case notification in six selected high-burden states from 2019 to 2022.
Intervention or response: A non-randomized retrospective study using secondary data from the National TB Control Program (NTP) records from 2019 to 2022. In 2021, 36 community-based organizations (CBOs) and 2,000 community TB workers were mobilized country-wide for community-TB active case search (ACS). A purposeful selection of six high TB burden States from the six geo-political zones in Nigeria was done. Using paired

samples t-tests to assess differences, a comparison of presumptive-TB cases, community referrals, and notified TB cases from 2020 to 2022 was conducted relative to 2019 baseline figures.

Results/Impact: In 2020, total presumptive cases increased by 144% (M = 14,899, SD = 17,757; t(5) = -2.055, p = 0.095). Subsequent years saw significant increases: 388% in 2021 (M = 40,271, SD = 24,360; t(5) = -4.049, p = 0.01) and 876% in 2022 (M = 90,892, SD = 57,194; t(5) = -3.893, p = 0.01). Referrals from the community increased by 73% (2020), 235% (2021), and 406% (2022); confirmed TB cases increasing by 33%, 125%, and 258%, respectively, over the same period, all statistically significant.

Conclusions: Engaging and empowering communities in TB interventions effectively detected and notified previously undetected TB cases. This emphasizes the need to intensify and sustain community engagement efforts within TB control programs across Nigeria.

PP37-1142-16 Should screening for non-TB conditions amongst TB household contacts be a routine service? Consensus findings from a Delphi survey with global TB experts

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Background: Following *Mycobacterium tuberculosis* exposure, a complex interplay of host and environment factors determine risk of infection & disease. In this sense, TB 'selects' families with underlying health and psychosocial vulnerabilities. Routine TB contact tracing presents an opportunity to provide additional non-TB services to people at high-risk of future TB and comorbidities. However, consensus on which interventions to offer is lacking.

Design/Methods: Using purposive and snowball recruitment, respondents completed successive rounds of an email-based Delphi survey intended to distil expert consensus on whether non-TB services should be offered to TB household contacts as part of routine TB prevention, which services, and when. Findings were summarised through thematic and descriptive analysis, informing development of successive survey rounds in consultation with two independent expert steering committees, representing TB survivors and clinical academics.

Results: Of 223 individual respondents from 83 countries, 84% were in favour of providing non-TB services to recently exposed TB household contacts as part of routine TB prevention. Collectively, experts gave 642 votes for 41 non-TB conditions/services. HIV (n=107), diabetes (n=81), mental health (n=77) and nutrition (n=72) assessments for TB contacts had the highest frequency of votes. Experts who did not recommend additional services for TB contacts (n=34, 15%) or who qualified their recommendations cited resource constraints and the risk of overburdening existing TB services as factors limiting feasibility. Experts broadly agreed that an imperative exists for TB programs to provide holistic services that benefit household contacts engaged by the health system and at risk of future TB disease.

Conclusions: There is consensus amongst TB experts to implement HIV, diabetes, mental health and nutrition screening amongst TB-affected households as part of routine contact screening (dependent upon epidemiological prevalence). Studies assessing the feasibility, acceptability and effectiveness of these expert-preferred services for TB household contacts are urgently needed to generate evidence to inform guidelines and practice.

PP37-1141-16 Engagement and non-engagement factors in TB active case finding among artisanal small-scale miners and female sex workers in Tanzania: A mixed-methods study

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Background: Tuberculosis (TB) remains a significant public health challenge in Tanzania, particularly among high-risk populations such as ASMs and FSWs. Despite efforts to control TB, including ACF interventions, these populations continue to face barriers to accessing TB services due to various social, economic, and structural factors.

Understanding the complex interplay of factors influencing their engagement or non-engagement in TB interventions is crucial for designing targeted and effective TB control strategies tailored to their specific needs.

Design/Methods: This mixed-methods study aimed to comprehensively assess the factors influencing engagement and non-engagement in a TB ACF intervention

targeting ASMs and FSWs in Tanzania. Through quantitative surveys, participants' perceptions of TB susceptibility, severity, benefits, and barriers were explored, while qualitative interviews provided deeper insights into motivations, challenges, and perceptions of the intervention among community members, community health workers (CHWs), peer educators (PEs), and other stakeholders.

Results: The intervention's educational components, delivered by CHWs and PEs, were well-received by participants, who expressed positive perceptions of the TB education provided.

However, logistical barriers, particularly transportation to health centers for sputum collection, emerged as significant challenges, particularly among non-engaged individuals.

Interestingly, perceived severity of TB was associated with higher engagement levels, underscoring the importance of increasing awareness about the disease's severity and potential consequences among at-risk populations.

Thematic analysis showed that health-seeking behaviour was similar across both groups but that individuals in the non-engaged group were more reluctant to give sputum samples, often because they did not understand the purpose. CHWs feared contracting TB on the job, and many noted that mining areas were difficult to access without transportation.

Conclusions: Recommendations from CHWs, PEs, and stakeholders stress ongoing community events, healthcare worker training, and collaboration with local leaders and healers for sustainable TB control in mining communities. These insights inform future interventions, aiding global TB elimination efforts in Tanzania and beyond.

PP37-1140-16 Finding missing TB cases: USAID Afya Shirikishi Project's experience in providing TB services in hard-to-reach areas in Ukerewe Islands, Tanzania

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Background and challenges to implementation: Tanzania is among the 30 high TB burden countries globally with 48,209 (36%) TB cases missing annually. Mwanza region report (2020) has listed TB in the top ten causes of mortality. Ukerewe district in Mwanza has 38 islands, making it geographically hard to reach with limited access to health care services. The only transport from one island to another is through use of canoes. This presents a challenge for community health workers (CHWs) who face delays in reaching the farthest islands, hence resulting in difficulty in finding missing TB cases.

Intervention or response: Amref Health Africa Tanzania in collaboration with the Ministry of health has been implementing the USAID Afya Shirikishi project with the main aim to find missing TB cases in all eight districts of Mwanza region since 2021. The project has advocated government officials to understand the project, engaged/supported CHWs, Bodaboda riders and community leaders to provide community TB services so to address a gap of accessing TB services. 11 CHWs have been equipped with skills to provide outreach TB services-health education, contact persons investigation & active case finding. Bodaboda riders transport sputum samples from the community to TB testing hub. Bodaboda riders and CHWs are supervised by regional/council health management teams and project staff. TB data review from district health information system2 for year 2021, 2022, 2023 was done retrospectively in February 2024.

Results/Impact: 942 TB cases were notified in Ukerewe from January 2021- December 2023 of which 527(56%) were reported by CHWs. TB cases notified in 2021 were 359 (213 through CHWs=59%); in 2022 were 320 (161 through CHWs=50%) and in 2023 were 263 (153 through CHWs=58%).

Conclusions: More than half of TB notification in Ukerewe islands, Tanzania were result of CHWs contributions which shows that they are a vital cadre that if supported can reach in most difficult areas.

PP37-1137-16 Enhancing TB prevention and care: Challenges and opportunities in cross-border screening of seasonal migrants in Nepal

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Background and challenges to implementation: The National Tuberculosis Program (NTP) in Nepal has implemented active case finding strategies to enhance TB case notifications. One such approach involves screening seasonal migrants returning from India, a high-risk group for TB. Collaborating with NTP partners, the program only targeted in nine Nepal-India border area of nine Terai districts due to limited resources (budget/Fund).
The study highlights the challenges faced to reach migrants with TB services, and suggests potential solutions, including policy formulation and standard screening protocols.
Intervention or response: At each of the nine border sites, two health care providers called social mobilizers are assigned to manage the TB screening desks. These mobilizers conduct screening, collect sputum samples from migrants with presumptive TB, and facilitate sputum transportation to diagnostic sites. Upon confirming TB positivity, concerned district TB focal persons are notified to ensure patient enrollment in treatment. All information is documented and reported in the National Tuberculosis Program Management Information System (NTPMIS).
Results/Impact: Analysis of data from the NTPMIS in 2023 revealed that out of 365,749 migrants screened, 4.8% (n=17629) were identified as TB presumptive cases. Among these, 2% were children and 98% were adults. Testing methods included GeneXpert (24%), microscopy (69%), and other diagnostic tools (8%). The overall positivity rate was low, with only 1% positivity in microscopy and 3% in GeneXpert. Despite the low yield, the intervention contributed 262 additional cases to the national program, predominantly pulmonary bacteriologically confirmed (79.8%), with a few cases of pulmonary clinical diagnosis (18.7%) and extra-pulmonary TB (1.5%). Among the bacteriologically confirmed cases, six were rifampicin-resistant/multidrug-resistant (RR/MDR) TB.
Conclusions: Rolling out cross-border TB screening for seasonal migrants in Nepal presents opportunities in ending TB. The initiative contributed to increased access to readily available health services for migrants and steps need to be taken to increase more rapid diagnostic tests to increase the yield.

PP37-1139-16 Contribution of peer supporters in improving TB notification among people living with HIV using community TB screening in Masvingo Province, Zimbabwe Jan-Oct 2023

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Background: In Zimbabwe, tuberculosis (TB) is largely driven by human immunodeficiency virus (HIV), with a co-infection rate of 50%. The TB death rate (per 100,000 people) was 13% in 2021. Staff shortages at facilities pose a challenge in screening for TB per national protocol.
In response, Zimbabwe's National Network of People Living with HIV (PLHIV) has utilized Community HIV/AIDS Service Agents (CHASAs) who live with HIV to link their peers to TB services.
Design/Methods: This was a prospective cohort study conducted in Masvingo Province from January to October 2023 comparing the yield of the national community TB cascade with the CHASA model. The study recruited 138 peer supporters who received training from professional healthcare workers to support and guide their peers through the TB screening process. Participants aged 18 years and above were screened from HIV support groups. Presumptive TB was assessed by the recorded presence of cough ≥2weeks, fever, night sweats, unintentional weight loss and household TB contact person. Those who met the criteria were referred to the facility.
Results: The study screened 5,683 PLHIV, 68% were females which is consistent with Zimbabwe's ART care demographics. Of the participants, 22% (1315) were presumptive TB cases. We observed a 21% (49/234) TB detection yield, surpassing the 15% national community yield from 2022.
Notably, males showed a 13% higher TB risk than females, with TB-positive rates of 0.95% (18 /1,890) versus 0.79% (30/3,793) among females. The 45-54 year-olds contributed the most screenings (30.8%).
Among the 1,315 presumptive TB cases referred for further diagnosis only 29% (384) visited the facility. All but one TB cases were initiated on treatment.

Conclusions: Peer supporters have potential for increasing community TB screening and detection among PLHIV. There is need to explore policy guidance to allow peer supporter to collect sputum in the community to plug facility referral leakages.

Acknowledgement: This study was made possible through the U.S. Agency for International Development under the Tuberculosis Implementation Framework Agreement, implemented by JSI Research & Training Institute, Inc.

PP37-1148-16 Community-led TB case finding: Reaching a closed community through their peers in Wakiso district, Uganda

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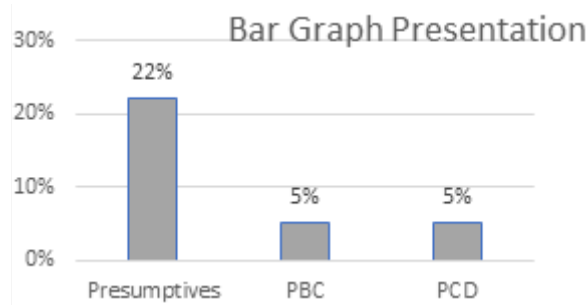
Background: Without the engagement of community gatekeepers or peers, TB case finding in closed communities can be very difficult. Persons with alcohol use disorders have many social and biological risk factors for TB disease. They often have many social contacts with TB disease and their own poor nutritional status often predisposes them to progression from TB infection to TB disease. In addition, they have, low risk perception for TB which translates into poor health seeking behavior.
It is upon this basis that we used a peer-led approach to reach communities of persons with alcohol use disorder for TB screening in Wakiso District, central Uganda.

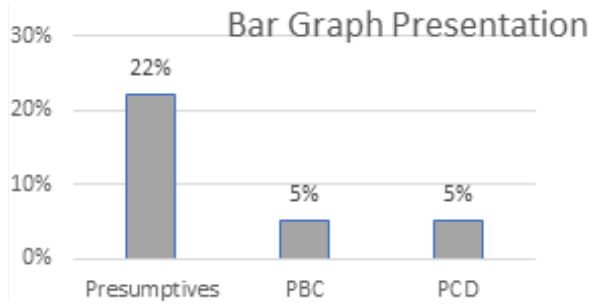
Design/Methods: In January and February 2024, community health workers (CHWs) identified TB patients with a history of alcohol use disorder who received treatment from their respective health facilities. These TB patients helped the CHWs to identify common localities where persons with alcohol use disorder dwelled. They also worked closely with the patients to initiate contact and establish relationships with other persons with alcohol use disorders in the community. The CHWs then conducted community TB sensitization and screening for the identified persons, collected sputum samples from those with presumptive TB and sent them for GeneXpert testing, and started those diagnosed with TB on TB treatment.

Results: Following this intervention, We sensitized and screened 831 persons with alcohol use disorders. Of these 182 had presumptive TB (22%) and had their sputum samples were collected and sent for GeneXpert testing. Ten (10) (5%) people were diagnosed with bacteriologically confirmed TB disease (PBC TB) and 9 were clinically diagnosed with TB (PCD TB) (5%). All patients diagnosed with TB were initiated on TB treatment.



Background and challenges to implementation: Without the engagement of community gatekeepers or peers, TB case finding in closed communities can be very difficult. Persons with alcohol use disorders have many social and biological risk factors for TB disease. They often have many social contacts with TB disease and their own poor nutritional status often predisposes them to progression from TB infection to TB disease. In addition, they have, low risk perception for TB which translates into poor health seeking behavior. It is upon this basis that we used a peer-led approach to reach communities of persons with alcohol use disorder for TB screening in Wakiso District, central Uganda.

Intervention or response: In January and February 2024, community health workers (CHWs) identified TB patients with a history of alcohol use disorder who received treatment from their respective health facilities. These TB patients helped the CHWs to identify common localities where persons with alcohol use disorder dwelled. They also worked closely with the patients to initiate contact and establish relationships with other persons with alcohol use disorders in the community. The CHWs then conducted community TB sensitization and screening for the identified persons, collected sputum samples from those with presumptive TB and sent them for GeneXpert testing, and started those diagnosed with TB on TB treatment.



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their sputum samples were collected and sent for GeneXpert testing. Ten (10) (5%) people were diagnosed with bacteriologically confirmed TB disease (PBC TB) and 9 were clinically diagnosed with TB (PCD TB) (5%). All patients diagnosed with TB were initiated on TB treatment.
Conclusions: Peer led interventions are effective for reaching TB key population groups who may otherwise not have been reached through conventional methods.

PP35 TB prevention and care, and community engagement

PP35-1123-16 Facilitators and barriers for TB notification by private providers in India: Results from a systematic review and meta-synthesis

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Background: TB Notification has been made mandatory in India in 2012; still the notification from private sector is sub-optimal. Meta-synthesis can advance current knowledge by combining the qualitative insights from many studies.
We conducted a systematic review and a meta-synthesis of qualitative studies to identify the challenges and enablers for TB notification by the private providers in India.
Design/Methods: A systematic search in electronic databases was done using a search strategy. Titles and abstracts were screened for inclusion. Full texts of studies were assessed for eligibility. We screened 276 abstracts and included 19 eligible articles in the review. We assessed methodological limitations of individual eligible studies using Critical Skills Appraisal Program (CASP) tool.
We rearranged the data according to relationships and then mapped and interpreted the nature of reviewed concepts. We synthesized the evidences using thematic analysis and in an iterative way. We assessed our confidence in each summary finding using GRADE-CERQual.
Results: Included studies had details from 31 Focus Group Discussions and 303 In-Depth Interviews conducted among various stakeholders. Major barriers for TB notification from private sector were lack of knowledge among the private practitioners regarding the mechanism to notify and perceived complexity of the data exchange mechanism.
Private providers had concerns of 'losing their business', fear of ‚scrutiny' of diagnosis and that NTP is not sensitive to the confidentiality. Enablers for notification were sustained interaction of NTP with private sector, non-financial incentives like recognition and feedbacks and establishing a single window system inside a private hospital.

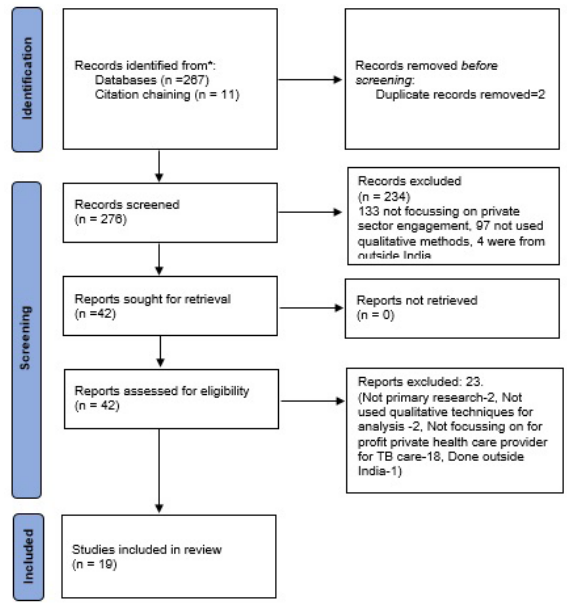

Figure 1. PRIMSA flowchart indicating the results of literature search.

Conclusions: Simplifying the data exchange mechanisms, devising strategies to gain confidence of the private providers regarding the fact that NTP respects confidentiality of the people affected with TB, periodic training on management information system and promoting more non-financial incentives to private sector may be attempted to further strengthen notification from the private sector.

PP35-1126-16 Approaches to ensure access to quality-assured TB medicines after transitioning from Global Fund support

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Background and challenges to implementation: Sustainability and transition planning are important elements of the Global Fund (GF) Strategy. The GF identified the procurement and regulatory environment for procurement of TB drugs as key concerns in transitioning TB programs. Specific challenges include: registration processes that create barriers for manufacturers; regula-

tor's lack of readiness to utilize the WHO Collaborative Registration Procedure (CRP) and other mechanisms to facilitate registration; inadequate quality assurance of medicines; and lack of local sources of quality-assured TB medicines.

Intervention or response: The USAID-funded Promoting the Quality of Medicines Plus (PQM+) program worked with public and private sectors in Kazakhstan, Tajikistan and Uzbekistan to address these challenges. The program provided technical assistance to improve the national regulatory authorities' (NRAs) ability to regulate and register medicines to treat TB and other diseases, strengthened quality control laboratories' (QCLs) ability to reliably test medicine quality, and engaged private sector partners to help manufacturers of quality-assured medicines register their medicines. PQM+ also is helping a local Uzbekistan manufacturer to achieve WHO prequalification of its TB medicine.

Results/Impact: Results across the three countries are summarized in Table 1. The multipronged approach is helping the countries transition from GF support and maintain access to quality-assured medicines. The interventions have helped ensure that countries have registered medicines, a quality testing system that can safeguard medicine quality, and, in the long-term, that a local manufacturer will be able to produce quality-assured TB medicines.

Intervention	Results
Strengthen QCLs to test medicine quality reliably and per WHO or ISO international standards by strengthening the labs' quality management systems and staff capacity	Kazakhstan – Two QCLs (Karaganda and Almaty) met the WHO prequalification requirements. Uzbekistan – Two NCLs (Tashkent and Andijan) achieved ISO 17025 accreditation by the local accreditation authority. Tajikistan – One NCL (Dushanbe) achieved ISO 17025 accreditation by the local accreditation authority.
Strengthen NRA to register medicines through regulatory reform and by institutionalizing improved registration practices such as WHO CRP	Kazakhstan – NRA is now able to use WHO CRP when manufacturers of WHO prequalified TB medicines apply for registration. Uzbekistan – NRA is now able to use WHO CRP and has registered six (6) WHO prequalified TB medicines.
Help manufacturers of quality-assured TB medicines register their medicines	Tajikistan - A local company supported international manufacturers to register 14 quality-assured TB medicines, which ensured smooth importation and supply of the quality-assured medicines procured with domestic funding.
Strengthen quality of local manufacturing by promoting compliance with international standards such as Good Manufacturing Practices (GMP) and helping manufacturers pursue WHO prequalification for their TB medicines	Uzbekistan - A local manufacturer developed a TB medicine (levofloxacin), improved its compliance with international standards (GMP), and is submitting a dossier for WHO prequalification (application anticipated for Summer 2024).

Table 1. Results of regulatory system and private sector interventions.

Conclusions: Maintaining a supply of quality-assured TB medicines is essential for countries transitioning from GF support. Based on the context, countries can use different approaches to ensure ongoing access to quality-assured TB medicines: improving medicines registration including through use of WHO CRP; improving medicine quality testing systems; helping manufacturers register their quality-assured medicines so they are available for domestic procurement; and strengthening local manufacturing capacity.

PP35-1124-16 Engagement of private healthcare providers in TB notification: Experiences from USAID Afya shirikishi project in Geita, Tanzania

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Background and challenges to implementation: The systematic involvement of healthcare providers in delivering effective TB services to all segments of the population is an essential component of the Global Plan to End TB by 2030 and this can be achieved through Public-Private Mix (PPM) approaches. In Tanzania, Non-State Actor (NSA) serves as a public forum for the private health sector.

The private and informal sector includes Accredited Drug Dispensing Outlets (ADDOs), pharmacies and unqualified practitioners like traditional healers. A minimal engagement of private health sectors is still a challenge in provision of TB services.

Intervention or response: To address the priority gaps in TB case findings at community level in Tanzania, the USAID Afya shirikishi project uses different approaches that includes active case finding (ACF), contact investigation tracing as well as Public-Private Mix (PPM).

Under Public-private Mix, 100 ADDOs and 96 traditional healers have been oriented on identification of signs and symptoms for TB, preventive measures as well as referring presumptive cases to community health workers and then to diagnostic facilities.

Results/Impact: From October 2021-March 2024, in Geita region, the project has reached 3,386 people through ADDOs and 3,131 people through traditional healers. Of all reached, across all private health providers engaged, only 4,152 (64%) people were screened for TB and 1,997 were presumptive cases.

A total of 1,681 sputum samples were collected for testing. Among 179 new TB cases notified, 65 cases were through traditional healers while 114 were through ADDOs. This total accounts 5% of all total cases notified by the project though community interventions.

	FY2 (Oct 2021-Sept 2022)		FY3 (Oct 2022-Sept 2023)		FY4 (Oct 2023-March 2024)		Total	
Indicators	ADDOs	Traditional healers	ADDOs	Traditional healers	ADDOs	Traditional healers	ADDOs	Traditional healers
Reached with TB Education	677	831	1768	1300	941	1000	3386	3131
Screened for TB	414	482	988	770	661	837	2063	2089
Presumptive cases	190	235	487	317	357	411	1034	963
Completed referrals to diagnostic centres	160	184	438	246	309	344	907	774
Sputum samples tested among referred	160	184	438	246	309	344	907	774
Confirmed with all forms TB cases	23	21	50	31	41	13	114	65
All forms TB case notifications initiated with TB medication	23	21	50	31	41	13	114	65

Conclusions: The use of intermediaries approach of Public-Private Mix by most of NGOs needs more support by the National TB Program in equipping private healthcare providers with TB screening skills and enable them screening registers for easy capture of clients that use ADDOs and traditional healers as primary healthcare seeking place.

PP35-1117-16 Tracking Anti TB Drug (ATT) sales in private health care sector to enhance TB case notification in Uttar Pradesh, India

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Background: Patients in India primarily seek treatment in the private sector. Uttar Pradesh (UP) alone recorded over 0.6 million TB cases in 2023 estimated 1 million as per India TB prevalence study 2019, indicating a significant potential for undetected cases. UP contributes to 33% of India's ATT drug sales. Diverse manual and digital methods of record keeping makes it difficult to capture accurate data of ATT sales.

As a consequence, failure to identify TB individuals (not reported on Nikshay) from these records not only perpetuates disease transmission but also restricts their access to essential healthcare services.

Design/Methods: With support from Food security and drug administration(FSDA), State TB cell and National Health Mission (NHM), an application was built to work as a centralized digital platform for tracking ATT sales across the state. The application will assist local TB staff in identifying unreported cases in Nikshay and effectively resolving noncompliance issues with TB patient notifications among private practitioners.

Results:

1. FSDA has taken ownership for hosting the application and amalgamated the app with their data of the registered pharmacies of UP, and have mobilized pharmacists for program engagement.
2. NHM formally approved the app for a pilot in five districts, disseminated directives to stakeholders, and commenced training sessions.
3. By March 28th, 37 wholesalers, who collectively support approximately 2000 retailers for ATT drug sales, underwent hands-on training to effectively utilize the application.

Background and challenges to implementation: Patients in India primarily seek treatment in the private sector. Uttar Pradesh (UP) alone recorded over 0.6 million TB cases in 2023 estimated 1 million as per India TB prevalence study 2019, indicating a significant potential for undetected cases. UP contributes to 33% of India's ATT drug sales. Diverse manual and digital methods of record keeping makes it difficult to capture accurate data of ATT sales. As a consequence, failure to identify TB individuals (not reported on Nikshay) from these records not only perpetuates disease transmission but also restricts their access to essential healthcare services.

Intervention or response: With support from Food security and drug administration(FSDA), State TB cell and National Health Mission (NHM), an application was built to work as a centralized digital platform for tracking ATT sales across the state. The application will assist local TB staff in identifying unreported cases in Nikshay and effectively resolving noncompliance issues with TB patient notifications among private practitioners.

Results/Impact:

1. FSDA has taken ownership for hosting the application and amalgamated the app with their data of the registered pharmacies of UP, and have mobilized pharmacists for program engagement.
2. NHM formally approved the app for a pilot in five districts, disseminated directives to stakeholders, and commenced training sessions.
3. By March 28th, 37 wholesalers, who collectively support approximately 2000 retailers for ATT drug sales, underwent hands-on training to effectively utilize the application.

Conclusions: Successful ongoing implementation hinges on effective stakeholder engagement, comprehensive training, and ownership and support from health authorities. The technology driven solution has the potential to increase notification, engagement with pharmacists, estimating numbers of individuals in private sector. A secondary outcome of tracking patient adherence through tracking medicine re-purchase is being explored.

PP35-1118-16 Streamlining referrals from private laboratories: Insights from an operational framework for private engagement in Delhi

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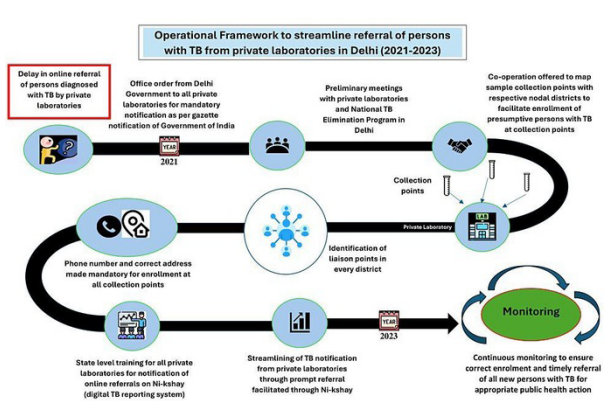
Background and challenges to implementation: Delhi boasts of several state-of-the-art private laboratories which offer quality tuberculosis (TB) diagnosis for people from across the country. Adding to this influx, is non-availability of complete contact details of persons who receive these services, thus, making it difficult to initiate an appropriate public health action. Over the years, this has resulted in a perennial cycle of unidentified denominators mandating public health actions. To address this concern, Government of Delhi conceptualized an operational framework in 2021 for streamlining the referrals from private laboratories, the impact of which is being explored in this study.
Intervention or response: In 2021, an operational framework to streamline referrals from private laboratories was rolled out in a phased manner. Identification of liaison points in every district of Delhi was completed. Sample collection centres were mapped to respective nodal districts for ease of public health actions. Data of patients referred by the mapped private laboratories during 2021-2023 was extracted from Ni-kshay (India's national TB reporting system) and analyzed on R version 4.2.3 to plot a control chart for analysis of any shift due to this intervention. Impact of operational framework was assessed by increase in referrals from private laboratories for appropriate public health actions.



Results/Impact: There was a 3-fold increase in private laboratories who were actively notifying persons with TB in 2023 (252) as compared to 2021(63). Among those diagnosed by private laboratories, 65% (6045) were successfully referred to their nearest health care facility for appropriate public health actions (z-score: 26.6801, p-value:< 0.001). A significant shift in process for referrals was observed on the control chart during the study period (7 points above UCL) suggesting that the shift was due to the intervention.
Conclusions: The operational framework successfully streamlined TB referrals from private laboratories in Delhi, thus signifying the need for its replication in similar high burden urban settings.

PP35-1119-16 Enhancing TB prevention and care through private sector collaboration in Papua New Guinea (PNG)

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Background and challenges to implementation: Tuberculosis (TB) remains a significant challenge in Papua New Guinea (PNG), with access to TB screening, diagnostics, and treatment being hindered by geographic barriers and financial constraints, leading to delays in diagnosis and treatment initiation, as well as high rates of treatment discontinuation. This pilot assessment investigates the benefits of TB service implementation at private sector workplace in a high-burden, resource-limited settings.
Intervention or response: In 2021, Santos, an Oil & Gas company in PNG, in close collaboration with the PNG government, initiated free TB screening, diagnostic and treatment services to allow easy access to high-quality TB services at the workplace. This included training of clinical staff, to deliver and manage the service. Individuals screening positive, underwent inhouse investigations including x-ray and laboratory-testing. TB patients received close treatment support to minimize loss to follow-up and allow for early workplace-reintegration.
Results/Impact: In 2023, 47 workers with signs and symptoms of TB based on clinical screening underwent chest x-ray and bacteriological testing for TB. In total 5/47 cases (10.6%) were diagnosed with DS-TB and commenced on treatment. No patients were lost to follow-up (LtFU), two patients have been cured with three patients still on treatment. Workplace and family screening was conducted on all patients.
Conclusions: In a resource-limited setting with a high burden of TB, free-of-charge symptom-oriented occupational health TB screening identified >10% of symptomatic employees with active TB. The integration of comprehensive TB services within one workplace ensured proper

follow-up and guaranteed treatment successes. Although numbers of patients are still limited in this project, preliminary results showcase a feasible approach for companies in high TB burden settings with low public health resources to prioritize workforce health and well-being.

PP35-1120-16 Engagement of the private sector to enhance the TB prevention cascade in high-burden areas of the Philippines

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Background and challenges to implementation: Contact investigation (CI) is the Philippines' strategy to identify people eligible for tuberculosis preventive treatment (TPT), which is the primary modality to prevent progression from latent infection to active tuberculosis (TB) disease. Despite passage of the universal healthcare (UHC) law in 2019 and scale-up of CI/TPT in public facilities since 2020, the number of individuals initiated TPT still did not meet the target from 2018-2022. No public-private mix has been documented to augment the TB prevention cascade in a subnational context. This study aimed to describe the private sector engagement in the UHC's primary care provider network (PCPN) of Negros Oriental, a high TB-burden province, and to estimate the TPT yield using this approach.
Intervention or response: We explored the role of a private primary care facility to augment the TB prevention cascade linked to UHC's national health insurance coverage. We reviewed the one-stop-shop active case finding (ACF) model, developed a screening algorithm that integrated CI/TPT processes in the workflow, and estimated the number of people eligible for TPT using a data collection tool.
Results/Impact: Provincial board resolution was passed to establish a private sector-engaged PCPN, wherein a private facility was positioned to augment TB screening and prevention in component municipalities (Figure 1).

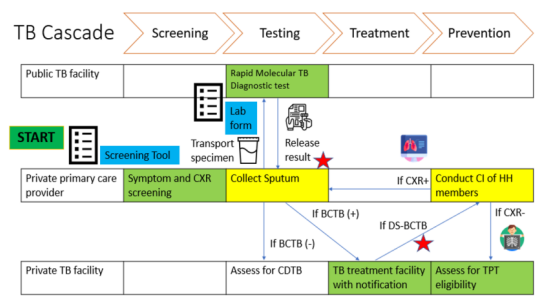

Figure 1. **Patient pathway in a private sector-engaged PCPN, where CI/TPT eligibility screening is incorporated in ACF workflow.**
(Acronyms: ACF – active case finding; BCTB – bacteriologically confirmed TB case; CDTB – clinically diagnosed TB case; CI – contact investigation; CXR – chest X-ray; HH – household; PCPN – primary care provider network; TPT – TB preventive treatment)

Among the screened clients in July-September 2023 (n=2919), 3.7% (n=107) TB contacts were identified. Results showed that 37 of 107 (34.6%) were "immediately-eligible" for TPT (with TB risk factors), while 70 (65.4%) required tuberculin skin test or IGRA.
Conclusions: CI/TPT integration into the ACF workflow may be used as an adjunct strategy to find more people eligible for TPT in the context of the UHC law. Aside from enhancing the TB preventive cascade, the private sector's linkage to the national health insurance scheme could create more opportunities to contribute to the country's TPT targets in a sustainable manner.

PP35-1122-16 Multi-sectoral approach to mainstream TB-related activities: Outputs in the state of Uttar Pradesh, India

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Background and challenges to implementation: To achieve the end TB goal, the Central TB Division has signed Memorandum of Understanding with various non-health government departments. These include Industries, Defence, Railways, Panchayati Raj Institution (PRI), Labour, Ministry of Small and Medium Enterprises (MSME), National Highways Authorities limited, Integrated Child Development Services (ICDS), among others.
A key objective is to leverage support from Industries and their Corporate Social Responsibility for the nutrition for individuals who are on TB medication and to streamline work of other departments with NTEP detect, treat and prevent activities.
Intervention or response: The State TB Cell and State TB Technical Support proactively engaged government departments and industry's CSR through in-person and virtual meetings with state level representatives wherein key objectives, activities and areas within which they could contribute to elimination of TB in their geographic or work-domain were discussed and decided
Results/Impact: In 2023, according to NI-KSHAY portal the state of UP has notified 6166 (1% of state total) individuals with active TB from Railways, Military Polyclinics, NABH Hospitals and few industries. A total of 59498 nutrition food baskets were given to 40938 (10%) of individuals on treatment for TB. The engagement with PRI catalyzed the Prime Minister TB free Panchayat campaign during the year and 2% of 50,000 panchayats were eligible to claim TB free status.

S#	Type of Department	Type of Facility	Notification in 2023
1	Government Department	ECHS	14
2	Government Department	ESI Hospital	1144
3	Government Department	NTPC	95
4	Government Department	Railway Hospital	402
5	Government Department	Prison	45
6	Private Hospital/CSR	Hindalco	16
7	Private Hospital/ CSR	Medanta Foundation	16
8	Private Hospital/CSR	Apollo Tyres	75
9	Private Hospitals	NABH Hospital	4359

Conclusions: Multi-sectoral Engagement is vital in the mission to eliminate tuberculosis from UP by 2025. It needs intense follow-up, perseverance and political will at district level for scale and sustenance.

PP35-1127-16 Assessment of inventory management practices of anti-TB drugs during the COVID-19 pandemic in a paediatric healthcare facility in Eswatini

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Background: Access to effective tuberculosis treatment is hindered by drug stockouts, delivery disruptions, poor storage conditions, and substandard quality and regulation of medicine, which in turn contributes to challenges in providing effective treatment for tuberculosis. There is a dearth of information on how inventory management practices of anti-tuberculosis drugs were affected during the COVID-19 pandemic.
This study aimed to assess its performance in a pediatric healthcare facility in the Kingdom of Eswatini.
Design/Methods: A retrospective record review was conducted from January 2021 to March 2022. Eight tracer commodities were selected and categorized into five treatment categories.
We assessed stock status information, which was classified into overstocked (more than 3 months of stock (MOS)), adequate (2-3 MOS), risk of stock out (1-2 MOS), and stocked out (less than 1 MOS). We also evaluated the loss rates and the stockout rates. Using global drug facility pricing, we calculated the total cost of losses.
Results: All the tracer drugs were overstocked at the beginning of 2021; however, by March 2022, only two drugs were overstocked. Drug stockouts were experienced starting November 2021 at a rate of 13%, and by March 2022, the stockout rate had increased to 63%. Rifampicin/Isoniazid/ Pyrazinamide, 75 mg/50mg/150 mg was out of stock for 5 months, Rifampicin, 150 mg and Isoniazid, 100 mg for 4 months respectively, and Rifampicin/Isoniazid, 75 mg/50 mg for 1 month. Furthermore, losses due to expiry dates were observed for 3 drugs, with the total cost of this loss being $1329.16.

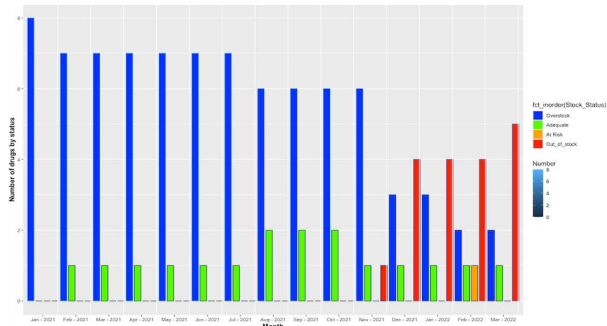

Figure. Stock status by month - January 2021 to March 2022.

Conclusions: This study has revealed that underutilizing anti-tuberculosis drugs during the early COVID-19 pandemic lockdowns led to dramatic changes in the stock status and the stockout of five essential anti-tuberculosis medicines by the end of the first quarter of 2022.
Thus, investments in managing anti-tuberculosis drugs will play a pivotal role in ensuring uninterrupted healthcare services.

PP35-1125-16 Leveraging intersectoral collaboration and molecular diagnostics for TB elimination in aspirational blocks of India: Insights from the IOCL Initiative

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Background and challenges to implementation: Tuberculosis (TB) remains a formidable public health issue in India, especially in aspirational blocks where healthcare access is constrained. Intersectoral collaboration offers a promising avenue for bolstering TB elimination endeavors by harnessing varied expertise and resources. The Central TB Division (CTD) of the Ministry of Health and Family Welfare (MOHFW) and the Indian Oil Corporation Limited (IOCL), supported by the Ministry of Petroleum and Natural Gas (MoPNG), aimed at enhancing TB case detection in aspirational blocks across Uttar Pradesh (UP), Chhattisgarh, Haryana, and Maharashtra.
Intervention or response: Central to this collaboration is the deployment of 251 molecular diagnostics facilitated by IOCL in February-March 2023 across the targeted aspirational blocks. This integration into existing healthcare

infrastructure has significantly augmented the capacity for early and precise TB case identification, particularly in remote areas with limited healthcare access.
Results/Impact: The early detection of TB cases, facilitated by rapid and sensitive diagnostic tools, has enabled prompt initiation of treatment and reduced community transmission. Between April and December 2023, a total of 54,067 tests were conducted using 251 molecular diagnostics, resulting in the detection of 6,258 cases in Uttar Pradesh, 975 cases in Maharashtra, 884 cases in Uttarakhand, and 349 cases in Chhattisgarh.
These findings underscore the efficacy of molecular diagnostics in enhancing TB case detection and subsequent management.
Conclusions: This manuscript highlights the pivotal role of intersectoral collaboration, particularly between the health and industry sectors, in tackling complex public health challenges like TB. The successful partnership between CTD, MOHFW, and IOCL exemplifies how pooling resources and expertise across sectors can expedite progress towards TB elimination goals.
These findings advocate for the scaling up of similar collaborative models nationwide to achieve sustainable gains in TB control, thus contributing to the global endeavor to end the TB epidemic.

PP35-1121-16 Improving quality of TB care in hospitals through the Private Big-Chain Hospitals Engagement Initiative in Indonesia

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Background and challenges to implementation: Indonesia is the second-highest country with tuberculosis (TB) burden in the world. It is estimated more than 1 million new TB cases each year. Nonetheless, Indonesia is among the countries with high number of missing cases, accounting for 9.8% of the total globally. In 2017, it is estimated 62% of TB cases in hospitals were not reported to the national TB Program (NTP). A concerted effort is required to improve hospital involvement in the TB program.
Intervention or response: Big-Chain Hospitals Engagement (BCHE) initiative aims to increase the involvement of hospitals in the TB program through the chain's central management approach. In 2022, a cooperative agreement (MoU) signed between NTP and each hospital central management that included 262 hospitals accross six chains. The MoU regulates standardized TB care in health facilities, including access to mWRD test, programmatic TB drugs, and TB information system, as well as community assistance for patients support. Key interventions include capacity building, mentoring and coaching, along with regular monitoring and evaluation meeting.
Results/Impact: From 2021 to 2023, number of hospitals reporting TB cases increased from 218 (85%) to 260 (99%), while TB case notifications doubled from 22.612 cases to 48.899 cases. Access to the mWRD tests increased from 194 (76%) to 257 (98%) hospitals. Challenges were identified, including a high turnover of TB programmer and limited logistic supplies (TB drugs and mWRD cartridges) at health facilities.

Indicators	2021	2022	2023
(n) TB Case Notification	22.612	40.664	48.889
(n) Hospitals Notified TB Cases	218 (85%)	245 (96%)	260 (99%)
(n) Hospitals' access to mWRD test	194 (76%)	239 (93%)	257 (98%)

Conclusions: The BCHE initiative is effective at improving TB case notification and providing high quality of TB care in hospitals. Leadership and commitment from central chain management are critical to the success and sustainability of this intervention.

PP31 Performance of TB and drug-resistant TB detection tools

PP31-1083-16 Comparison of targeted next-generation sequencing to line probe assays: Findings from the Seq&Treat study

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Background: Rapid and accurate detection of drug resistant tuberculosis is essential to the successful treatment of tuberculosis. Understanding how different molecular diagnostics perform in drug resistance detection can inform utility of different products for different use cases. The Line Probe Assay (LPA) is a DNA strip-based test that identifies mutations associated with drug resistance through binding of probes. Targeted Next-Generation Sequencing (tNGS) relies on the amplification of specific gene regions prior to sequencing.
Design/Methods: The Seq&Treat clinical study evaluated the performance of two tNGS solutions, Genoscreen and Oxford Nanopore, on samples from persons at risk for drug resistant tuberculosis. Hain LPA tests (MTBDRplus,

MTBDRsl) were run as a comparator test on all sediment samples. Diagnostic performance was assessed against a composite reference standard of phenotypic drug-susceptibility testing and whole-genome sequencing for both tNGS solutions and the comparator tests.
Results: We found similar sample failure rates ~5-10% across the tNGS solutions and LPAs, however there were difference in single target failure rates. Both tNGS solutions had a higher sensitivity compared to MTBDRplus for RIF and INH resistance detection. While the sensitivity for fluoroquinolone resistance was similar between LPA and Oxford Nanopore, it was higher on Genoscreen without a drop in specificity.
Conclusions: Our findings illustrate the power of tNGS performed on clinical samples, and the improved accuracy in comparison to LPA. In addition to improved performance for first line drugs, the ability of tNGS to generate comprehensive drug susceptibility information, including for new and repurposed drugs, will be important for future testing algorithms. The data presented here can provide insight for TB programmes as they consider updating their TB diagnostic algorithms and placement of tNGS in comparison to LPA.

PP31-1084-16 Role of immunohistochemistry with PGRS5 antibody in the diagnosis of cutaneous TB

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Background: Cutaneous tuberculosis (TB) is a paucibacillary disease and in the absence of microbiological confirmation, it is diagnosed on the basis of clinical features and histopathology. However, histopathological features being less specific, there is a need to explore the role of newer and more specific tests. The genome of *M. tb* , encodes a unique protein family known as PGRS (Polymorphic GC-rich Repetitive Sequences) family. These proteins are surface antigens of *M.tb* which play critical roles in pathogenesis and immune evasion. TB patients produce antibodies against such proteins.
Therefore, a study was planned to evaluate the role of IHC with PGRS5 polyclonal antibody in cutaneous TB patients.
Design/Methods: A prospective observational study was designed to study the role of immunohistochemistry (IHC) in 45 newly diagnosed patients of cutaneous TB. The diagnosis of cutaneous tuberculosis was based on clinical features. Skin biopsy was performed in all patients and biopsy specimen was processed for histopathology, CBNAAT and culture for *M.tb* . IHC of skin biopsy was done using PGRS5 polyclonal antibodies.
Results: Forty five new patients of clinically diagnosed cutaneous TB were enrolled. *M.tb* culture was positive in 20 (44.44%) patients and CB-NAAT detected M.tb in 21 (46.66%) patients. Histopathological diagnosis of TB was consistent in 37 (82.22%) patients. IHC with PGRS5 antibody was positive in 31 (68.89%) patients with a brown granular staining pattern. All the patients had favorable outcome with anti-tuberculosis treatment.
A significant agreement was seen between histopathology and IHC with anti-PGRS5 antibody. The sensitivity, specificity, positive and negative predictive value was 95%, 29%, 61% and 83% respectively.
Conclusions: Immunohistochemistry is a cost effective screening test which can be used to diagnose doubtful cases of cutaneous tuberculosis with inconclusive histopathology which are culture and or CBNAAT negative.

PP31-1081-16 What proportion of unreported community-based TB is probably infectiousness and can AI-driven computer-aided detection accurately identify cavitary disease as a marker of infectious TB?

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Background: The infectiousness of persons with TB residing in the community who do not self-report to healthcare facilities remains poorly defined. Whether novel AI-driven computer-aided-detection (CAD) can identify those with cavitary disease (proxy for infectiousness), during community-based active case-finding (ACF) for TB, requires clarification.
Design/Methods: Participants with microbiologically-confirmed TB (sputum Xpert Ultra and/or culture positivity), recruited from two large-scale, multicentre, community-based ACF studies in South Africa (XACT-3 and XACT-19), underwent point-of-care (POC) chest radiography analysed by CAD (qXR v4.0) and two expert human readers. All participants underwent PET-CT scanning. Accuracy of CAD to detect cavitary disease was compared to PET-CT (radiological reference standard; presence of cavitation plus SUVmax of >2.5 suggesting metabolically-active cavitary disease was used as a proxy for probable infectiousness).

Results: A total of 1,455 participants were enrolled and 112 (7.7%) had microbiologically-confirmed TB (54/112 [48.2%] were asymptomatic). CXRs and PET-CTs were available in 82.1% (92/112). 61/92 (66.3%) had cavitary disease on PET-CT (median SUVmax 5.4). At the developer-recommended cavity threshold, CAD sensitivity and specificity (95% CI) were 60.7% (47.3-72.9) and 84.6% (65.1-95.6), respectively.
Compared to human readers, CAD had statistically similar sensitivity (60.7% [47.3-72.9] versus 66.7% [52.5-78.9]), specificity (84.6% [65.1-95.6] versus 73.1% [52.2-88.4]), and PPV (90.2% [78.6-95.9] versus 83.7% [72.7-90.9]). CAD also had statistically similar specificity in detecting cavitary disease compared to human readers in participants with sub-clinical TB, i.e., asymptomatic, (85.7% [63.7-97.0] versus 71.4% [47.8-88.7]) and in people living with HIV (87.5% [47.4-99.7] versus 75.0% [34.9-96.8]).
Conclusions: A high proportion (two-thirds) of persons with microbiologically-confirmed TB had evidence of metabolically-active cavitary disease suggesting they were probably infectious, thus negating the dogma that community-based persons with TB, whether asymptomatic or not, have low-burden disease and are likely non-infectious. CAD may be a useful POC rule-in test to detect cavitary disease and could inform contact tracing and treatment strategies in endemic settings.

PP31-1082-16 Expediting detection of drug resistance TB in routine settings: Lesson learned from the USAID – TIFA supported project, Tanzania

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Background: Drug resistance tuberculosis (DR-TB) is difficult to diagnose and treat. Despite low prevalence of DR-TB in Tanzania, majority are diagnosed by Xpert Ultra or Line Probe Assay (LPA) which has many technical and operational drawbacks.
Background and challenges to implementation: Diagnosing and treating drug-resistant tuberculosis (DR-TB) presents with a number of challenges. Despite low DR-TB prevalence in Tanzania, majority are diagnosed by Xpert Ultra or Line Probe Assay (LPA) which is a centralized platform with low throughput and thus translating to long turnaround time (TAT) of results.
Intervention or response: We introduced Xpert XDR Assay in zonal laboratories to improve access to rapid molecular diagnostics. Three Xpert XDR machines were installed at Kibongo'to Infectious disease Hospital (KIDH), Dodoma Regional Referral Hospital (DRRH) and NIMR-Mbeya. Laboratory technicians were trained and the machines were linked to the National Electronic TB register (ETL) for automated feedback of results. Baseline DR-TB results before (Pre-TIFA) and after (post-TIFA) were analyzed for TAT, performance and resistance patterns. Data was analyzed using the STATA software. We described the patterns of DR-TB using proportions, summarized TATs using medians which were then compared across groups using Mann Whitney U test. We plotted a Kaplan Meir curve and used the log rank test (alpha set at <0.05) to compare pre and post TIFA TATs of results.
Results/Impact: LPA was mainly used for DR-TB diagnosis prior to introduction of Xpert XDR Assay. A total of 979 samples were tested between Sep 2021 to Aug 2023. Of the samples, 80.1% (784/979) were tested using LPA and 19.9% (195/979) using Xpert XDR Assay. Samples tested by Xpert XDR Assay increased from 20 to 175 during pre-TIFA and post-TIFA respectively. Median TAT (IQR) was 1(1-9) day for Xpert XDR Assay compared to 20(20-21) days for LPA, p<0.0001. The overall TAT for DR-TB results was 31(27-38) days during pre-TIFA period and 17(15-17) days during post-TIFA period, p<0.0001.
Conclusions: Xpert XDR Assay reduced TAT for DR-TB diagnosis and if scaled up could ensure timely availability of DR-TB results, facilitating the selection of the most suitable anti-TB regimen for DR-TB patients.

PP31-1078-16 Diagnostic accuracy of tongue swab testing in persons with sputum Xpert Ultra *Trace* results

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Background: Molecular amplification of tongue swab samples is a non-sputum-based investigational test to diagnose pulmonary tuberculosis (pTB). An improved method recently reported >90% sensitivity overall. Performance characteristics in persons with low-positive results on sputum molecular tests are unknown.
Design/Methods: Adults in South Africa and Uganda with sputum Xpert Ultra *trace* (TR+) results were recruited for confirmatory evaluation and follow-up. They

underwent symptom evaluation, examination, chest X-ray, further sputum testing (repeat Xpert Ultra and two solid and liquid mycobacterial cultures), and two tongue swabs. Tongue swabs were tested using PCR amplification of the IS6110 gene. A single copy detected on >=1 swab was considered TB-positive. TR+ persons not diagnosed with TB at baseline were re-evaluated at 1 and 3 months. We determined the sensitivity and specificity of tongue swabs for TB against a microbiologic reference standard (MRS: any positive result from Xpert Ultra or TB culture) and a composite reference standard (CRS: a clinical recommendation for TB treatment or any positive culture) at baseline.

Results: 157 TR+ participants (76, 48% women, median age 37 [IQR 30-47]) provided tongue swabs at baseline. 39 (25%) were positive for TB by MRS and 56 (36%) by CRS. Sensitivity and specificity of tongue swabs against MRS were 18% [95% CI 7-34%] and 94% [88-98%], and vs. CRS were 14% [6-26%] and 93% [86-98]. Among 9 TR+ participants with positive TB culture but negative Xpert at baseline, 1 (11%) was tongue swab-positive. Another 2/13 (15%) TR+ persons with negative baseline culture and Xpert had a positive tongue swab at baseline, and by 3-months were culture positive. Sensitivity was higher in persons with HIV.

		Total		Uganda		South Africa	
Participant HIV Status	Reference Standard	Sensitivity n/N % (95% CI)	Specificity n/N % (95% CI)	Sensitivity n/N % (95% CI)	Specificity n/N % (95% CI)	Sensitivity n/N % (95% CI)	Specificity n/N % (95% CI)
HIV-positive	Baseline MRS	7/27 0.26 (0.11, 0.46)	54/47 0.95 (0.85, 0.99)	4/13 0.31 (0.09, 0.61)	15/15 1.00 (0.78, 1.00)	3/14 0.21 (0.05, 0.51)	39/42 0.93 (0.81, 0.99)
	Baseline CRS	7/36 0.19 (0.08, 0.36)	42/45 0.93 (0.82, 0.99)	4/20 0.25 (0.06, 0.44)	8/8 1.00 (0.63, 1.00)	3/16 0.19 (0.04, 0.46)	34/37 0.92 (0.78, 0.98)
HIV-negative	Baseline MRS	0/11 0.00 (0.00, 0.28)	47/50 0.94 (0.84, 0.99)	0/8 0.00 (0.00, 0.37)	33/33 1.00 (0.89, 1.00)	0/3 0.00 (0.00, 0.71)	14/17 0.82 (0.57, 0.96)
	Baseline CRS	0/15 0.00 (0.00, 0.22)	42/45 0.93 (0.82, 0.99)	0/11 0.00 (0.00, 0.29)	30/30 1.00 (0.88, 1.00)	0/4 0.00 (0.00, 0.60)	12/15 0.80 (0.52, 0.96)

Table 1. Sensitivity and specificity of tongue swabs for TB diagnosis in people with trace Xpert Ultra sputum results, against microbiological (MRS) and composite (CRS) reference standards, stratified by participant HIV status.

Conclusions: Tongue swabs had low sensitivity and moderately high specificity for TB in persons with a *trace* Xpert Ultra result. Tongue swabs have limited value for diagnosing people with low-positive molecular test results of uncertain clinical significance.

PP31-1079-16 Nanopore sequencing for the detection of drug-resistant TB compared to standard-of-care drug susceptibility testing in Kyrgyzstan

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Background: The third edition of the WHO guidelines for rapid diagnostics for tuberculosis (TB) detection recommends the implementation of targeted next-generation sequencing (tNGS) for the diagnosis of drug resistant (DR) TB. It also identifies key research priorities, including assessment of the impact of tNGS on patient-important outcomes. We present the first results of using the Oxford Nanopore Technologies (ONT) tNGS TB assay compared to standard of care (SOC) drug susceptibility testing (DST) in Kyrgyzstan.

Design/Methods: From an ongoing study that will enroll 782 TB patients, we analyzed data from the first participants aged >18 years with signs and symptoms of pulmonary TB, enrolled between January to March 2024 in three regions of Kyrgyzstan. Sputum samples were collected and subjected to SOC-DST (i.e., Xpert, line probe assay and phenotypic DST). Additionally, sequencing was done using the ONT tNGS TB assay on a MinION device, targeting 24 genes related to 16 anti-TB drugs, including all BPaL drugs. The results of all tests were compared to explore clinical significance.

Results: Thus far, 423 patients were included, of which 62 (15%) were diagnosed with active TB. In 55 patients (89%), Xpert MTB/RIF detected *Mycobacterium tuberculosis*. Of these, 27 patients were tested using the ONT tNGS assay. SOC DST was completed for 21; for six patients phenotypic DST is still pending. SOC DST revealed isoniazid but not rifampicin resistance in nine patients (33%) and rifampicin plus isoniazid resistance in ten patients (37%). The ONT tNGS assay results were generally concordant with SOC DST, but identified additional resistance, including to levofloxacin and moxifloxacin, in 18 patients.

Conclusions: The first results of this study show that using ONT tNGS for the diagnosis of TB in Kyrgyzstan is promising and highlight the potential of incorporating tNGS into routine TB diagnostic algorithms to reach accurate and timely treatment decisions.

PP31-1080-16 Multipurpose value of Xpert Ultra on urine: An alternative to sputum and can detect disseminated TB and TB meningitis

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Background: Xpert Ultra has very high sensitivity and is recommended for use in pulmonary and extrapulmonary TB. The evidence on the value of testing urine samples is limited, its use in routine programs poorly described.
Design/Methods: Xpert Ultra results from samples tested between April 2020 and March 2021 were extracted from the laboratory information system for the TB laboratory in Johannesburg, South Africa. Analysis was initially restricted to urine samples, and descriptive statistics were performed. All positive results were then de-duplicated, and a search for matched TB results from the same individuals was performed limited to the same episode (+/- 4 weeks). The relationship between Xpert trace results and alternative sample types was evaluated using logistic regression adjusting for age and sex.
Results: A total of 2918 urine samples were tested, with 362 (12.4%) testing positive for TB. The number of trace-positive tests of all positives was 95 (26.0%). Among those testing positive, 188 (52.8%) had a non-urine Xpert Ultra result or an additional urine culture result on MGIT. Among these individuals, the majority (130/188; 70.2%) had a result confirming the urine Xpert Ultra TB result, either an Xpert Ultra positive at another disease site or a urine TB culture positive. The proportion trace among those with or without a confirmatory result was similar (28.5% vs 23.5%: p>0.05). The majority of those with a confirmatory result had a matched sputum TB positive result (77; 58.7%), followed by blood culture (29; 22.1%) or CSF (12;9.2%). Sputum results were more likely to be trace positive than results on blood culture or cerebrospinal fluid (adjusted OR = 2.73; p=0.05).
Conclusions: The use of Xpert Ultra on urine was confirmed in a high proportion of individuals further investigated for TB, with almost one-third having evidence of severe or disseminated disease. The use of this alternative sample is promising.

PP31-1085-16 Effectiveness of the Xpert XDR assay for rapid triage-and-treatment of drug-resistant TB: Interim results from the TRIAD study

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Background: GeneXpert MTB/XDR (Xpert XDR; Cepheid) testing has replaced Line Probe assay as the diagnostic test for second line TB drug resistance in TB endemic settings.
In a Phase 4 operational study we assessed the effectiveness of the Xpert XDR assay for rapid triage-and-treatment of DR-TB.
Design/Methods: We enrolled adult participants that tested positive for Mycobacterium tuberculosis (M.tb) with rifampicin resistance (R) (Cohort 1) in study sites in South Africa, Nigeria and Ethiopia. Enrolled participants' sputum samples underwent Xpert MTB/XDR testing as a triage test to guide early initiation of appropriate all-oral DR-TB treatment.
Using the Wilcoxon Rank Sum test, we compared time from first sputum collection to starting an appropriate DR-TB treatment regimen with a historical cohort comprising RR-TB participants that accessed DR-TB care at each implementing site over approximately 24 months prior to study start (Cohort 3).
Appropriate DR TB treatment in this study was defined as initiation of at least four drugs to which resistance had not been identified by the diagnostic strategy.

Results: Between June 2022 and March 2024, a total of 617 patients were enrolled into Cohort 1 and 322 into Cohort 3. Overall, median time in days (IQR) to starting an appropriate DR regimen was 7 (3,11) in Cohort 1 vs 7 (3,16) in Cohort 3, p= 0.004. When disaggregated by geographic site, median time to appropriate DR TB regimen start in Cohort 1 versus Cohort 3 was 8 (6,13) vs 14 (7,34), p <0.001 for South Africa; 5 (1,9) vs 14 (5, 32) p <0.001 for Nigeria and 3 (1,6) vs 5 (2,11), p= 0.006 for Ethiopia, respectively.
Conclusions: Rapid triage-and-appropriate treatment of DR-TB using Xpert XDR testing was effective in reducing time to appropriate regimen initiation. Xpert XDR testing offers an efficient tool for clinician guided appropriate drug selection for drug-resistant tuberculosis programmes.

PP31-1086-16 Fluoroquinolones resistance in Peruvian M. tuberculosis strains by Xpert MTB/XDR and next-generation sequencing: A comparison study

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Background: Fluoroquinolones (FLQ) are considered one of the main drugs used in the treatment of MDR/RR-TB. Levels of resistance to moxifloxacin (Mfx) are variable and directly correlate with the presence of specific mutations.
Design/Methods: Six *Mycobacterium tuberculosis* (MTB) strains isolated from patients with drug resistant tuberculosis were evaluated by Xpert MTB/XDR and Next Generation Sequencing (NGS) for determination of FLQ resistance at Peruvian National Institute of Health. The reproducibility of Xpert MTB/XDR was verified using three replicates for every strain. Mutations associated with resistance to FLQ were set according the second version of the catalogue of mutations endorsed by the World Health Organization.
Results: Five different *gyrA* mutations associated with low (D89N, A90V, D94A) or high (D94N, D94H) level of resistance to Mfx were identified. Two strains harbored mixed MTB subpopulations with two *gyrA* mutations each. A correspondence between mutations and Xpert mutant probes Melting temperature (Tm) pattern was established. Both methods detected resistance for FLQ in all strains. The five initial strains showed the same probes Tm pattern in all replicates.
Of these, four strains had a total agreement between the probes Tm pattern and the corresponding mutation (100% Allele frequency [AF]), while one strain (PER-MTB-01) showed a probes Tm pattern associated only with A90V mutation although this strain harbored the A90V (AF=87%) and D89N (AF=12%) variants. PER-MTB-06 strain harbored the mutations A90V (AF=74%) and D94N (AF=16%). For this strain, in 2/3 replicates the probes Tm pattern corresponded with A90V mutation (showing "Detected Low" result by Xpert assay), while in 1/3 replicate an additional probe Tm associated with D94N was detected (showing "Detected" result) (Figure 1).

Peruvian MTB strain	XPERT MTB/XDR Tm mutant probe detected	Resistance level for FLQ	Replicates (Positive / Analyzed)	NGS Mutation	Allele frequency	Resistance level for Mfx
PER-MTB-01	gyrA1-mutB melt gyrA2-mutA melt gyrA3-mutB melt	Detected Low	3/3	*gyrA*_A90V *gyrA*_D89N	87% 12%	Low-level Low-level
PER-MTB-02	gyrA1-mutB melt gyrA2-mutA melt gyrA3-mutB melt	Detected Low	3/3	*gyrA*_A90V	100%	Low-level
PER-MTB-03	gyrA1-mutA melt gyrA2-mutA melt	Detected Low	3/3	*gyrA*_D94A	100%	Low-level
PER-MTB-04	gyrA1-mutB melt gyrA2-mutB melt gyrA3-mutC melt	Detected	3/3	*gyrA*_D94H	100%	High-level
PER-MTB-05	gyrA1-mutB melt gyrA2-mutB melt gyrA3-mutC melt	Detected	3/3	*gyrA*_D94N	100%	High-level
PER-MTB-06	gyrA1-mutB melt gyrA2-mutA melt gyrA3-mutB melt	Detected Low	2/3	*gyrA*_A90V *gyrA*_D94N	74% 16%	Low-level, High-level
	gyrA1-mutB melt gyrA2-mutA melt gyrA3-mutB melt gyrA3-mutC melt	Detected	1/3	*gyrA*_A90V ***gyrA*_D94N**	74% 16%	Low-level, High-level

Figure 1: Correspondence between Xpert MTB/XDR and Next Generation Sequencing (NGS) results. Moxifloxacin mutations are compared with mutant probe Tm detected by Xpert MTB/XDR in Peruvian MTB strains resistant to fluoroquinolones. **MTB**: *Mycobacterium tuberculosis*, **FLQ**: fluoroquinolones, **Mfx**: moxifloxacin.

Conclusions: The presence of mixed strains could interfere with the correct interpretation of the results of the Xpert MTB/XDR cartridge, especially for drugs for which resistant subpopulations are commonly observed.

PP38 Managing TB, operational research, outcomes and perspectives

PP38-1157-16 Recurrence of TB and associated risk factors in Taiwan: A retrospective cohort from 2012 to 2019

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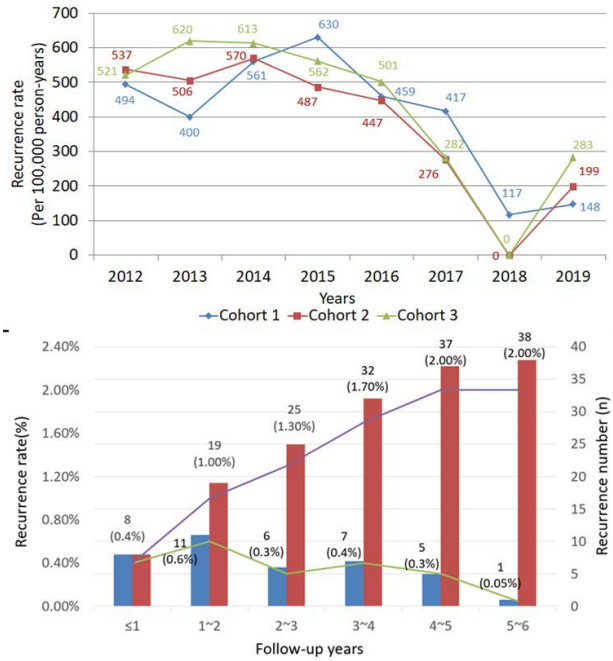
Background: Despite effective short-course anti-TB treatments, TB recurrence remains an important issue in public health. This study aims to investigate the rate of recurrence of TB and its associated risk factors in Taiwan.
Design/Methods:
Patients with active TB who completed anti-TB treatment from 2012 to 2019 at Taipei Veterans General Hospital were identified and included for analysis. All enrolled cases were followed for up to 6 years to identify TB recurrence, which was detected by the TB notification system in Taiwan CDC. The evolving trends in annual rates of TB

recurrence were examined. Independent demographic, clinical, and microbiological factors associated with TB recurrence were also investigated.

Results: A total of 1875 patients with active TB were enrolled for analysis. The overall TB recurrence rate was determined to be 2.0% (equating to 434 per 100,000 person-years), with a median follow-up duration of 72 months. A notable decline in the recurrence rate was observed post-2017. The peak recurrence rate was observed during the second year following treatment completion. Independent factors associated with TB recurrence were a BMI <20 kg/m² (adjusted hazard ratio [aHR]: 4.35, 95% CI: 1.68-11.30, p=0.003), a history of previous TB (aHR 5.18, 95% CI: 2.11-12.73, p<0.001), and 2-month sputum TB culture non-conversion (aHR:2.84, 95% CI: 1.11-7.25, p=0.029). These observations were further corroborated through subgroup analyses, encompassing pulmonary TB and culture-confirmed pulmonary TB.



Conclusions: The TB recurrence rate is low in Taiwan and showing a declining trend. Independent factors associated with TB recurrence included low BMI, previous TB, and 2-month sputum TB culture non-conversion.

PP38-1152-16 The role of a shorter treatment regimen in the treatment outcome of multi-drug-resistant TB in Afghanistan

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Background and challenges to implementation: Drug-resistant tuberculosis (DR-TB) remains a global public health crisis, with only one in three people with DR-TB able to access life-saving care and a low treatment success rate. This poses a significant challenge for the Afghan health system.

The TB Program began the all-oral bedaquiline-containing treatment regimen, which lasts 18-20 months longer, in 2020 across five cities: Herat, Balkh, and Nangarhar. In 2021, the TB Program transitioned to implementing the shorter 9-11 months treatment regimen following the adoption of the new WHO recommendation on using the oral shorter treatment regimen in the national DR-TB guideline.

Intervention or response: In 2021, clinicians were trained and started the shorter treatment regimen that contains 6 Bdq-Lfx-Cfz-Eto-Z-E-Hh-B6/5 Lfx-Cfz-Z-E-B6 in three PMDT sites. The sample transport system was established to perform drug susceptibly tests in the national reference laboratory.

The patients underwent ambulatory treatment for TB with their families, while the TB Program partners covered transportation costs for TB patients to attend their monthly follow-up appointments.

Results/Impact: In 2021, 387 DR-TB cases were enrolled for treatment in the seven PMDT sites. Among four PMDT sites, 295 patients began the 18-20-month all-oral treatment regimens, 190 of them were successfully treated (64%), 59 were lost to follow-up (20%), 35 percent died (12%) and 11 patients (4%) were not evaluated, and treatment failed.

Of the other three PMDT sites, 92 of them started the shorter 9-11-month all-oral treatment regimen. A total of 79 patients were successfully treated (86%), 6 were lost to follow-up (7%), 4 percent died (4%) and 3 patients (3%) were not evaluated, and treatment failed.

Regimen	Number of cases registered for treatment in 2021	Cured	Complete	Lost to follow up	Failed	Died	Not evaluated	Treatment success rate %
Oral long course (18-20 months)	295	179	11	59	6	35	5	64%
Oral short course (9-11 months)	92	17	62	6	3	4	0	86%

Table 1: DR-TB treatment outcome in Afghanistan (2021).

Conclusions: Treatment outcomes were significantly improved by initiating the shorter all-oral treatment regimen and applying the ambulatory treatment with the support of family members.

PP38-1153-16 Treatment outcomes of rifampicin- or multi-drug-resistant TB in children and adolescents from an eight-year retrospective cohort in Bandung, Indonesia

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Background: Data on children and adolescents treated for rifampicin-/multidrug-resistant tuberculosis (RR/MDR-TB) in Indonesia are lacking. This study aimed to describe a cohort of children and adolescents with RR/MDR-TB, with assessment of treatment outcomes and associated risk factors.
Design/Methods: A retrospective cohort study was performed in children and adolescents aged <18 years treated for RR/MDR-TB at Hasan Sadikin Hospital, Bandung, Indonesia, from January 2016 to March 2024. Multivariable logistic regression analyses were used to calculate adjusted odds ratios (aOR) for predictors of mortality and any unfavorable outcome.
Results: Among 84 children and adolescents with RR/MDR-TB included in this study, 69 (82.1%) were adolescents aged 10-17 years, 54 (64.3%) were female, 34 (40.4%) were severely malnourished, 54 (64.3%) were culture-positive, and none were HIV-positive.
Among 69 patients whose outcome data were available, 48 (69.6%) were successfully treated, 14 (20.2%) died (including 5 who died before treatment initiation), and 7 (10.1%) were lost to follow-up (LTFU) (including 5 who were pre-treatment LTFU); treatment was ongoing in 15 patients.
Predictors of mortality (before/during treatment) included shortness of breath on admission (aOR: 6.43, 95%CI: 1.30–49.06), high bacterial load with low CT values on Xpert MTB/RIF assay (aOR: 16.96, 95%CI: 1.61–260.5), and the presence of lung cavities on chest radiograph (aOR: 4.83, 95%CI: 1.07–23.35). Lung cavities were also associated with unfavorable outcome (combined death and LTFU) (aOR: 3.63, 95%CI: 1.01–13.20).
Among those who received treatment, neither treatment duration (shorter *vs.* longer) nor the type of regimen (all-oral *vs.* injectable-containing regimens) was significantly associated with mortality or unfavorable outcome.
Conclusions: Baseline indicators of severe/extensive disease, including high bacterial load and the presence of lung cavities, were associated with worse outcomes. The high proportion of pre-treatment mortality and LTFU reflects complex patient pathways and delays in diagnosis and treatment, which require interventions to remove barriers to accessing care.

PP38-1150-16 Programmatic experiences of linezolid use for drug-resistant TB in Taiwan

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Background: The programmatic management of drug-resistant tuberculosis (DR-TB) in Taiwan has maintained a high success rate (> 80%) by Taiwan multidrug-resistant tuberculosis consortium (TMTC) since 2007. As TMTC began to adopt short regimens along with new and repurposed drugs, the use of linezolid among DR-TB patients increased. To better manage adverse drug reactions (ADRs), TMTC initiated active drug safety monitoring (aDSM) in 2017, followed by therapeutic drug monitoring (TDM) in 2022.
This retrospective study aims to examine programmatic experience in managing linezolid use in Taiwan from one of the five TMTC centers.
Design/Methods: From 2017 to 2023, DR-TB patients treated with linezolid were enrolled. Indications to use linezolid included:
1. Constructing a long regimen with at least 4 (likely) effective drugs, or
2. Replacing injectables in standardized 9-month short regimen, or
3. Using the 6-month bedaquiline-pretomanid-linezolid with/without moxifloxacin (BPaL/BPaLM) regimen.
Clinical management of linezolid-related ADRs ranged from supportive care, temporary interruption, dose change (reducing daily dosage or increasing dosing interval), to permanent discontinuation of linezolid.
Results: Forty-nine DR-TB patients with a mean age of 55 ± 17 years were included; 35 (71%) were male, 26 (53%) on long regimen, 14 (29%) 9-month regimen, and 9 (18%) BPaL/BPaLM regimen. Forty-one patients (84%) were cured, 7 (14%) death, and 1 (2%) loss-to-follow-up. Linezolid-related ADRs occurred in 42 (86%) patients, the most frequent being myelosuppression (33, 67%) and

peripheral neuropathy (18, 37%). Thirty patients permanently discontinued linezolid due to treatment completion, 16 ADRs, and 3 deaths related to comorbidities. After excluding the 3 deaths, patients treated with short regimen or with dose change were more likely to complete linezolid treatment.

	Due to adverse drug reactions (n=18)	Due to treatment completion (n=30)	p value
Age, mean ± SD, yr	52 ± 18	54 ± 16	0.72
Male sex, n (%)	13 (81)	20 (66)	0.49
Linezolid treatment duration, median (IQR), d	101 (51-145)	194 (83-224)	0.02
Myelosuppression, n (%)	13 (81)	18 (60)	0.19
Peripheral neuropathy, n (%)	7 (44)	11 (37)	0.75
Using short regimen, n (%)	4 (25)	19 (63)	0.01
With TDM, n (%)	1 (6)	9 (30)	0.13
With dose change, n (%)	4 (25)	22 (73)	0.004

Table1. Clinical characteristics of patients who permanently discontinued linezolid.

Conclusions: The risk of discontinuing linezolid permanently due to ADRs was significantly reduced by using short regimens and dose modification guided by a robust aDSM, which could be further fine-tuned with TDM.

PP38-1154-16 Accelerating implementation of shorter, all-oral regimens for drug-resistant TB: Lessons from BPaLM roll out in Eswatini

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Background and challenges to implementation: The noble 6-month long all oral (MDR-TB) treatment regimen containing bedaquiline-pretomanid-linezolid-moxifloxacin (BPaLM) could offer a greater benefit to patients and National Tuberculosis Control Programs (NTCP) compared to 9 or 18-months long regimens. Despite the World Health Organization's (WHO) endorsement of this regimen in May 2022, the adoption and implementation by the programs remain slow. Eswatini rapidly achieved nationwide access to the BPaLM regimen in early 2023 and may serve as a model for other countries.

Intervention or response: The Eswatini NTCP sensitized stakeholders soon after WHO rapid communication on BPaLM recommendation. Pretomanid, ordered through Global Drug Facility, arrived in country in December 2022.The program developed a transition plan to guide implementation of BPaLM regimen in February 2023 with involvement of MDR-TB clinicians, recipients of care, National Tuberculosis Reference Laboratory, Central Medical Stores, Regional Health Management teams, National HIV Program and implementing partners. Concurrently a readiness assessment was also conducted and identified strategies to facilitate equitable access of the BPaLM regimen nationwide. This exercise was conducted in discussion groups, each group was formed with expertise in relevant areas and used a template to guide discussion (see table 1). A standard operating procedure (SOP) on MDR-TB clinical management, inclusive of the BPaLM regimen, was developed. Training of DR-TB clinicians and site pharmacists was conducted using the SOP.

Results/Impact: The resulting transition plan for the BPaLM regimen led to the first initiation for MDR-TB on the 22nd of February 2023. This momentum continued throughout 2023, and the by the end of the year, almost 50% of patients enrolled on MDR TB treatment benefited from BPaLM regimen.

Thematic area	Discussion outputs of Transition Plan
Revision of guidelines	Prior to a complete guideline update an SOP and algorithm with different regimens were developed to guide implementation.
Quantification, procurement and supply chain management	Based on historical data for DR-TB enrolment and data from the drug resistance prevalence survey in 2018, it was estimated that 65% of patients diagnosed with RR-TB would be eligible for BPaLM and 3% for BPaL.
Training Plan	The plan defined target participants, timelines, and the mode of training.
Communication Plan	Targeted both facility and community based health care workers including DR-TB affected communities.
Laboratory capacity	Capacity to support BPaLM implementation co-existed with episodes of laboratory reagent stock outs. There were plans to include Pretomanid DST as soon as the guidance was available.
Monitoring and Evaluation	Revision of interim and end of treatment outcomes for BPaLM and BPaL was discussed. A quarterly data review was planned with the M&E team to monitor the implementation of BPaLM/BPaL regimen use.
Active Drug Safety Monitoring (ADSM)	The structure and screening tools existed in the DR-TB sites, but there was a need to strengthen reporting. With support from Global Fund, the NTCP replaced 18 faulty ECG machines.
Patient support package	The program advocated for transport support for post-treatment follow-up of patients enrolled on BPaLM, and recommended minor revisions for the consent form, education, and counselling materials.
Supervision and support strategies	The program planned semi-annual supportive supervision visits by national and regional teams as well as clinical management support through bi-weekly clinical meeting and ad hoc calls to DR-TB experts when needed.

Conclusions: Multidisciplinary transition planning resulted in a well-coordinated process for BPaLM roll out in Eswatini that can inform planning in other TB/HIV

high-burden countries. A transition plan, SOP, algorithm, readiness assessment output and training plan were available to guide implementation.

PP38-1158-16 Improving paediatric TB management in national TB programmes in sub–Saharan Africa: Role of the Uganda Supranational Reference Laboratory

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Background and challenges to implementation: The Uganda Supranational Reference Laboratory (SRL) was designated by the World Health Organization (WHO) in 2013 to offer technical assistance (TA) to 21 countries in sub–Saharan Africa in tuberculosis (TB) diagnosis, training, and developing national strategic plans. In 2022 WHO endorsed the simple one-step (SOS) stool processing method to diagnose TB in children using GeneXpert. To facilitate smooth uptake of this new method in the respective TB diagnostic networks, countries needed support to design implementation plans, develop guidelines and policies.
Intervention or response: In July 2023, the Uganda SRL received a grant through the United States Agency for International Development's TB Implementation Framework Agreement, to provide TA to Zimbabwe, Liberia, Tanzania and Botswana to implement SOS. The SRL provided support in designing and reviewing country implementation plans, facilitating in-country stakeholder engagements, and training in-country personnel on the SOS method. The SRL provided continuous follow-up through virtual and physical support supervisions on the agreed actions and recommendations.
Results/Impact: Through SRL's TA, countries conducted in-country stakeholder engagement activities, held national trainings to create pools of clinical and laboratory master trainers that increased the number of sites trained on SOS and continued to support SOS activities. Endorsement of the implementation plans by the TB programs in each country led other funders to include SOS activities in their pediatric TB programming and country funding mechanisms. Additionally, all four countries reviewed and updated guidelines and data collection tools, and are seeing increased numbers of TB cases identified among children 0-14 years.
Conclusions: The SRL Uganda model of technical assistance and in-country stakeholders supporting TB activities has proved to be catalytic, and facilitates faster uptake of new techniques by expanding the pool of funders, partners, and trainers. This has further strengthened the clinic-lab interface to reduce policy implementation gaps and improve TB screening, diagnosis and linkage to care.

PP38-1155-16 2nd month conversion impact on TB treatment outcomes: Analysis in Indonesian cohort 2017-2023

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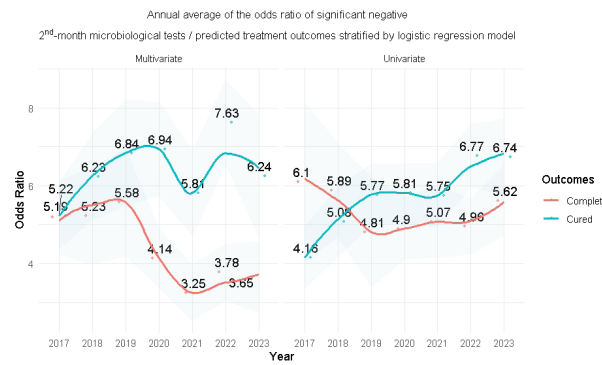
Background: Persistent negative culture conversion at two months of treatment despite increased tuberculosis bacteria clearance rates from sputum is concerning and linked with treatment failure and drug resistance. This study aimed to explore the relationship between sputum conversion at two months of treatment and the treatment outcomes.
Design/Methods: A multi-year cross-sectional study of registered drug-susceptible pulmonary tuberculosis cases in Indonesia from 2017 to 2023. Multinomial logistic regression assesses the probability of 2nd-month microbiological test results predicting the treatment outcomes, focusing on plausible odds ratios between 0 and 10.
Results: Over the study period, 1,542,730 patients analyzed, primarily male (60%) adults over 15 (97.42-98.61%) at about 42 years old with bacteriologically confirmed tuberculosis (65.23-77.73%). HIV-unknown cases increased (61.03-78.25%), while HIV-positive (1.45-1.09%) and HIV-negative (37.46-20.66%) cases decreased. Direct smear microscopy utilization decreased (94.75-7.20%), while rapid molecular tests increased (1.17-90.32%). Most cases were new (80.69-95.65%), treated with Category 1 regimen (93.32-98.87%) from tuberculosis programs (97.29-99.12%), and 33.77-51.43% of patients completed the treatment, 45.24-62.75% were cured, and unsuccessful treatment declined from 5.92% to 3.48%. Accounting for provincial data, increasing age (OR:0.97-0.99), male (OR:0.49-0.78), HIV-positive (OR:0.11-0.89), and pre-treatment status (other and re-treatment) over new cases associated with decreased odds of positive treatment outcomes. Conversely, using the drug from the tuberculosis program (OR:1.04-5.01) and a negative 2nd-month microbiological test (OR:3.25-7.63) predicted positive treatment outcomes.



Conclusions: Between 2017 and 2023 in Indonesia, notable improvements in TB diagnosis and positive treatment outcomes were seen. Rapid molecular test use increased, but direct smear microscopy remained common. Positive treatment outcomes increased, driven by cured cases mainly using drugs from tuberculosis programs, notably Category 1 regimen. Accounting for provinces, negative 2nd-month microbiological tests positively impacted outcomes. Factors like age, drug regimens, source of drugs, HIV status, microbiological tests, pre-treatment status, and gender had different odds ratios for outcomes, underscoring their importance in the provincial context.

PP38-1149-16 Sputum-negative pulmonary TB in Shanghai, China: Notification, clinical characteristics and outcomes

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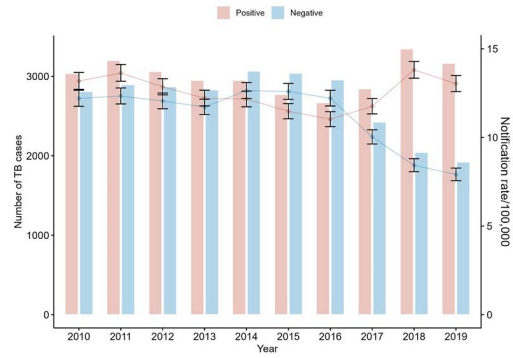
Background: With the scaling up of WHO-recommended diagnostics, 40% of pulmonary tuberculosis (PTB) cases were still clinically diagnosed without sputum biological confirmation in China. To better understand this early paucibacillary disease, we explored notification, clinical characteristics and outcomes of sputum-negative PTB in Shanghai, China.
Design/Methods: We accessed PTB surveillance data in Shanghai, China, from 2010 to 2019. All presumptive PTB patients underwent at least one sputum biological diagnostic (i.e., smear, culture, GeneXpert MTB/RIF). Any positive was defined as sputum-positive, otherwise sputum-negative. Data of newly diagnosed secondary PTB patients was extracted for analysis. The annual notification of sputum-negative PTB was calculated. Clinical characteristics and treatment outcomes were compared between sputum-negative and positive PTB. Log-binomial, logistic and Cox models were used to adjust potential confounders.
Results: Of 56851 PTB patients in 2010-2019, 26858 (47.2%) were sputum-negative. The annual notification declined from 12.2/100,000 in 2010 to 7.9/100,000 in 2019 (P for trend <.001). Patients with sputum-negative PTB were more likely to be younger (>=60 18.9% vs 27.0%, P_{adj}=0.014), female (34.1% vs 30.5%, P_{adj}=0.038), registered in referral hospitals (61.1% vs 54.3%, P_{adj}<0.001), had less proportion of pulmonary cavities (12.1% vs 35.4%, P_{adj}<0.001) and diabetes (4.0% vs 9.6%, P_{adj}<0.001), fewer days for delay in seeking care (10 vs 12, P_{adj}<0.001) but more in diagnosis (11 vs 7, P_{adj}<0.001). 53204 PTB patients were successfully treated (95.7% in sputum-negative vs. 91.7% in sputum-positive) and were followed for 373926.8 years. Sputum-negative PTB were less likely to have failure (0.2% vs 0.6%, adjusted OR=0.57, 95%CI 0.52-0.61), death (1.4% vs. 3.9%, adjusted OR=0.43, 95%CI 0.38-0.49) and recurrence (2.1% vs. 3.3%, adjusted HR=0.71, 95%CI 0.63-0.8).



Conclusions: As a less severe disease, sputum-negative PTB had fewer comorbidities, radiological abnormalities, and better treatment outcomes, but a longer delay in diagnosis, which indicated the urgent need for novel biomarkers to enhance early detection of sputum-negative PTB.

PP38-1159-16 Mismatch in TB treatment outcome between local and cross-border people with TB in border districts of Zambia: An area of attention in the cross-border efforts

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Background and challenges to implementation: The End TB Strategy emphasizes on a TB treatment success rate of at least 90%. National TB Programs are investing great effort on patient centered approach to accomplish this goal. While each individual country is putting in effort to retain and treat TB patients, cross border movement of patients continue, and this may have implications on the continuum of care and subsequently on treatment outcomes. The impact of cross-border movement of TB patients on treatment outcomes has not been adequately quantified thereby under informing cross-border collaborative efforts.
Intervention or response: We compared the treatment outcomes of the 2020 drug-sensitive TB (DS-TB) patients cohort. The patients were categorized as local or cross-border, all notified in Zambia. In this study, cross-border patients were defined as individuals identified as TB patients but are neither citizens nor residents of Zambia.

Results/Impact: A total of 6,003 DS-TB patients in border districts were analyzed. The TB treatment success rate for local patients was 81.1%, whereas for cross-border patients, it was 64.9%, far below the national average of 90% for the year reviewed. The cross-border patients had a higher proportion of loss to follow-up (19%), and 9.7% were not evaluated. In comparison, 4.6% and 4.1% of the local patients were lost to follow-up and not evaluated, respectively.
Conclusions: Cross-border TB patients are observed to have a distinctly lower TB treatment success rate. Drivers of undesirable treatment outcomes have a high proportion of loss to follow-up and not evaluated, which is conspicuously related to loss to follow-up. There is a need for robust systems to share patient outcomes between the referring and receiving countries. NTPs are encouraged to explore TB treatment outcomes among cross boarder TB patients to generate robust global evidence.

PP38-1151-16 Clinical audit of the management of drug-resistant TB in hospital in Indonesia

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Background and challenges to implementation: In 2020, the National TB Program (NTP) updated its clinical management guidelines for drug-resistant TB (DR-TB). To ensure the adherence to the guideline improve patient outcomes and care quality, the NTP initiated clinical audit in hospitals managing DRTB patients.
Intervention or response: From March 2022 to December 2023, the NTP carried out clinical audits in 256 hospitals across 33 provinces. Hospitals were pre-notified of audit visits, allowing TB teams to prepare medical records for review. Reviews were conducted by provincial clinical expert teams, the DR-TB working group (NTP), technical officers and partners on 555 medical records of patient on short-term DRTB regimens (STR) and 1071 on individualized regimens (ITR) against 33 criteria in 10 implementation domains.
Results/Impact: The audits highlighted several areas for improvement: recording and reporting issues (82.3%), treatment initiation delays (66.3%), and lack of contact investigation (63.7%). Specific challenges were noted in meeting diagnosis domains, including incomplete body mass index (15.7%), drug sensitivity testing (15.3%), culture records (13.3%), and second-line LPA results (13.0%). Additionally, 19.5% of patients received an inappropriate treatment regimen, with 17.5% requiring regimen or dose adjustment. The total duration of treatment was inappropriate in 10.7% of patients, and management of drug side effects was inadequate in 11.4%. Monitoring through scheduled laboratory tests was insufficient, with missing tests including culture (26.7%), smear sputum microscopy (25.5%), ECG (25.0%), blood test (22.4%), x-ray (17.5%), and weight measurement (16.5%). When comparing STR and ITR patients, those on STR regimens were more likely to miss standard treatments, underperforming in 31 of 33 audits criteria.

Audit criteria	Short-term regimen (n=555)		Individualized regimen (n=1071)		Total sample (n=1626)	
	Non-compliance	%	Non-compliance	%	Non-compliance	%
Recording and reporting accuracy	480	86.5	858	80.1	1338	82.3
Contact investigation	388	69.9	648	60.5	1036	63.7
DST for diagnostic testing	148	26.7	100	9.3	248	15.3
Initial regimen appropriateness	162	29.2	155	14.5	317	19.5
Completeness of follow-up culture results	211	38.0	223	20.8	434	26.7
Side effect management	69	12.4	117	10.9	18.6	11/4
Patient outcomes at audit: died	17	3.1	28	2.6	45	2.8

Table 1. Compliance with DR-TB management criteria in short-term vs individialized regimen.

Conclusions: The clinical audits revealed gaps in the management of DR-TB in several domains, underscoring a critical need for enhanced training and support for healthcare providers alongside the implementation of robust monitoring and evaluation system to ensure adherence to national DR-TB management guidelines.

PP40 Mpower strategies and industry monitoring

PP40-1179-16 Tobacco industry interference during the COVID-19 pandemic: A case study in Sri Lanka

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Background and challenges to implementation: Article 5.3 of the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) aims to protect strong tobacco control policies from the harmful influence of the tobacco industry. COVID-19 pandemic situation was a challenging period to the tobacco industry in Sri Lanka and their actions came under scrutiny as it sought to protect its commercial interests, potentially undermining public health efforts.
The study aimed to Tobacco Industry Interference during the COVID-19 Pandemic incidents reported since 13th March 2020, the date of initiation of the first Lock Down in Sri Lanka.
Intervention or response: The study used a qualitative design on data obtained via participatory methods. A systematic review of literature was conducted, encompassing academic papers, news articles, and reports from reputable sources.
Key themes were identified, including tobacco industry lobbying, marketing strategies during the pandemic, and initiatives taken to promote tobacco products as a ‚safer' alternative to prevent COVID-19.
Results/Impact: It is well evident fact that Tobacco industry was trying to convinced Sri Lanka government to tax reduction or unchanged tax policy as favor of their market. Newspapers and social media have been reported tobacco industries voice in different forms. further industry's move were revealed their hidden agenda to gain commercial benefits even at catastrophic condition and harmful influence against public health policies.
Conclusions: Ceylon Tobacco used corporate social investment They are promoting themselves by trying to show that when the use of cigarettes is reduced and taxes are reduced, it will be disadvantageous to the government activities to receiving wide positive media coverage in the process

PP40-1173-16 The effect of local smoking free policies (SFPs) on youth smoking behavior

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Background: As part of the MPOWER plan, the World Health Organization (WHO) suggests that smoking should be banned in public places. The decentralized government structure of Indonesia empowers local governments to enforce smoke-free policies on their own. The aim is to examine the correlation between the SFPs and any changes in youth smoking behavior.

No	Variable	n	%
1	Ever Smoker Different		
	Bad	239	75.2
	Good	79	24.8
2	Current Smoker Different		
	Bad	218	68.6
	Good	100	31.4
3	Local SFPs		
	No regulation	24	7.5
	Weak regulation	7	2.2
	Strong regulation	287	90.3
4	Human Development Index		
	Low	165	51.9
	High	153	48.1
5	Poverty Rate (in % of population)		
	Bad	49	15.4
	Good	269	84.6
6	Population age 15 and over (in % of total		
	Bad	34	10.7
	Good	284	89.3
7	Net Enrollment Ratio: Primary (in %)		
	Bad	45	14.2
	Good	273	85.8
8	Net Enrollment Ratio: Junior Secondary (in %)		
	Bad	71	22.3
	Good	247	77.7
9	Net Enrollment Ratio: Senior Secondary (in %)		
	Bad	58	18.2
	Good	260	81.8
10	Number of Puskesmas per 10,000 population		
	Bad	207	65.1
	Good	111	34.9
11	Number of hospitals per 100,000 population		
	Bad	261	82.1
	Good	57	17.9
	Total	318	100.0

Table 1. Characteristic of districts (N = 318)

Design/Methods: We used an ecological study design to assess the association between the SFPs across Indonesia from 2013 to 2018 and any changes in youth smoking behavior. The dependent variables were the different values of youth smoking prevalence (current smoker and ever smoker) year 2013-2018 in each district. The independent variables were the value of the SFPs in the year 2013-2018 in each district. The covariates were the difference value of the human development index, poverty rate, literacy rate, net enrollment ratio, number of primary health care per 10,000 population, and number of hospitals per 10,000 population year 2013-2018 in each district. We used multiple logistic regression to analyze the variable.
Results: Based on the availability data, we gathered 318 districts, and Table 1 showed the distribution of each variable. The prevalence of current smokers and ever smokers showed that more than 65% of districts are in the bad category (the value of prevalence increasing or stay the same from 2013-2018). On the other hand, 287 districts were categorized as having strong local SFPs (the product of the SFPs is *Peraturan Daerah/Peraturan Bupati/Peraturan Walikota*). Furthermore, more than 70% of districts were categorized as good on education-related indicators. The analysis showed that there was no association between the presence of SFPs and the youth smoking prevalence.
Conclusions: The research study revealed no correlation between the existence of SFPs and the prevalence of youth smoking. The Indonesian government should pay attention to the law enforcement of the SFPs.

PP40-1171-16 Assessing nurses' knowledge and practice of WHO FCTC Article 14 at primary healthcare settings in Bangladesh

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Background and challenges to implementation: In Bangladesh, implementing WHO FCTC Article 14 within primary healthcare (PHC) settings poses significant challenges for reducing tobacco use through cessation counseling. Nurses, recognized for their effectiveness in providing Non-Communicable Disease care (NCD) at PHC level, are key allies in supporting tobacco users to quit. This study aimed to assess nurses' knowledge and practice regarding implementation of WHO FCTC Article 14 at PHC level.
Intervention or response: This study employed mixed methods. A total of 328 registered nurses, trained in NCD delivery care and working at PHC level, were selected from 55 randomly chosen Upazila Health Complexes across Bangladesh. 10 key-informant interviews were conducted with policy experts, facility managers and nursing supervisors, employing purposive sampling techniques. To gauge actual practice, nurses providing service at NCD corners during the survey were also observed. Based on the percentage mean scores (PMS), knowledge level was categorized as 'adequate' (PMS≥60) and 'inadequate' (PMS<60), while practice level was categorized as 'favorable' (PMS≥60) and 'unfavorable' (PMS<60).
Results/Impact: Out of 328 nurses, 225 (68.6%) received training on NCD including sessions on 5A approach to tobacco cessation. However, despite this training, none of the nurses demonstrated both adequate knowledge and favorable practices in tobacco cessation.
Nevertheless, among 328 nurses, 11.9% demonstrated adequate knowledge of tobacco hazards and cessation counseling, while 20.7% exhibited favorable practices, largely attributed to integrating counseling into lifestyle modification advice (Figure 1).
Only 4.3% were observed practicing the 5A approach. Furthermore, barriers included a lack of skilled personnel, proper training, and time constraints. Furthermore, deficiencies in training and educational materials were noted, hindering effective counseling.

Figure 1. Level of knowledge and practice among the surveyed nurses.

Conclusions: Inadequate knowledge and poor implementation of WHO FCTC Article 14 were found among nurses. Recommendations include revising educational curricula, developing training materials, providing comprehensive educational interventions, and developing country-specific guidelines to enhance tobacco cessation counseling practices among nurses.

PP40-1174-16 Empowering schools to achieve the status of Tobacco Free Educational Institute: An interventional study from India

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Background: Global Adult Tobacco Survey 2016-17, indicating adolescents, the most vulnerable group exposed to tobacco use, underlined the implementation of tobacco control measures in schools.
Design/Methods: We aimed to empower Public School authorities to own and lead for being a tobacco free institute. A single training session, envisaging dissemination of information material and written guidelines of Tobacco Free Education Institute (ToFEI), was conducted for teachers and Tobacco monitors (students). Baseline

assessment of 203 schools (tenth-twelfth standard) of Solan district in North India, were done by trained school teams which included one member from respective village administrative body, employing the standardized Self-Evaluation Scorecard for ToFEI. The tool was based upon nine parameters in schools: Displaying of Tobacco free signage, evidence of tobacco use, display of awareness posters, organization of tobacco free activity, inclusion of no tobacco norms in rulebook, nominating tobacco monitors, defining and prohibiting sale of any tobacco products within 100 yards from outer boundary of school etc. Aggregate score of more than 90 was the benchmark for being a tobacco free institute. Reassessment was done after six months. Paired Samples t- test was employed to assess the effect of training.

Results: 162 (85%) schools significantly achieved ToFEI status. For 190 schools, there was a significant difference in the scores achieved which had increased from pre-training (M = 57.18, SD = 9.44) to post-training (M = 91.16, SD = 10.75; t = -33.27, p< 0.05). 13 schools which did not undergo training showed poor improvement in scores (M = 55.15, SD = 10.39 to post-six month evaluation; M = 55.38, SD = 11.13; t = -0.35, p >0.05).

Conclusions: Our study provides an inexpensive promising tool for empowering school stakeholders to achieve a tobacco free environment in schools. The administration is now implementing it in all public as well as private schools.

PP40-1175-16 Strengthening tobacco testing laboratories in India: A comprehensive assessment of capacity and capabilities

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Background: The WHO Framework Convention on Tobacco Control (WHO FCTC) is an international legally binding treaty, obligating governments to implement evidence-based measures to curb the tobacco epidemic. Articles 9 and 10 of the FCTC address the regulation of contents and emissions of tobacco products, as well as the regulation of tobacco product disclosure. Effective regulation and control of tobacco products require robust laboratory testing capabilities to ensure product quality, safety, and compliance with relevant standards. However, many tobacco testing laboratories, especially LMIC, often face challenges in terms of infrastructure, technical capacity, and quality assurance systems. To address this gap, a comprehensive initiative was undertaken to develop a Tobacco Testing Lab Capacity Assessment tool.

Design/Methods: The development of a comprehensive Tobacco Testing Laboratory Capacity Assessment Tool involved a thorough literature review, expert consultation, and rigorous validation processes. The tool evaluates key aspects including documentation, organization, staffing, infrastructure, equipment, sample management, testing methodologies, and waste disposal. The tool's content and construct validity, data quality, and reliability were assessed through statistical analyses, including exploratory and confirmatory factor analyses. The refined tool was piloted in four geographically diverse laboratories across India.

Results: The data collected across various laboratories provides valuable insights into the strengths and limitations of these facilities. The assessment revealed that the laboratories maintain good documentation practices, possess strong technical skills, and deliver reliable testing outcomes, showcasing their commitment to quality management systems. However, the analysis also uncovered organizational structure and staffing issues, posing challenges to operational efficiency. Furthermore, gaps were identified in the infrastructure in one of the laboratory, particularly in terms of space and advanced analytical equipment, limiting the laboratories' capabilities for comprehensive tobacco product testing.

Conclusions: This novel tool provides a practical and field-tested approach for assessing laboratory capacity-strengthening initiatives. It can be adapted in other geographical locations and in similar laboratory facilities.

PP40-1177-16 Message framing for tobacco marketing on Indonesian social media platform: Study analytic from Tobacco Enforcement and Reporting Movement (TERM) data

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Background: In Indonesia, the prevalence of social media consumers and smokers is on the rise. The allure of the messages conveyed in cigarette advertisements is a contributing factor to the desire of individuals, including children, to begin smoking. Cigarette advertisements are reportedly hip. This research aims to analyze message framing for tobacco marketing on different social media platforms.

Design/Methods: An analytical study of tobacco enforcement and reporting movement (TERM) data, a digital tobacco marketing monitoring system. Message framing and tobacco marketing tactic posts were obtained from TERM data between January 2022 and August 2023. A sample of 21,255 posts on Instagram, Facebook, News, TikTok, Twitter, and YouTube were analyzed quantitatively with frequency and percentage.

Results: Nine framing messages were found on Indonesian social media platforms. Information (16,145 posts) as the greatest message framing, and then product features (2,531 posts), entertainment (1,177 posts), self-care and health (451 posts), social welfare (387 posts), health claims (219 posts), glamourization (176 posts), community celebrations (116 posts), and religious events (53 posts). Instagram was the social media site with the most framing message posts (89%). Health, glamourization, community celebration, self-care, and health claims were mostly done with direct advertising and marketing tactics. While the other framing messages were mostly done with community-based marketing tactics, only social welfare was done with corporate social responsibility.
Conclusions: The results of our study provide important input for the government, academics, and other NGOs in providing education and promotion so that they can create innovative content and place the education and promotion to offset marketing tactics and posts on various social media platforms in preventing novice smokers and encouraging motivation to quit smoking.

PP40-1178-16 Kiddie pack cigarettes are highly available at the retailers: An urgent call to reduce the alarming increase of adolescent smoking rate in Indonesia

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Background: Smoking rate among youth age 10-18 years in Indonesia increased significantly from 7.2% in 2013 to 9.1% in 2028. High availability and accessibility of cigarettes increase the likelihood of smoking among youth. Cigarette price in Indonesia is amongst the cheapest globally. It coupled with availability of small pack size and single stick selling which makes cigarettes are highly accessible. This study aims to portray the distribution of cigarette packs including small packs that are available at the retailer settings in Indonesia.
Design/Methods: This study was part of a price monitoring survey conducted in selected 81 districts/cities of Indonesia between April-June 2023. We collected cigarette packs from at least six types of retailers in each districts/cities including traditional market, modern mart, street vendors, kiosk, train/bus station and gas station. All cigarette packs available at the selected retailers were observed. Information on pack size, top selling brand and type of cigarettes were documented. Data were analysed descriptively.
Results: The total number of cigarettes observed was 11,062 packs. The majority of pack size observed were 12 sticks (38.9%) and 16 sticks (36.5%), followed by 20 sticks at 24.3%. Most of the 16-pack size (95.2%) and more than half of the 12-pack size (53.5%) was machine rolled kretek cigarettes. The top three cigarettes which were consistently reported by the retailer were also having less than 20 cigarettes per packs, namely: Gudang Garam Surya [12], Sampoerna A Mild [16] and Dji Sam Soe [12].
Conclusions: Monitoring results show that the availability of cigarette packages less than 20 stick is very high. This condition makes it easier for adolescent to get cigarettes in small and cheap packages. The government must prohibit the production and distribution of small pack cigarettes across all cigarette types to reduce affordability and accessibility especially among the youths.

PP40-1172-16 Adaptation needs of an intervention to facilitate tobacco cessation among men attending emergency departments in Nairobi, Kenya

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Background: Three-quarters of cancer deaths globally are in low- or middle-income countries. Cost-effective tobacco cessation interventions are critical to reducing cancer burden in these settings. Interventions that reach men, who are more likely to smoke and less likely to be engaged in primary care, are particularly important in Kenya, where 84% of smokers are men. Engaging men presenting in emergency departments using a text-based mHealth program is a promising strategy to promote cessation. Text-based quit counseling using Text2Quit has been demonstrated to be effective in high-income settings. We aimed to identify barriers to using Text2Quit and optimize Text2Quit for Kenya.
Design/Methods: We invited emergency department patients who smoke in Nairobi, Kenya to participate in intercept interviews using a Text2Quit prototype adapted for Kenya. A multinational team of tobacco experts, designers, Kenyan physicians, and implementation researchers carried out rapid analysis of transcripts to identify barriers to usability, relatability (ease of understanding), and appeal. These barriers and proposed solutions were enumerated and ranked using nominal group technique with rank-order voting.

Results: Thirteen patients participated in interviews using a Text2Quit-Kenya prototype. Participants identified rigid response formats as a barrier to usability, long text messages as a barrier to relatability, and confusion about cost as a barrier to its appeal. Sixteen proposed solutions were identified by the nominal group technique process and five were prioritized based on importance to stakeholders and feasibility: 1) enable minor deviations in patient responses, 2) reduce length of messages, 3) clearly communicate that Text2Quit is free of charge, 4) provide brief in-person counseling at enrollment, including training on how to find and reply to texts and setting a quit date before texts begin, and 5) provide individualized counselor follow-up with users.
Conclusions: Barriers to uptake of Text2Quit among Kenyan men who smoke are addressable through a systematic adaptation process.

PP40-1170-16 Determinants of smoking among women living with HIV in sub-Saharan Africa

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Background: Little is known about the social determinants of cigarette smoking among women living with HIV (WLHIV) in sub-Saharan Africa. This study aimed to assess the determinants of smoking among this population.
Design/Methods: We analysed data on women living with HIV (n = 5,346) from the most recent Demographic and Health Surveys in eleven African countries. The data were adjusted for sampling weight, stratification, and cluster sampling design. The outcome variables were smoking status among women living with HIV. The predictor variables included women's socio-demographic and household characteristics. Pearson's chi-squared test and complex sample logistics regression were used to evaluate the relationship between outcome and predictor variables. Statistical significance was set at a p-value < 0.05.
Results: The prevalence of smoking was 1.5%. Women aged 40-49 years (AOR:5.38, 95%CI:1.74-16.63, p = 0.004), residing in urban areas (AOR:3.57, 95%CI:1.69-7.52, p = 0.001), and being in other occupation (AOR:6.20, 95%CI:1.71-22.40, p = 0.005), were more likely to smoke. Low literacy (AOR:0.06, 95%CI:0.01-0.45, p = 0.006) decreased the likelihood of smoking among WLHIV.
Conclusions: The prevalence of smoking among WLHIV is low in sub-Saharan Africa. The identified factors in this study can be used to develop policies and interventions aimed at maintaining low cigarette smoking prevalence among women living with HIV in sub-Saharan Africa.

PP34 Epidemiological, Clinical and Molecular Insights into TB and Co-morbidities

PP34-1112-16 Mapping drug-resistant TB prevalence in Africa using geospatial analysis

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Background: Tuberculosis (TB) is the leading infectious cause of death globally. Drug-resistant tuberculosis (DR-TB) presents a major challenge to achieving the global end TB strategy targets. While there have been national estimates for DR-TB prevalence in Africa, there have been few attempts to provide local-level estimates across the continent.
This study aims to address this knowledge gap by investigating the prevalence of DR-TB at subnational levels.
Design/Methods: We assembled a geolocated dataset comprising 140470 TB patients from 165 sources spanning 31 African countries. A Bayesian model-based geostatistical framework was employed to produce estimates of DR-TB prevalence for 546 districts. The estimates of DR-TB prevalence and number of DR-TB cases (based on TB incidence estimate from global burden of disease study) were produced at national and subnational levels.
Results: In this study, a total of 152449 DR-TB cases (95% Uncertainty Interval (UI): 29129-299411) were predicted to occur in Africa with marked differences between countries. The highest cases were in Eswatini (19867; 95%UI 7586-23784) and South Africa (18916; 95%CI 3561-23541) while the lowest were in Algeria (242; 95% UI 31-515) and Egypt (327; 95%UI 47-759).
Prevalence of DR-TB was highest in Eswatini (55.34; 95%UI 21.13-66.25), Morocco (50.64; 95%UI 10.18-65.11), Tunisia (49.92; 95%UI 9.86-69.59) and South Africa (47.98; 95% UI 9.03-59.72) whereas lower prevalence was observed in Gabon (4.48%; 95% UI 0.54-29.49), Republic of Congo (4.72%; 95%UI 0.58-32.74), and Niger (9.11%; 95%UI 1.06-28.90).
Substantial subnational variation was also noted with a total of 86 districts from 14 countries having higher prevalence than their respective national estimate.
Conclusions: Our study found a substantial national and subnational variation in the spatial distribution of DR-TB prevalence in Africa.
Thus, the comprehensive findings in this study can support policymakers in planning targeted interventions that are locally adapted to strengthen TB programs and then accelerate progress to end TB in the continent.

PP34-1113-16 Analysis of the epidemiological trends of pulmonary TB in China from 2000 to 2019 based on the Joinpoint Regression Model

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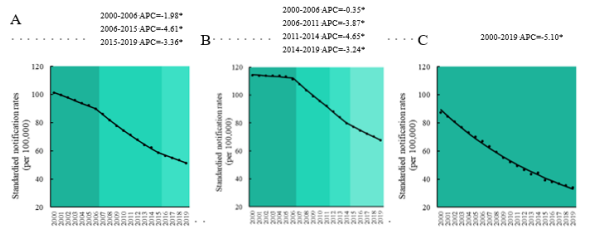
Background: China ranks third globally in terms of burden and falls under countries with moderately high to high prevalence of tuberculosis (TB). This study meticulously delves into the notification rates of pulmonary tuberculosis (PTB) and assesses of the epidemic in China from 2000 to 2019, aiming to provide robust data support crucial for enhancing TB prevention and control strategies.

Design/Methods: A detailed data collection regarding notification rates on PTB in China between 2000 and 2019 was conducted. The Joinpoint regression model was adeptly utilized to assess the temporal trends in notification rates on PTB, analyzed through the annual percentage change (APC) and the average annual percentage change (AAPC).

Results: Over the study period (2000-2019), the standardized notification rates of PTB in China exhibited a range from 51.32/100,000 to 101.15/100,000, with a notable annual average decrease of 3.52% ($P < 0.05$). A marked acceleration in this decline was observed from 2006 to 2015, with an AAPC of 4.61% ($P < 0.05$).

Stratified by age and gender, the age group with the most significant annual decline in overall standardized notification rates of PTB among men in China was < 15 years old, followed by the 55-65 years old, and the most minor decrease was 25-35 years old. At the same time, the age group with the most significant annual decline in overall standardized notification rates of PTB among women was < 15 years old.



A. Standardized notification rates of PTB cases in overall · B. Standardized notification rates of PTB cases in males · C. Standardized notification rates of PTB cases in females

*: $P < 0.05$

Figure. Joinpoint regression analysis of the standardized notification rates of pulmonary tuberculosis in China.

Conclusions: The epidemic of PTB in China showed a downtrend from 2000 to 2019. Nonetheless, there is a pressing need for focused attention on males and older adults, advocating for targeted and practical prevention and control measures for these groups.

PP34-1116-16 Tuberculosis prevalence in neighbourhoods in Nairobi, Kenya: Comparing community-based estimates 2015 to 2022

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Background: National and sub-national surveys, when performed intermittently, may assess important changes in TB prevalence. In 2022 we re-surveyed nine Nairobi County neighbourhoods previously surveyed in 2015.

We aimed to determine pulmonary TB prevalence, compare prevalence to 2015 estimates, and evaluate changes in risk groups.

Design/Methods: Participants reporting cough of any duration and/or whose chest x-ray suggested TB, submitted sputum for smear microscopy, Ultra(x1), and liquid culture(x2).

We defined prevalent TB as Mtb detection by Ultra or culture, excepting those only Ultra trace-positive. Our methods differed from 2015 which used solid media, GeneXpert MTB/RIF, and cough duration >2 weeks.

We calculated TB prevalence using random-effects logistic regression models with missing value imputations and inverse probability weighting.

Results: In 2022 among 6369 enrolled participants, 1582 submitted ≥1 sputum sample, among whom 42 (2.7%) had TB, a weighted TB prevalence of 806/100,000 (95% confidence interval (CI), 518-1096). Thirty-one (2.0%) participants tested Ultra trace-positive/culture-negative. For comparison to 2015, we excluded 2022 participants (n=3) whose only criterion for sputum was cough <2 weeks *(Table)*.

TB prevalence among men was high (1368/100,000) but unchanged compared to 2015 ($p<0.001$). The age group with the highest estimated prevalence changed from 2015 (55-64 years) to 2022 (45–54 years).

Among people with prevalent TB who reported cough, 76% had not sought health care, with 79% attributing their decision to the belief that their symptoms were not severe.

	Stratification	2022: cough any duration (95%CI)	2015: cough >2 weeks (95%CI)	2022: cough >2 weeks (95%CI)	p-value
Overall		806 (518 - 1096)	621 (332 - 910)	769 (475 - 1063)	<0.001
Sex	Female	455 (179 - 730)	382 (145 - 619)	413 (178 - 647)	0.271
	Male	1394 (802 - 1985)	941 (512 - 1371)	1368 (754 - 1982)	<0.001
Age	15-24	407 (117 - 697)	403 (175 - 631)	355 (50 - 659)	0.080
	25-34	853 (251 - 1456)	753 (213 - 1293)	806 (223 - 1390)	0.177
	35-44	875 (335 - 1414)	605 (168 - 1043)	828 (241 - 1413)	<0.001
	45-54	1375 (361 - 2390)	602 (5 - 1200)	1384 (364 - 2403)	<0.001
	55-64	1115 (209 - 2021)	1070 (0 - 2333)	1106 (209 - 2003)	0.435
	65+	479 (0 - 1433)	544 (0 - 1644)	508 (0 - 1542)	0.267

Table. TB prevalence survey weighted models
Variables included in models: Cough, night sweats, age group, sex, chest X-ray field reading, weight loss.

Conclusions: Our 2022 survey revealed persistently high pulmonary TB rates in Nairobi County neighbourhoods compared to 2015, particularly among men. Notably, the highest risk age group changed during this 7-year period. Limitations of this study include changes in methodology between the two surveys and unknown effects of the COVID pandemic. High-risk groups may change over short time periods and targeted interventions will need to take this into consideration.

PP34-1111-16 Delays in treatment initiation affects TB severity in four African countries: A cross-sectional survey

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Background: Delayed tuberculosis (TB) treatment initiation facilitates disease progression which may lead to severe TB disease, increased infectiousness, and mortality. We describe TB disease severity at treatment initiation among adults with symptomatic pulmonary TB(PTB) in four African countries and determine if there is an association between total delay and TB disease severity at treatment initiation.
Design/Methods: Adults (≥18 years) with PTB initiating treatment at health facilities in South Africa (ZA), Tanzania (TZ), Mozambique (MZ) and The Gambia (GM) enrolled between 09/2017 and 01/2020. Structured questionnaires at treatment initiation collected information on demographics and the presence and duration of TB symptoms. Total delay was calculated as time (weeks) between the onset of the first TB symptom and the initiation of treatment at the health facility. TB disease severity measures included: smear status, body mass index (BMI), chest X-ray severity scores (Falk score: extent of disease, Ralph score: % lung affected), and the Karnofsky performance scale (KPS: ability to perform ordinary tasks). We developed ordinal regression models to test causal associations between total delay and TB disease severity.
Results: We enrolled 1429 patients (ZA:359,TZ:284,MZ:416,GM:370) (median age 34 years[IQR27-43], 35% female, 52% completed high school).
Overall HIV prevalence was 42% but varied by country (ZA:69%,TZ:49%,MZ:45%,GM:7%). Median total delay was 6 weeks(IQR4-10). 46% had 3+ smear grading, 48% were underweight and 72% had moderate/far advanced TB disease (Falk score). An increased total delay is associated with a higher smear grading, higher Falk score, higher Ralph score and lower KPS (Table1).

	Unadjusted OR (CI)	p-value	Adjusted OR* (CI)	p-value
	Smear status (negative, scanty, 1+, 2+, 3+)			
	1.02 (1.01-1.03)	<0.001	1.02 (1.01-1.04)	<0.001
	Falk score (normal, minimally advanced, moderately advanced, far advanced)			
Total delay (weeks)	1.03 (1.02-1.04)	<0.001	1.03 (1.02-1.04)	<0.001
	Ralph score (<60, ≥60)			
	1.03 (1.02-1.04)	<0.001	1.02 (1.01-1.04)	<0.001
	Karnofsky performance scale (≥80%=normal activity, 50-79% =assistance needed, ≤40=rapidly progressing)			
	1.03 (1.01-1.04)	<0.001	1.03 (1.02-1.04)	<0.001

Table 1: Ordinal regression analysis on the relationship between total delay and measures of TB severity at treatment initiation in four African countries.
**a priori confounders – country, HIV status*

Conclusions: Across all countries, there were indications of severe TB disease at treatment initiation. Our findings highlight the opportunity to include total delay in the patient's risk assessment to identify those who may have advanced TB and would benefit from further investigations. Early TB diagnosis and treatment initiation are vital to minimize morbidity and prevent transmission.

PP34-1109-16 TB molecular diagnostic testing among people living with HIV: Experience from Katavi, Kigoma, Rukwa and Songwe regions

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Background and challenges to implementation: Tuberculosis (TB) is a communicable and life-threatening disease that is a major cause of ill health and one of the leading causes of death worldwide, 10.6 million people fell ill with TB globally in 2021. People living with HIV are at 15 - 21 times more risk of getting TB infection and disease compared to those without HIV and they are missed due to low bacillary load. The high sensitivity molecular diagnostic testing is able to detect more TB cases regardless of HIV status.
We aimed is to increase TB molecular diagnostic testing among PLHIV through implementation.
Intervention or response: Uhuru project and National Tuberculosis and Leprosy Program (NTLP) procured eight and three GeneXpert machines in 2021 and 2022 respectively to add on the existing 16 machines in the four regions. Eighteen bodaboda riders were deployed to support sputum sample transportation.
Laboratory technologists and healthcare workers were capacitated on molecular diagnostic testing and the national TB diagnostic algorithm (which insist on molecular diagnostic testing for all presumptive TB cases) respectively. We extracted data from the District Health Information System Version 2 (DHIS2-ETL) from October 2019 to September 2023, and analyzed using MS Excel to compare the performance before and after the project implementation.
Results/Impact: Prior to installation of additional GeneXpert machines, in October 2019, among 1,587 TB/HIV co-infected patients, 795 (50%) were tested through GeneXpert and 190 (11.9%) through microscopy. During the project implementation, as of October 2021 to September 2023, out of 1,738 TB/HIV co-infected patients, 1,138 (65.5%) were tested through GeneXpert and 157 (9%) by microscopy. This is 15.5% increase in GeneXpert testing. The TB/HIV case notification also increased from 1,587 to 1,738 which is 9.5% increment.
Conclusions: Molecular diagnostic testing is key to early TB case detection among PLHIV. More efforts are needed on adherence to the national TB diagnostic algorithm.

PP34-1115-16 Molecular epidemiology of TB in area with high burden of HIV in West Siberia, Russia

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Background: The Asian part of Russia (Siberia and the Far East) is marked with the highest tuberculosis (TB) incidence, prevalence, and mortality aggravated by TB/HIV coinfection. We aimed to study key features of molecular epidemiology of TB in the Omsk province, a region in West Siberia characterized by especially high burden of HIV (43.7 /100 000 in 2022).
Design/Methods: A total of 608 *M. tuberculosis* isolates were recovered from newly diagnosed patients with TB alone (n=400) and TB/HIV (n=208). The modern Beijing genotype and its main Russian epidemic and endemic clusters (B0/W148 and Central Asian/Russian), and ancient Beijing sublineage were detected by PCR assays targeting specific molecular markers. Non-Beijing isolates were spoligotyped and compared to SITVIT2 database.
Results: TB/HIV co-infected group was 34.2% (208/608) of all included TB patients. The proportion of multidrug-resistant (MDR) strains in TB/HIV group was significantly higher than in the TB group: 49.5% (103/208) vs 36.0% (144/400) (p=0.001; RR=1.4). The strains isolated from TB/HIV and TB patients did not differ significantly in the spectrum of genotypes and belonged to the East-Asian and Euro-American lineages. However, Beijing genotype and Beijing Central Asian/Russian subtype were significantly more prevalent in TB/HIV group than in TB group: 79.3% vs 63.5% (p<0.001); 50.0% vs 40.5% (p=0.025), respectively. Central Asian/Russian subtype strains from TB/HIV patients were more often MDR than from TB patients: 39.4% vs 27.2% (p=0.037). All strains of ancient Beijing sublineages were MDR and were more frequent in TB/HIV group (9.1%) compared to TB group (3.8%) (p=0.066).
Conclusions: In Western Siberia, Russia, a high proportion of patients with TB/HIV was identified (34.2%). HIV-infected individuals have a 1.4-fold increased risk of MDR-TB. Half of the strains isolated from TB/HIV patients belonged to the Beijing Central Asian/Russian subtype, known to be dominant among MDR strains in Central Asia.
Acknowledgement: Russian Science Foundation (grant 24-44-00004).

PP34-1108-16 Utilisation of digital tools to enhance TB screening among people living with HIV in communities for a lasting impact

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Background and challenges to implementation: Zimbabwe has a high HIV/TB coinfection rate with an estimated HIV-positive TB incidence of 125 cases per 100,000 people reported in 2022. Discrepancies between notified and estimated cases highlight suboptimal treatment coverage, emphasizing the need for enhanced case detection.
Intervention or response: The PEPFAR-funded Target Accelerated Sustainability Quality of Care (TASQC) program, implemented by Organization for Public Health Interventions and aimed at achieving HIV epidemic control, has significantly transformed the approach to TB screening among PLHIV by moving from a paper-based system to digital platform across 15 districts. Community Outreach Agents (COAs) collect and input screening data into Open data Kit (ODK) during outreach programs. Each client is screened using the four-symptom TB screening tool. Those identified as presumptive TB cases, are seamlessly referred to designated facilities, health posts, or alternative service delivery points. This structured approach ensures timely interventions for individuals at risk of TB within the community of PLHIV. Routine programme data were collected from January to December 2023 and analyzed descriptively using STATA v15.
Results/Impact: A total of 125,750 PLHIV were screened for TB in the community from January -December 2023, of whom, 86,337 (68.7%) were female and overall median age was 43 years (IQR 34–51 years). Of these, 9163 (7%) were presumptive TB cases and were referred to the health facilities for further TB diagnosis. Of the remaining 116,587 excluded TB symptoms, 11,131 were linked to the facility for TB preventive treatment (TPT) initiation which translated to community contribution of 18% of 60,812 annual TPT initiations.
Conclusions: This study showed integration of digital tools for TB screening among PLHIV can significantly streamline identification and referral process in community settings. However, it also points out the need for better linkage to care for patients post-screening. These tools offer potential for enhancing TB prevention and care within HIV service delivery.

PP34-1114-16 Unveiling TB transmission dynamics in Indonesia: Insights from a large-scale epidemiological study (2022–2023)

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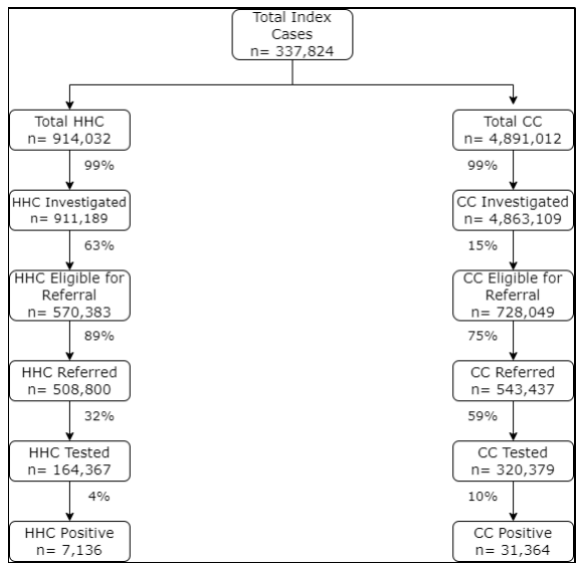
Background: Indonesia, a high Tuberculosis (TB) burden country, implements community-based contact investigation as part of its national TB elimination strategy. Although the current focus of the contact investigation mainly targets Household Contacts (HHC), Close Contacts (CC) also pose a potential transmission risk. As the Global Fund Primary Recipient for TB Community, Consortium Penabulu-STPI compared the positivity rate between contact investigations of HHC and CC.
Design/Methods: In 2022–2023, a total of 337,824 TB index cases were identified across eight provinces with high TB burden. Contact investigations were conducted by community cadres to HHC (defined as individuals cohabiting with the index) and CC (defined as persons who might occasionally be in contact with the index). Screened CCs with at least one TB symptom and one TB risk factor were referred to the healthcare for rapid molecular test whereas all HHC were referred immediately regardless of TB symptoms presence. Comparison was examined using cascade. Qualitative analysis using a Focus Group Discussion (FGD) and in-depth interview was provided to offer additional insights.



Results: From 914,032 HHC and 4,891,012 CC, 99% of them were investigated. HHC had a higher proportion of symptomatic individuals. However, the number and the proportion of TB positives was higher among CC. By end-2023, 4% from 164,367 HHC and 10% from 320,379 CC tested were TB positive. FGDs with 156 cadres and interviews with 24 healthcare workers identified factors like interaction frequencies, contact durations, environmental, and individual susceptibilities that vary among HHC and CC, impacting prolonged social contacts with TB index cases.
Conclusions: TB positivity rate was higher among CC in comparison to HHC, suspectedly due to different social dynamics among HHC and CC. Further understanding of TB transmission dynamics remains an important consideration.

PP34-1180-16 TB transmission in north-eastern states of India: Leads from whole genome sequencing

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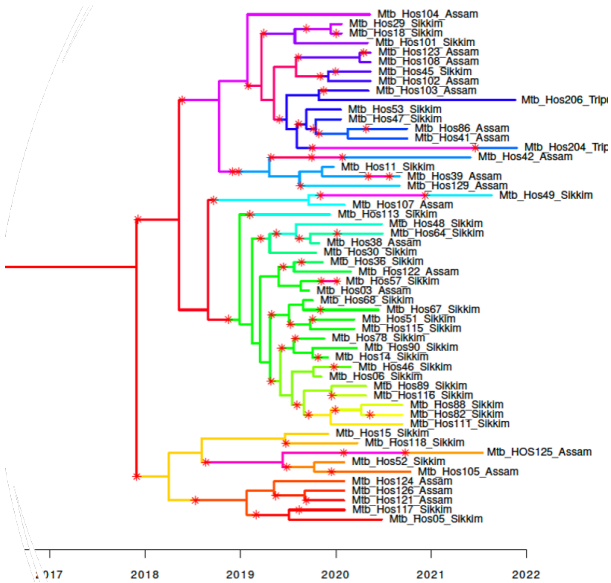
Background: Whole genome sequencing (WGS) has become the main tool for studying transmission of *Mycobacterium tuberculosis* complex (MTBC) strains.However, the clonal expansion of one strain often limits its application in local MTBC outbreaks.
Design/Methods: Patients with Multi-drug resistant TB were enrolled from Assam, Sikkim and Tripura.WGS was performed from cultures.WGS data was analysed and is presented using Trans-Phylo program.
Results:



Conclusions: The source isolate Mtb_HOS129 played a pivotal role in transmission to significant proportion of patients in Assam, and transmission extended to Tripura. The transmission of most TB cases in Sikkim originated from the Mtb_Hos30 isolate, identified as the transmission initiator in the region. A complex transmission network showed transmission of TB isolates across the three northeastern states (Sikkim,Assam and Tripura), with evidence from both sampled and unsampled cases. The phylogenetic tree and the transmission tree can be thought of as two sides of a same coin. There is a unique color for each of the cases (sampled or unsampled). Each segment of the tree is colored according to the case that was hosting the pathogen. A change from one color to another, therefore, represents a transmission event, and these are highlighted with red stars. When a color reaches a leaf of the tree, it indicates that this case is sampled. If a color does not lead to any leaf, then it corresponds to an unsampled case. The dates of the stars, therefore, correspond to the dates of the transmission events as shown on the x axis of the transmission tree. The colors before and after each star indicate who infected whom, as shown by the links in the transmission tree.The internal nodes of the phylogenetic tree do not correspond to transmission events, as is sometimes incorrectly assumed, and that instead transmission events (stars) can occur at any point along the branches of the phylogenetic tree.

PP33 Game plan for finding the missing people with TB

PP33-1203-16 Impact of TB case finding optimisation and expansion activities on propriety of patent medicine vendors, USAID Tuberculosis Local Organization Network (TBLON3) experience, Southwest Nigeria

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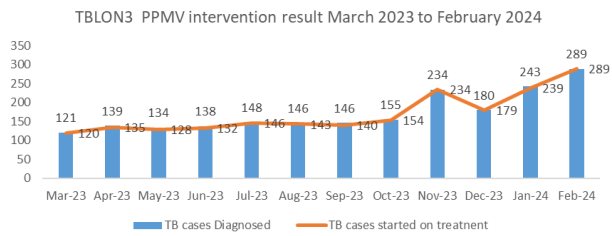
Background and challenges to implementation: Nigeria ranks first in Africa and sixth among 30 countries globally with the highest TB burden. Private health providers are critical sources of health care, accounting for about 60 to 70 percent of health care provision in Nigeria, Prominent

among these Private health care providers are Propriety of Patent Medicine Vendors(PPMV), When sick, individuals visit a propriety of patent medicine vendor or community pharmacy for over-the-counter medications in the first instance since they are in close proximity and in almost every neighborhood.

Intervention or response: 468 PPMVs were engaged across the four TB LoN3 states (Lagos, Ogun, Oyo and Osun) in October 2022 to improve TB case detection. as at February 2023, only 114, less than a quarter were actively providing TB services. By March 2023 Active optimization and systematic expansion into new PPMVs was commenced, providing support to strengthen TB services which includes but not limited to training and capacity building, robust and prompt sample logistic pick up, supportive supervision (SSV) and timely payment of performance based incentives.

Results/Impact: A consistent increase in the number of TB cases identified and notified in engaged Patent Medicine vendors were observed totaling 2073 TB cases diagnosed and 2039 started on treatment (98%) notified between March2023 and Feb 2024) representing 23% of total case finding and 23% notified across Public Private mix interventions in the four states supported by USAID Tuberculosis Local Organization Network (TBLON3) project.



Conclusions: Continuous optimization and Strategic engagement of PPMVs with consistent follow up and regular support no doubt has helped to sustain successes recorded in TB case finding and case notification in PPMVs.

Keywords: Private sector; Case findings; Propriety of Patent Medicine vendors; Tuberculosis

PP33-1206-16 Wellness on Keke as a game changer in community TB case finding in Kano State

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Background and challenges to implementation: The wellness on Keke (WOK) is an innovative approach that serves as a one stop shop mobile diagnostic unit deployed by KNCV Nigeria to provide TB screening services in hard-to-reach communities. It's designed to accommodate a portable digital x-ray machine coupled to a TB diagnostic platform which could be a Truenat or TB LAMP.

Intervention or response: Community selection is targeted based on KNCVs Early Warning Outbreak Recognition System (EWORS) alert and reported TB cases by Local Government TB Supervisor's for the period under-review.

Firstly, advocacy visits are conducted to community gate keepers to get their buy-in for the activity. Local town criers and mobilizers then engaged to pass announcements to the community members on the schedule TB screening exercise.

On the screening dates, sputum samples are collected from identified presumptive(s) are tested immediately, TB patients diagnosed will be placed on TB treatment at the nearest DOTS sites.

Results/Impact: 195 community outreaches were conducted from Oct 2022 to Sep 2023 in 36 LGAs of Kano state. 672,005 people attended, 670,814(100%) were screened for TB, 50,237(7%) presumptive TB identified, 50,888(90%) were evaluated and 2,051 new confirmed TB cases were detected (4 were DR-TB Cases) and 100% of them were placed on TB Treatment. Contribution of Wellness-on-Keke to KNCV community TB screening is 47% for the period under-review in Kano state.

Conclusions: Having the advantage of on-the-spot diagnosis and wider reach, this innovative approach is a game changer in helping to take TB services to the door-steps of the clients in their respective communities and it has also improve the yield in TB case finding in Kano state.

PP33-1207-16 Illuminating the impact of engaging informal stakeholders in paediatric case finding: A case study of Tsangaya schools in Kano State, Nigeria

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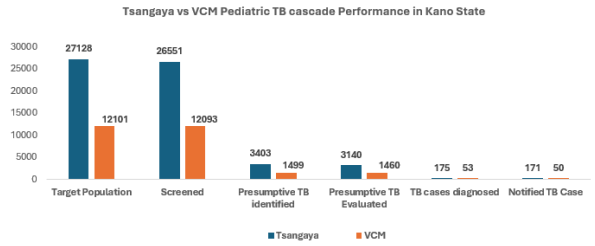
Background and challenges to implementation: Despite a growing focus on the plight of tuberculosis among children, 56% of the 1.2 million children who develop TB annually are not detected and notified. In Kano State, most children with TB are actively detected through screening at the Nutrition clinics, Pediatric OPD (Outpatient Department) and Children Medical wards in Tertiary, Secondary and Primary Health Care centers. Children with TB at the community and schools are often not being detected or actively screened for TB leading to high proportion of missed cases and persistent poor case notification among children.
This study presents result from engaging informal sectors in active screening for pediatric TB.
Intervention or response: The Tsangaya Qur'anic Schools in Kano is an informal school with children within the range of 5-15 years kept in an informal environment to study Qur'an. KNCV Nigeria partnered with community leaders and tsangaya boards at Local Government Area (LGA) level to identify and map ten tsangaya schools from seven LGAs.
Seven Tsangaya coordinators and 250 Voluntary Community Mobilizers (VCM) were trained to conduct TB screening, collect, link samples to laboratories and confirmed TB cases to a nearby facility for treatment. Data from October 2022-september 2023 was collated and analyzed.
Results/Impact: A total of 38,644 children were screened, 4902 presumptive TB identified, 4600 of the presumptive TB clients were evaluated (94%), with 228 TB cases diagnosed (TB yield of 5%). Tsangaya schools contributed 77% of these diagnosed TB cases. Number needed to screen to get a child with TB was 169 and number needed to test to diagnose a child with TB was 20.



Conclusions: The engagement of tsangaya schools significantly amplified the efforts of pediatric case finding across the supported schools.
To maximize this impact, a collaborative approach to TB screening is recommended across similar settings to further enhance early TB detection and prevention efforts.

PP33-1198-16 Is the juice worth the squeeze? Comparing active case finding costs in two districts with varying TB burdens of Ho Chi Minh City, Vietnam

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Background and challenges to implementation: Studies show the importance of site selection during active case finding (ACF) interventions due to variations in sub-national tuberculosis (TB) prevalence. Fewer studies have analyzed the cost implications of effective and suboptimal site selection. Here we review the costs of two case-matched ACF campaigns conducted in settings with different levels of TB burden.
Intervention or response: Thirty-two ACF events were conducted between December 2022 and March 2023, evenly split between two districts of Ho Chi Minh City, Viet Nam: Go Vap (pre-ACF case notification rate [CNR]: 126 per 100,000) and Binh Chanh (pre-ACF CNR: 131 per 100,000). Both districts have areas with high poverty rates and large numbers of internal economic migrants. We considered total incremental costs for the ACF campaigns including costs like stipends, X-rays and logistics, while excluding costs like healthcare worker salaries, diagnostic tests and drugs. We report the numbers of people screened and yield of TB, as well as cost per TB diagnosis by campaign.
Results/Impact: In Go Vap, a total of 6,754 participants were screened by chest X-ray (CXR), resulting in the detection of 20 people with TB (rate=0.3% and number needed to screen [NNS]=338). In Binh Chanh, a total of 4,943 participants were screened by CXR, resulting in the detection of 31 people with TB (rate=0.6% and NNS=159). The total ACF campaign costs in Go Vap and Binh Chanh were USD 13,968.93 and USD 11,858.11, respectively. The incremental cost per person diagnosed with TB was USD 777.05 in Go Vap and USD 448.49 in Binh Chanh.
Conclusions: The higher TB prevalence in Binh Chanh resulted in 42% lower cost per TB diagnosis during ACF. Thus, while total costs did not differ significantly, targeted site selection during ACF planning may help build a much stronger investment case for scale up of this resource-intensive approach and accelerate progress towards ending TB.

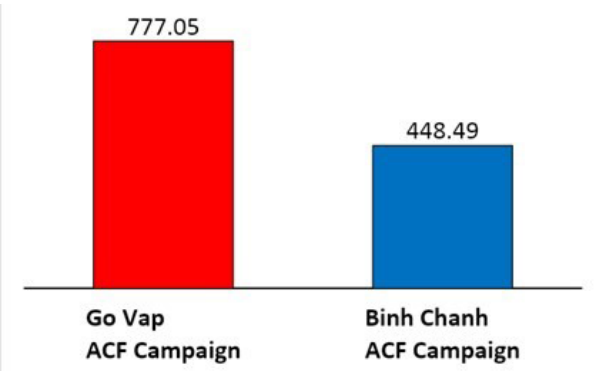

Figure. Cost per person diagnosed with TB during active case finding (ACF) in Vietnam.

PP33-1200-16 Strategic patent medicine vendors engagement: A viable intervention for improving public-private mix TB case finding

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Background and challenges to implementation: Engaging all health providers through the public-private mix is key to ensuring a wider coverage for active TB screening activity and consequently, finding all the missing TB cases. Private and Informal care providers are often the first point of care for community members due to proximity and easy accessibility to health services. Patent Medicine Vendors are significant stakeholders for community engagement because they are well known and trusted in the community.

Intervention or response: The activation of PMV sites was strategically done by identifying viable vendors through a one-on-one engagement to assess their level of interest and readiness to collaborate with the project on TB case finding. Implementation was initially commenced at the LGA with highest TB burden in the state, and then scaled up to other LGAs.

TB LON Data for TB case finding between 2021 and 2023 was extracted for PMV's achievement and the cumulative achievement for PPM (which comprises of Private for-profit facilities, PMVs, Traditional Birth Attendants (TBAs), Traditional Medicine Practitioners (TMPs), Community Pharmacists (CPs), and Standalone Laboratories (SAL).

Results/Impact: The total TB case finding from PPM improved numerically over the quarters between 2021 and 2023 as case finding from PMV intervention increased; significantly accounting for more than one-third contribution to the total PPM TB case finding as shown in the table below.

Period	Total TB cases diagnosed (PPM)	TB cases diagnosed PMV	% contribution
Jan to Mar 2021	92	4	4%
Apr to Jun 2021	108	3	3%
Jul to Sep 2021	117	5	4%
Oct to Dec 2021	155	42	27%
Jan to Mar 2022	179	59	33%
Apr to Jun 2022	252	99	39%
Jul to Sep 2022	222	93	42%
Oct to Dec 2022	225	94	42%
Jan to Mar 2023	203	71	35%
Apr to Jun 2023	271	88	32%
Jul to Sep 2023	240	82	34%
Oct to Dec 2023	161	93	58%

Conclusions: Strategic engagement of PMVs for community-based active TB case finding is a viable and yielding intervention that can significantly strengthen the Public-Private Mix (PPM) contribution to the TB-related targets in the Sustainable Development Goals and End TB strategy by improving community TB case detection.

PP33-1199-16 All roads lead to Rome, some are just shorter - measuring tuberculosis detection yields from four provider types through a public-private-mix intermediary agency in Vietnam

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Background and challenges to implementation: While engagement of all care providers and public-private-mix (PPM) is widely recognized as an important strategy for ending TB, there is substantial heterogeneity in the providers and thus in the effectiveness of PPM implementation. Understanding potential case detection yields from different providers better could optimize engagement and allocative efficiency.
Intervention or response: Between 01-01-2020 and 31-12-2023, the National TB Program (NTP) engaged Friends for International TB Relief to serve as intermediary agency in 15 provinces of Vietnam. The model aimed to engage all care providers outside of the NTP network and supported willing participants in X-ray screening, sputum testing and treatment of persons with TB. Providers were categorized as pharmacies, private practices, clinics and hospitals, and others such as occupational health screening providers. For each category, we report providers enumerated, engaged, signed and actively participating as well as the TB care cascade from X-ray screening to detection and yield.
Results/Impact: By the end of the project, we enumerated 19,520 providers of whom 8,466 (43.4%) were approached, 3,157 (37.3%) signed a collaboration agreement, and 818 (25.9%) contributed to the TB care cascade. In 1,891 participating pharmacies, 4,818 persons were screened and 532 detected with TB. Private practices (n=784) screened 246,444 persons and detected TB in 8,217. The contribution from 212 clinics and hospitals was 1,378,895 persons screened and 21,522 TB detections. All other providers (n=270) screened 63,994 and detected 1,201 persons with TB. The respective yields were 11,042, 3,383, 1,561 and 1,877 per 100,000 screened.
Conclusions: Our results show large differences in participation, screening and TB case detection across different non-NTP provider types. During programmatic design and implementation, it is important to account for these differences with respect to human resource and financial capacity to optimize resource utilization and expectation management.

PP33-1201-16 The yield of systematic screening for active TB in the outpatient department of two hundred and twenty-two high-burden health facilities in Nigeria

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Background and challenges to implementation: Nigeria ranks 6th among 30 high burden tuberculosis (TB) countries globally with about 470,000 persons developing TB disease every year. The 2020 Epi-analysis indicated that the out-patient department (OPD) of health facilities accounted for a large proportion of missing TB cases. This necessitated the institution of screening for active TB in the OPD of selected high burden facilities by the National TB Programme (NTP). This study demonstrates the yield of the OPD intervention after three years.
Intervention or response: In 2021, the NTP selected 222 health facilities (6 in each state and the federal capital) based on high hospital attendance. Two Screening Officers (SO) were engaged in each facility and trained on provider-initiated symptomatic screening of clients for TB. Clients are screened in the waiting area of the facility. Persons presumed to have TB are linked by the SO to the TB unit where their sputum samples are collected and tested using Xpert MTB/RIF assay or chest x-ray for clients unable to produce sputum. Confirmed TB cases are contacted and started on appropriate treatment. The NTP data collections tools were used for documentation and reporting. Quarterly surveillance data from the intervention facilities was collated and analyzed.
Results/Impact: Between 2021 to 2023, a total of 17,749,934 OPD attendance was recorded with 13,326,897 (75%) screened for TB, 863,265 (6%) presumptive TB cases identified, 749,394 (87%) were evaluated, 80,129 (11%) TB cases were diagnosed, and 74,355 (93%) started on treatment. Number Needed to Screen was 166 and Number Needed to Test was 9. This intervention contributed 5%, 8%, and 11% to the total TB notification in 2021, 2022, and 2023 respectively.
Conclusions: TB screening in the OPD setting has the potential of finding the missing TB cases in Nigeria. This approach should be integrated into facilities' routine services and scaled up to more facilities across the nation.

PP33-1204-16 Evaluation of computer-aided detection powered by artificial intelligence software in detecting TB using radiographs from a TB mass screening program in the Philippines

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Background and challenges to implementation: The use of chest X-ray (CXR) equipped with computer-aided detection powered by artificial intelligence software (CAD-AI) in TB screening was introduced in 2019. However, expanding the use of CAD-AI in active case finding (ACF) activities is quite challenging due to perceived uncertainty of its performance and usefulness as a relatively new tool.
Intervention or response: ACF using symptoms screening and CXR with CAD-AI was implemented in two highly urbanized cities in Metro Manila targeting urban poor communities. CAD-AI provided a threshold score (0-100%) for each radiograph with a pre-specified threshold of 30% indicating presumptive TB. Radiographs were read by experienced radiologists who made dichotomous decisions on whether findings were suggestive of TB. Individuals with presumptive TB either by symptoms, CAD-AI or human readers were advised to submit sputum specimens for Xpert MTB/Rif testing. The performance of CAD-AI and radiologists in TB detection were compared with reference to Xpert MTB/Rif test results, using McNemar's test with 95% confidence intervals (CIs).

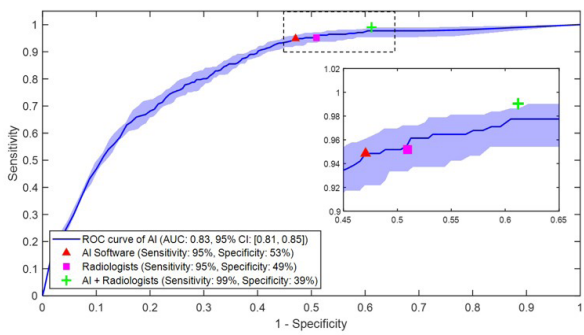

Figure. Sensitivity and specificity of CAD-AI and human reading

Results/Impact: Between August-October 2023, 20,042 individuals were screened for TB, of whom 3,267 were tested with Xpert MTB-Rif, and 311 bacteriologically confirmed (BC)-TB cases were identified. The sensitivity of CAD-AI and radiologists in detecting TB was the same at 95% (p=0.85), while specificity of CAD-AI was significantly higher than the radiologists (53%, 95% CI [51%, 55%] for CAD-AI vs. 49%, 95% CI [47%, 51%] for radiologists, p<0.001). When combining TB-positive predictions from CAD-AI and radiologists, the sensitivity significantly increased to 99% (p<0.001), and only 3 of 311 BC-TB were missed. However, in this case, specificity decreased compared to either CAD-AI or radiologists (39%, CI [37%, 41%], p<0.001).
Conclusions: The results suggest that CAD-AI has the potential to become an important tool in promptly and accurately identifying presumptive TB during mass TB screening programs. Hence, increasing uptake and expanding use of CAD-AI should be considered.

PP33-1205-16 Reaching the last mile: Wellness on Keke driven active TB case finding in remote communities in Taraba State

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Background and challenges to implementation: Tuberculosis (TB) is a major public health concern worldwide, especially in remote communities where access to healthcare services is limited. The delay in the movement of samples from remote areas affects the sample's viability.
This abstract discusses the innovative strategies implemented by the Taraba State KNCV Nigeria TB LON Project in the introduction of the Wellness on Keke (WoK) initiative to scale up access to TB services and to efficiently cover hard-to-reach areas.
Intervention or response: In 2023, KNCV Nigeria under the TB LON 1&2 Project deployed two tricycles (WoK) in Taraba State. Each of the WoKs was equipped with Truenat and TB LAMP diagnostic platforms. The WoK intervention leverages community engagement, health units, and technology to overcome barriers to TB diagnosis by providing on-the-spot testing, early detection, and treatment initiation for TB patients. Data on the field are captured on a paper-based tool and electronically transmitted.
Results/Impact: Between July 2023 and February 2024, the WoK platform coupled with TBLAMP, navigated 37 communities in Gassol LGA, Taraba State. It analyzed 1,491 samples and detected 120 cases of TB, resulting in a TB yield of 8%. Also, the WOK platform coupled with Truenat visited 39 communities in Kurmi LGA and analyzed 1,382 samples over the same period, detecting 122 TB cases resulting in a TB yield of 9%. Cumulatively, the WOK intervention reached a total of 76 communities, an-

alyzed 2,873 samples with a total of 242 TB cases detected and a TB yield of 8%. All positive TB cases were enrolled for treatment.
Conclusions: Lessons learned from the Taraba State WoK Program underscore the significance of community-driven initiatives and innovative service delivery models in addressing challenges to TB case finding in remote communities. This abstract advocates for the scale-up of similar initiatives to accelerate progress toward TB elimination in remote areas.

PP33-1202-16 Comparative analysis of screening officer-driven intensified case finding and provider-driven intensified case finding supported facilities in Osun State

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Background and challenges to implementation: Tuberculosis (TB) remains a significant global health concern. TB remains a major public health concern in Nigeria, ranking sixth globally in terms of prevalence according to WHO global report 2023. Effective case finding is crucial for interrupting transmission and controlling the disease. Adequate human resources (HR) are crucial for effective tuberculosis (TB) case finding and control. This study aimed to compare TB case finding rates in IHVN/USAID TB LON-3 SO-supported health facilities (HFs) with those where Intensified Case Finding is driven by the providers supported facilities in Osun state, Nigeria.
Intervention or response: A comparative analysis was conducted using data reported in the health facility register and DHIS2 from USAID/TB LON 3 SO-supported health facilities and Provider driven ICF facilities. This study reviewed data generated in 12 months from January 2023 – December 2023, in all the implementing facilities across 30 LGAs in Osun State (TB High Burdened and Low Burdened). It compared the screening outcomes, presumptive identified and case finding.
Results/Impact: This analysis compared TB case detection rates between SO-supported and Provider driven ICF supported facilities. A total of 253229 attendees were symptomatically screened for TB in SO supported facilities against 45229 in provider driven ICF facilities, 19517 were presumptive TB in SO supported and 500 in Provider driven facilities. TB diagnosis case finding was 1405 in SO supported facilities and 33 in Provider driven facilities within the period of January 2023 through December 2023.

	CLIENT SCREENED	PRESUMPTIVE IDENTIFIED	TOTAL TB CASE DIAGNOSED	TOTAL TB CASE STARTED ON TREATMENT
SO Supported Facilities	253229	19517	1438	1427
Provider Driven Facilities	45229	500	33	33
Differential	208000	19017	1405	1394

Conclusions: This study shows that HR supported facilities have high outcome across the TB cascade. Results indicate that enhancing human resources in healthcare institutions can maximize tuberculosis control efforts.

PP32 Digital adherence technologies

PP32-1094-16 Improving TB treatment adherence in mobile, and homeless people with TB by Humana People to People India (HPPI), a national-level NGO in India

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Background and challenges to implementation: Between 2017 to 2021, HPPI documented poor TB treatment adherence in Delhi's unhoused population due to frequent mobility, low risk perception, alcoholism, stigma, and lack of identity documents preventing accesses to TB services.
To address this, Project LEAD works in four Indian cities (Delhi, Howrah, Hyderabad, and per-urban Mumbai) to demonstrate a TB detection and care model for underserved and high-risk urban homeless, migratory, and slum populations.
LEAD is funded by United States Agency for International Development's TB Implementation Framework Agreement, implemented by JSI Research & Training Institute, Inc. and supported by National TB Elimination Program (NTEP) and John Snow India Private Limited.

Intervention or response: Project LEAD mobilized 38 city field officers (CFOs) across Delhi for TB case detection and care in homeless people. After identifying PwTB from homeless communities, CFOs prepared them for treatment through post-test counselling. CFOs then escorted PwTB to local chest clinics for treatment initiation and avoid initial loss to follow-up (LTFU). To support adherence, they conducted daily follow-up visits to PwTB for 14 days at a stretch after treatment initiation, followed by weekly visits til treatment completion. CFOs tracked PwTB during their movements while on treatment by utilizing information about their contacts and networks. They assisted PwTB to obtain essential identification documents and access financial benefits from NTEP for nutritional supplementation. CFOs further mobilized key community stakeholders to support homeless PwTB with nutrition assistance, housing, and employment.
Results/Impact: Between August 2023 to January 2024, LTFU cases declined from previous 14% (39/283 on treatment) to 1.2% (13/1053 on treatment), and mortality from previous 10% (29/283) to 2.3% (25/1053). 96% (1013/1053) were continuing treatment with 2 PwTB successfully completed treatment. Baseline figures were derived from HPPI's previous TB projects (2017 – 2021) with homeless people in Delhi.
Conclusions: Intensified and strategic interventions help in treatment adherence in homeless PwTB.

PP32-1093-16 Trend analysis in medication adherence among persons with TB using mhealth tool in Gauteng, South Africa

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Background: Tuberculosis (TB) is a curable and preventable infectious disease. Alongside HIV, TB ranks as a leading cause of death worldwide. Monitoring TB treatment using direct observed therapy (DOT) has seen remarkable success in specific contexts. However, it's still limited in addressing poor adherence. The need to develop technology-driven supportive tools aimed at increasing adherence is crucial. Mobile health (mhealth) technologies have the potential to improve medication adherence, but few studies have tested its effectiveness. This study examined trends in medication adherence over time from using wisepill technology feedback reminders.
Design/Methods: Prospective enrollment of 90 people with tuberculosis (PWTB) initiated on a 6-month regimen of susceptible TB medication were purposely selected from five clinic facilities in Ekurhuleni district of Gauteng, South Africa. Participants were enrolled between February 2022 and March 2023. The evriMED 1000 measured adherence to medication monthly. We assumed that medication was taken when the box was opened. The Cochran–Armitage test was used to measure the significant increase in medication adherence over six visits.
Results: Supportive feedback reminders from wisepill technology did not increase adherence over time. The observed decline was particularly during visit 5 (n=67, *M*=29, IQR=23-30, rank-sum= 11915.5, p =.075) and visit 6 (n=63, *M*=27, IQR=12-30, rank-sum= 11214.0, p =.0529) where the rank-sum scores were less than the rank sum score at visit 1 (n=84, *M*=27.5, IQR=22-30, rank-sum= 15140.5). Despite this decrease, there was significant increase over time between visit two (n=81, *M*=30, IQR=28-31, rank-sum= 20407.0) to visit four (n=73, *M*=30, IQR=26-31, rank-sum= 17014.0, p =.003). Transfer outs, lost to follow-up, and not opening the box influenced end of treatment outcomes.
Conclusions: Retention in care was low in this cohort. This implication highlights an ongoing challenge faced by the TB program, to retain patients' adherent after initiating TB treatment. Monitoring TB adherence trend using technologies remains valuable.

PP32-1087-16 Digital technologies for treatment adherence in TB: An assessment of facilitators and barriers to adoption and scale-up in India

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Background: Inadequate adherence to tuberculosis treatment elevates the risk of treatment interruptions, drug-resistance, mortality, and financial strain on patients/healthcare systems. India's National Tuberculosis Elimination Program (NTEP) launched the Integrated Digital Adherence Technology initiative (IDAT) such as medication monitoring box (99DOTS and MERM box) and video-observed therapy (VOT) in 2019, offering diverse DAT choices. Nonetheless, challenges remain in achiev-

ing their nationwide adoption and scalability. We evaluated the underlying factors affecting the adoption and scale-up of DAT in India.

Design/Methods: We conducted a qualitative study to explore factors affecting the adoption, scale-up, and sustainability of DAT including 99DOTS and Medication event reminder monitoring (MERM) box. This included key-informant interviews of program managers, district TB center staff, treatment supporters, researchers, and development partners in two Gujarat districts: one with sustained and other without sustained DAT implementation. A total of 19 key-informant interview and 8 in-depth patient interviews were done to identify the underlying factors. Our analysis was guided by a program sustainability conceptual framework.

Dimensions	Barriers	Facilitators
Project design and implementation factors		
Project effectiveness	**Technology issues** – No internet access or poor signal, limited access to mobile phone, one phone and two patients in same household, failure to call the number with zero-balance, 'why should I spent money on recharge of the phone for taking treatment?', frequent changing/de-activation of mobile numbers	**Cues to action** - If the patient misses the dose, then a reminder call is done by DOT supervisor ensuring adherence, less visit and travel to the healthcare facility
	System issues - Ni-kshay not working, patient calling but dose is not marked, failure to register the call if patient calling after 12 p.m. midnight	**Logistic ease** - Ease of remote monitoring, less workload on the DOT provider and less stress
	Semiotics and technology fatigue - patient is calling the same number daily in spite of different numbers, so call is not registered with the system, difficulty in understanding the information on the envelope	**Motivation** – monitoring done by government
Training	**Accountability shifting** - treatment supervisors are relaxed as the entire accountability has shifted to patient instead of treatment supervisor/supporter	**Anonymity** - privacy, confidentiality, trust with the treatment supervisor/supporter (better patient-provider relationship)
	Coaching - Inadequate and irregular training related to counselling for treatment adherence	**Supervision** - training staff - supportive supervision by WHO and quarterly performance review meetings
Factors within the organizational settings		
Integration with existing adherence options	**Conventional method** - DOT was a better option as accountability was there. In 99DOTS, patient is calling the number but treatment supervisors are relaxed. So, adherence rate of the district has come down. In MERM box, patient has issues with understanding signals, and it was difficult to carry out-station.	**Segregation** - program manager based on the existing knowledge identifies 10-15% of the patients who will not adhere to treatment if put on DAT and so are initiated on DOT
	Dilemma - reduced program priority owing to lack of evidence and too many options (which technology for whom dilemma)	**Award** - TB free certification of the district initiative is a motivating factor for healthcare providers
	Doubling of work - have to cross-checked with the Nik-shay database and patient as most of the time patient is calling but call is not registered. And so have to manually enter the dose taken.	**Confidentiality** - data remains with the program (NTEP has purchased numbers, so no information sharing with international agencies/manufacturers)
Procurement	**Interupted supply** – challenge with seamless supply of DAT, single use per patient, issue with non-rechargeable nature of MERM box batteries	**Cost**- though additional cost, but cheap in comparison with MERM, no maintenance cost
	Foam factor - the size of the blister pack and envelope not matching so have to be dispensed separately, cumbersome for the patient as well as provider. Even for the MERM box, some spaces remain vacant due to non-availability of drug leading to more confusion.	**Storage**- ease to store 99DOTS at the centre
Factors in the broader community context		
Socio-economic	**Additional costs** - recharge fees, internet data costs to the patient	**User friendly** - reduced travel and visit to healthcare facility
	Determinants - sub-optimal health literacy and lower socio-economic status, cultural and social determinants affecting usage. Stigma with MERM box owing to loud sound and big size	**Stigma** – less stigma associated owing to privacy and confidentiality maintenance
Political consideration	**Budgeting** - additional cost and budgeting for incentives for treatment supporter in the program	**Enabler** – monetary benefit for treatment supporter/DOT provider
Community participation	**Counselling and IEC** – poor counselling related to use and benefit of DAT	**Social influences** – improved family involvement for 99DOTs
	Stigma - high TB and HIV-related stigma	**Incentive** - financial benefit for DOT provider

Results: Barriers to maintaining DAT included supply disruptions, packaging mismatches, technical issues, connectivity gaps, low health literacy, and placing too much responsibility on patients. MERM boxes, due to their noise and size, carried a stigma and were less favored by patients. To overcome these hurdles and expand usage, recommendations included streamlining packaging, enhancing box quality and size, using a unified numbering system and signaling system, ensuring system reliability, and empowering communities and healthcare providers. Key stakeholders emphasized the importance of directly observed treatment for sustaining DAT, along with training for patients and support personnel, policy backing, stable funding, and ongoing monitoring. Additionally, a patient-centered approach to adherence tailored to individual needs was highlighted for achieving high treatment success rates.

Conclusions: Successful adoption and scale-up of DAT in NTEP require concerted efforts to address these identified barriers, implement effective strategies, and prioritize patient-centered care.

PP32-1092-16 Psychometric properties of instruments for TB caregiver burden: A systematic review

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Background: The state of the tuberculosis caregiver burden affected their own and the patients' quality of life along with their preventive and treatment adherence due to its stigmatization and chronic infectious disease condition. Research on caregiver burden measurements is essential to enhance validity by selecting appropriate instruments that lead to better interventions and improved quality of life for caregivers and patients.

Design/Methods: This systematic review aimed to (i) identify psychometric tools that have been developed to assess the caregiver burden for chronic infectious disease, (ii) summarize key characteristics, psychometric properties, and strengths and limitation of instruments for tuberculosis patients' caregiver, (iii) compare the instruments' theoretical conceptualizations of caregiver burden, and (iv) evaluate each instrument on their ability to assess tuberculosis caregiver burden.

Results: In this study, five instruments from eleven studies assessing caregiver burden were reviewed. Results indicate that while the instruments had different conceptualizations of the burden of caregiving due to their role as family or informal caregivers, formal caregivers. Two domains were found to explore the instruments' features, which are (1) domain of caregiver strain (including financial burden, social and personal life burden, and physical-psychological health) and (2) Caregiver burden assessment methods (including responsibility burden, overall burden, and general feelings to care recipients). Contextual factors that may potentially affect the assessment of caregiver burden and recommendations for researchers and psychologists are discussed.

Conclusions: TB caregiver burden significantly impacts the quality of life for both caregivers and patients, hindering adherence to treatment due to stigma and chronicity. This systematic review analyzed instruments to assess this burden, identifying common domains (caregiver strain & assessment methods) across varying conceptualizations of caregiver roles.

PP32-1097-16 The acceptability of digital adherence technology combined with differentiated care and psychosocial intervention among adults with rifampicin-resistant TB in South Africa

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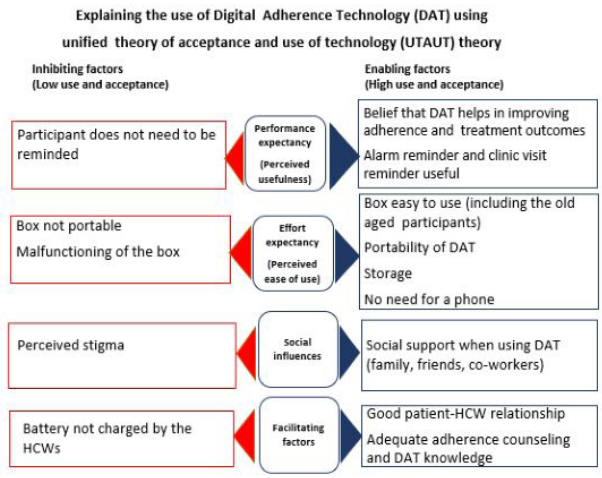
Background: As digital adherence technologies (DATs) are being introduced, there is limited evidence on factors affecting their acceptability among people with Rifampicin Resistant TB (RR-TB). Our objective was to evaluate the acceptability of the smart pillbox which was rolled out with differentiated care based on missed doses and consisted of automated reminder SMSs, phone calls, and home visits. Some participants were offered psychosocial assessments and support according to identified issues.
Design/Methods: We conducted in-depth face-to-face interviews with adults who had RR-TB in two South African Provinces from May to August 2022. Interviews were conducted in local languages, audio recorded, transcribed verbatim, and translated to English. Participants were purposively selected by gender, age, and adherence levels. We conducted inductive and deductive thematic analysis using the unified theory of acceptance and use of technology framework.



Results: We included 36 individuals who used the smart pillbox. Most participants reported positive attributes of the smart pillbox such as the daily alarm reminder at their preferred time, storage, ease of use, and social support. Barriers to using the box included lack of portability, perceived stigma, and pillbox malfunction. We deduced that differentiated care was initiated after TB nurses used DAT to identify non-adherence caused by psychosocial and medical issues such as side effects, alcohol use, and mental illness and participants were referred to a Social Worker. Participants appreciated psychosocial support provided by Social Workers i.e. counseling and referrals according to their needs. Participants appreciated differentiated care as they felt cared for by the healthcare workers although some felt home visits stigmatizing.
Conclusions: Smart pillboxes were person-centered and acceptable among people with RR-TB. DATs can be useful in identifying non-adherence due to psychosocial challenges leading to early intervention, hence a combination of DAT and psychosocial interventions is important. Further work is needed to make DATs and home visits less stigmatizing.

PP32-1096-16 The nexus of technology and health: Implementing digital adherence technology in Nairobi County, Kenya - A person-centric approach to drug-susceptible TB management

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Background and challenges to implementation: An adherence study conducted in 2018 in Kenya indicated that 35% of patients on TB care were non adherent to treatment. Non-adherence to TB treatment increases TB transmission, poor outcomes, and adversely affects TB control. In 2021, Kenya reported a total of 77,854 drug-sensitive Tuberculosis (DSTB) cases, out of whom 10,598 (13.6%) were from Nairobi county. Kenya reported a treatment success rate (TSR) of 86% and loss to follow-up rate of 5.4% (LTFU), while Nairobi reported a TSR of 84% (8902) and a LTFU rate of 7% (742). LTFU in this one county contributes to 17% of the country's LTFU rate. Addressing adherence in Nairobi county therefore would impact the country's performance.
Intervention or response: Through USAID funding, Center for Health Solutions-Kenya, in collaboration with the National TB Program, piloted the use of Digital adherence technology (DAT) through an in-country android mobile application and use of customized medication sleeves in Nairobi County from December 2022 to March 2024. Enrolled patients were provided with adherence counselling and sent daily reminders to prompt patients for drug intake and to send USSD codes to mark adherence on the patients pill calendar reflected on the health care workers' mobile devices.
Results/Impact: Between December 2022 and September 2023, 3149 DSTB patients were enrolled to the DAT platform. The average recorded digital adherence was at 55%.

Prior to implementation, Quarter 4 2021 patients reported a LTFU of 7.5%, while Q4 2022 reports a LTFU of 0%.
Conclusions: Successful implementation of DAT can improve the standard of care and adherence to TB treatment. Patient-health worker relationships improves as there is real time monitoring and follow up of patients. There is need for targeted DAT interventions for patients who are at a higher risk of loss to follow-up.

PP32-1091-16 Introduction of digital treatment adherence to improve therapeutic outcomes in Eastern DR Congo

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Background and challenges to implementation: The DRC's struggle with multidrug-resistant TB (MDR-TB) is exacerbated in the mineral-rich, conflict-ridden provinces of North and South Kivu, which suffer from low treatment success rates due to insecurity and insufficient healthcare investments. The National Tuberculosis Program (NTP) aims for a ≥95% cure rate, yet these provinces reported cure rates of 86% and 94% respectively in 2021, highlighting the urgent need for innovative treatment adherence methods.
The NGO ALTB - a community association led by TB survivors, with the support of Stop TB Partnership, introduced "99DOTS" in above mentioned areas as DAT to improve tuberculosis treatment outcomes.
Initial challenges included the lack of patient access to telephones and the financial means to utilize the designated toll-free numbers for treatment monitoring. Through additional effort and resources, solutions were found to include more relevant communication options.
Intervention or response: The „99DOTS" platform was introduced across 18 health zones and 31 treatment centers. Healthcare personnel were trained on the platform use, facilitating real-time monitoring and support for TB patients.
Results/Impact: The project registered 1,536 TB patients in the platform, including 28 MDR-TB cases, achieving a 100% cure rate. This success demonstrates the viability of DATs in enhancing treatment adherence in challenging settings. The integration of such technology fostered better communication between patients and healthcare providers, addressing treatment barriers like side effects and medication shortages.
Conclusions: Implementing DATs in conflict-affected and remote areas of eastern DRC offers a promising avenue to improve TB treatment adherence and outcomes. This approach could serve as a model for similar contexts globally, where conventional treatment adherence strategies are hindered by external factors.

PP32-1089-16 Enhancing TB treatment adherence: Insight from participants' experience in a pragmatic randomised control trial using the Tuberculosis Treatment Support Tools

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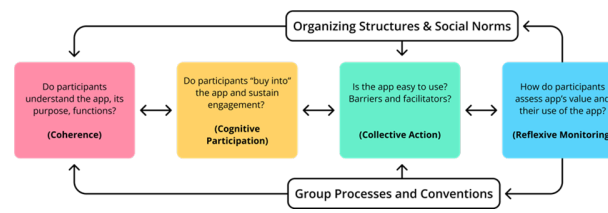
Background: Limited knowledge exists regarding users' experiences and perceptions of mobile health apps, particularly for tuberculosis (TB) treatment. Understanding factors that influence the utilization of mobile health apps is crucial for understanding trial results, enhancing patient engagement, and improving health outcomes. Our objective was to explore participant and treatment supporter experiences using the Tuberculosis Treatment Support Tool (TB-TSTs) Companion app and identify barriers and facilitators to using the app and recommendations for improvement.
Design/Methods: As part of a mixed method pragmatic trial of the TB-TST intervention in Argentina, we conducted semi structured interviews with 33 individuals with active TB randomized to the intervention and five treatment supporters. We focused on participant use of the app designed to monitor treatment progress, provide information on TB and treatment, and interact with treatment supporters. Analysis was guided by the Normalization Process Theory (NPT) that includes four key constructs determining implementation of new practices: Coherence (meaning), Cognitive participation (organization), Collective work (enactment), and Reflexive monitoring (control). Barriers and facilitators were mapped to NPT constructs (Figure 1)



Results: Participants found the app helpful for reminders, educational content, and communication with healthcare providers. Initially unclear, the drug metabolite test's

purpose became clearer with use. The app helped sustain motivation to complete treatment by aligning with participants' goals that centered around protecting loved ones and resuming normal activities. Users felt empowered to communicate with health providers and ask questions they might have hesitated to raise in other settings. Barriers to app usage included time constraints, technical issues, and treatment side effects. Recommendations for improvement centered on technical improvements and user experience enhancements.
Conclusions: This study emphasizes the need for comprehensive features catering to diverse patient needs and underscores the crucial role of healthcare provider support in utilizing such interventions effectively.

PP32-1095-16 Optimising adherence in months 3 and 4 of TB treatment using DAT: A case study at Chandaria Health Centre, Nairobi, Kenya

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Background and challenges to implementation: Non-adherence among TB patients constitutes a substantial portion of diagnosed and treated cases. A 2018 adherence study by DNTLDP Kenya revealed a 35% non-adherence rate among TB patients.
This paper delves into the phase of TB treatment with the weakest client adherence, specifically in DS TB, necessitating adherence optimization throughout the treatment course. It draws data from Chandaria Health Centre's Digital Adherence Technology app (DAT), which has documented an increase in clients with poor adherence.
Intervention or response: To enhance TB patient adherence, a digital health approach aligned with the 2019-2023 National TB Strategic Plan and the End TB Strategy was implemented at Chandaria Health Centre. All healthcare personnel underwent comprehensive DAT training, by support of the partners and county. A total of 113 eligible patients were enrolled in the DAT program. Findings reveal excellent medication adherence among TB patients in the initial months, particularly in months 1 and 2, with fewer cases of poor adherence.
However, poor adherence cases notably increase in months 3 and 4, while months 5 and 6 exhibit the lowest incidence of poor adherence. This adherence pattern designates months 3 and 4 as the critical phase of TB treatment where adherence challenges arise, impacting Treatment Success Rates, Cure rates, Drug Resistance Rates, Lost to Follow-up cases, Treatment Failures, Retention rates, and Mortality.
Results/Impact: In months 1 and 2, 98% (110) of cases exhibited good adherence. However, this rate decreased to 53.3% (60) in months 3 and 4, indicating a period of poor adherence. Conversely, adherence surged significantly to 98.7% (98) in months 5 and 6 among cases initiated on treatment.
Conclusions: Providing a targeted adherence optimization package to TB patients in months 3 and 4 of treatment is crucial to achieving over 95% adherence, driving policy reforms, enhancing treatment outcomes, and contributing to the goal of ending TB by 2035.

PP32-1090-16 Examining the challenges of capitalising on mHealth's potential to deliver locally-aligned person-centred MDR-TB care in Vietnam: A qualitative study

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Background: Vietnam's booming digital telecommunications sector offers opportunities to deliver mHealth interventions to support the control and reduction of the country's high MDR-TB burden. This qualitative study is an iterative evaluation to support the stepwise/incremental design and implementation process of mHealth technologies, a smartphone app.
Design/Methods: Using qualitative enquiry, we examine the design and implementation gaps of the initial iteration of a smartphone app, introduced within MDR routine care in Vietnam, to improve early adverse event (AE) identification and management. Semi-structured in-depth interviews were conducted with 37 participants, including MDR-TB patients and healthcare workers (HCWs) enrolled in a clinical trial of a mHealth intervention.
Results: We found that the app acquired social meaning that built patients' confidence to actively engage with providers, and drove uptake. This ignited more equitable patient-HCW communication. However, this tended to migrate outside of the app to other forms, including pre-existing modes, of communication. We demonstrate how the social value of the novel mHealth app, as interpreted by patient-users, may moderate its uptake and acceptability, yet its sustained usage will be disrupted by perceived limited functional value.
We developed a framework to explain why and how users engage with m-health interventions over time, inform adjustments in its design and support the digital and systemic infrastructure necessary to meet the needs of the diverse groups of stakeholders within a local health system.

Conclusions: Iterative approaches in developing and evaluating mHealth technologies should be adopted to attend to the social influences on mHealth technologies, which illuminates why some seemingly 'acceptable' technologies may struggle to sustain engagement and become integrated into local context.

PP32-1088-16 Evidence on cost-effectiveness in digital approaches to TB treatment

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Background: Tuberculosis (TB) is one of the oldest diseases known in society and it is still a serious public health problem. Directly Observed Treatment (DOT) is an approach defined by the World Health Organization (WHO) that aims to supervise medication doses by a healthcare professional, however it generates high costs for the healthcare system. The creation of new approaches combining the use of digital technologies and Tuberculosis treatment has been recommended by the WHO, however their cost-effectiveness is not yet well-defined in literature. The present study aimed to analyze the evidence in literature about the cost-effectiveness of Tuberculosis treatment using Digital Health.
Design/Methods: This is a scoping review that followed the recommendations proposed by Joanna Briggs Institute through the following steps: definition of objectives and question study, development of inclusion criteria, description of the planned approach, search for evidence, selection of evidence, extraction of data, presentation of evidence and synthesis of evidence.
Results: Five studies were included. All studies showed a positive relation in cost-effectiveness when applied digital health strategies, reducing costs and guaranteeing or even improving treatment outcomes, using different indicators to assess the direct and indirect costs to users and the health system, as well as effectiveness TB indicators. Emphasizing that digital health as an alternative strategy to complement the traditional one still guaranteed a reduction in costs and positive outcomes of TB treatment in relation to total costs. The digital strategies applied for the treatment of TB were mainly the use of video conferencing, sending recorded videos and the use of smart medicine-boxes for direct observation of the treatment.
Conclusions: It is concluded that the evidence in the literature regarding the cost-effectiveness of TB treatment, when applied digital health approaches, indicates that it could reduce costs for users and health system, guaranteeing or even improving TB outcomes.

PP39 Increasing uptake and breaking the cycle

PP39-1169-16 Using cascade analysis to identify opportunities to improve the delivery of TB preventive therapy to close contacts in Uganda

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Background: The Uganda National Tuberculosis Program recommends tuberculosis preventive therapy (TPT) for close contacts of persons living with TB (PWTB), however TPT coverage rates remain suboptimal. With support from TB REACH, we sought to identify gaps in standard-of-care TPT implementation in Uganda.
Design/Methods: We prospectively evaluated TPT implementation during contact investigation at 23 TB clinics across four districts in central Uganda (March-May 2023) using routine TB registers.
We surveyed clinic administrators about TB services available at their facilities. We constructed care cascades for contact tracing and TPT completion. We analyzed facility characteristics associated with high-quality, guideline-adherent program delivery.
Results: We found 95% (740/777) of PWTB were eligible for contact tracing and 43% (316/740) were traced. Community health workers screened 97% (1776/1840) of contacts for TB symptoms, and 92% (1637/1776) were eligible for TPT. Of these, 58% (947/1637) initiated TPT and only 18% (175/947) completed TPT.
Cascade outcomes were highly correlated within facilities (for a PWTB being traced, ICC=0.38, for a contact initiating TPT, ICC=0.79 and completing TPT, ICC=0.88) indicating the substantial role facility-level factors play in driving patient outcomes.
Sites varied widely in their ability to effectively implement TPT during contact investigation (Figure 1).
While the small sample size limited our ability to detect many facility-level determinants of cascade progression, we found facilities that offered patients on TPT social support had significantly higher TPT completion rates (2% vs 46%, p=0.03).

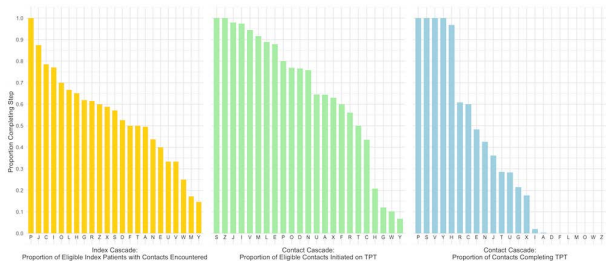

Figure 1. Facility-Level Variation in Proportion of Clients Completing Cascade Steps with Greatest Losses. Each of the 23 facilities is represented by the same letter in all graphs.

Conclusions: There is considerable variation across facilities in completion rates for contact investigation and TPT delivery cascade steps.
Further research is needed on contextual and facility-based factors that explain this variation in order to close gaps between facilities in high-quality TPT service delivery in Uganda.

PP39-1165-16 Adoption and rapid scale up of short course TB prevention therapy: Lesson learned from three regions in Tanzania

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Background and challenges to implementation: Tuberculosis (TB) is an old disease which still ravages the health of people globally. In 2022, 10.6 million people contracted the disease and 1.3 million people died of TB including 167,000 people living with HIV (PLHIV). PLHIV are 16 times more likely to contract TB than people without HIV, also is the leading cause of death among PLHIV. Sub-Saharan Africa has the highest burden of HIV associated TB worldwide. The 2023 global TB report estimates 128,000 cases of TB in Tanzania, but only 78% were notified and 18,100 deaths were reported (5100 among PLHIV). TB preventive therapy (TPT) has been shown to reduce incidence of TB among PLHIV.
Compared with Isoniazid Preventive Therapy (IPT), shorter-course TB preventive therapy regimen (3HP) has fewer side effects and higher completion rates. In 2022, Tanzania TB program adopted 3HP for TB prevention among PLHIV and TB exposed children. Gaps in training, availability of reporting tools and distribution of 3HP drugs hindered effective rollout.

Intervention or response: Multi prongs approach was adopted by the Afya Thabiti, a PEPFAR funded project to achieve rapid scale up. A total of 574 health providers from 224 facilities were trained or mentored on 3HP, reporting tools were distributed and the project and drugs requested from medical store based on the eligible list per facility.
Results/Impact: Among eligible, 976 clients were initiated shorter-course TB preventive therapy regimen in a span of approximately 10 weeks with a rapid acceleration noted in mid-February. Weekly performance meetings were conducted in collaboration with sub national health management team to assess performance and address emerging challenges as the scale up was progressing.

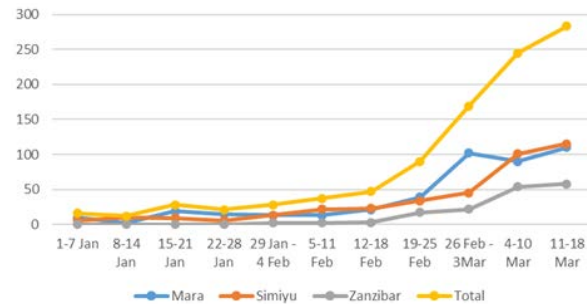

Figure. 3HP initiation trends per region.

Conclusions: Multi-faceted approach including capacity building, strengthening reporting and drugs supply chain improved rapid initiation of 3HP among eligible clients in three regions. Weekly monitoring coupled with data driven action plans ensured the scale-up efforts were on course.

PP39-1164-16 Increased uptake of TPT among children under five and PLHIV in three districts in Malawi

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Background and challenges to implementation: In 2022, the TB incidence in Malawi was 125 per 100,000 people, including 3200 cases among children aged 0-14 years. Malawi is classified as a high-burden TB/HIV co-infection country with 47% co-infection.

Despite progress in TB treatment coverage, utilization of TB preventive treatment (TPT) among key and vulnerable populations, including child contacts under 5 years (CU5) and people living with HIV (PLHIV) remains sub-optimal.

Intervention or response: Development Aid for People to People Malawi with the U.S Agency for International Development has implemented the TB Local Organization Network (LON2) project supporting the national tuberculosis and leprosy elimination program (NTLEP) in improving TPT uptake among CU5 contacts and PLHIV newly initiated on antiretroviral therapy (ART) in 3 high TB/HIV burden districts (Mangochi, Machinga and Mulanje). 21 CHWs(1 per facility) were trained in active case-finding to identify CU5 contacts and PLHIV. They collaborated with the Ministry of Health TB focal points and ART clinics utilizing a tracking tool to identify and follow-up those eligible for TPT.

They also provided mentorship on TB messaging, systematic screening, sample collection, and stigma reduction. Further, family support systems were established to provide psycho-social support and Direct Observed Therapy (DOT).

Results/Impact: In 2021, TPT uptake among CU5 and PLHIV in the three districts was below 55%. Between 2021 and 2023, the number of CU5 and PLHIV increased significantly (Table 1). TPT uptake increased to 74-80% among CU5 and to 71-73% among PLHIV (Table 1).

With increased uptake, by 2023, 74% coverage of CU5 was achieved approaching the 75% national target. Similarly, by 2023 the proportion of PLHIV initiated on TPT reached 71%, exceeding the 70% national target.

TPT		2021			2022			2023		
	Target TPT Coverage	Eligible	Initiated on TPT	%	Eligible	Initiated on TPT	%	Eligible	Initiated on TPT	%
Under 5	75%	365	181	50%	448	357	80%	590	435	74%
PLHIV*	70%	745	401	54%	5028	3677	73%	4493	3175	71%
Totals		1110	582	52%	5476	4034	74%	5083	3610	71%

**Eligible includes 'New on ART'*

Conclusions: Targeted community active case-finding and stakeholder collaboration led to higher TPT uptake. The NTLEP should scale-up this approach to enhance TPT coverage and end TB in Malawi.

PP39-1163-16 Overcoming barriers: High acceptance of preventive TB therapy among the tribal population in Chamba District, Himachal Pradesh India, based on accelerated efforts

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Background and challenges to implementation: Chamba district in Himachal Pradesh, India, is home to tribal communities like Gaddis, Gujjars, Bhotis, Pangwalis, and Bhots, each with their distinct cultures. However, historically they faced challenges such as economic marginalization and limited access to education and healthcare. This study aimed to assess the acceptance of preventive tuberculosis (TB) therapy among the tribal population with targeted intervention.

Intervention or response: The study was conducted among 1650 household contacts of pulmonary TB index patients in tribal blocks of Kihar, Tissa and Bharmour in Chamba district from July-2022 to March-2024. Targeted care was provided with the aim to increase acceptance of preventive TB therapy. Community health workers were tasked to raise awareness about TB prevention, alongside the provision of free and easily accessible TB services and additional incentives were implemented here to facilitate TB diagnosis . Acceptance of preventive TB therapy among tribal population in Chamba district was assessed by measuring operational loss in TB care services, and a comparison was made with state data.

Results/Impact: The study revealed a significantly higher acceptance rate of preventive TB therapy among tribal population of Chamba district compared to overall state acceptance rate during same period. Specifically, 98% of household contacts in study area visited health facilities for assessment of preventive TB treatment, with all 272 eligible individuals initiating preventive TB therapy. In contrast, in the overall state, 77% (33832 out of 43843) of household contacts visited health facilities for assessment (χ^2=13.72, df=1, p<0.001).

Conclusions: The high acceptance of preventive TB therapy among the tribal population of Chamba district challenges the notion that tribal people have less faith in the health system. Factors contributing to the high acceptance rate in tribal areas include the presence of community health workers, accessibility of TB services, and implementation of additional incentives. The findings can inform TB prevention policies in similar tribal areas.

PP39-1162-16 Shift of causes of TB preventive therapy non-completion among people with HIV in Malawi

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Background and challenges to implementation: Despite a strong evidence base, tuberculosis preventive therapy (TPT) implementation among People Living with HIV (PLHIV) in Malawi has been hampered by low completion. In 2021, Malawi introduced the shorter course of 3 months' isoniazid and rifapentine (3HP) to improve TPT completion. PLHIV who newly start ART are eligible for TPT. Data was extracted from Electronic Medical Record (EMR) system to track progress. We compared causes of TPT non-completion over time to adapt interventions for TPT completion.
Intervention or response: Partners in Hope (PIH), a Malawian Medical Non – Governmental Organization, collaborated with Ministry of Health (MoH) and implementing partners to conduct root-cause analyses of TPT non completion at health facilities in Chikwawa and Nsanje districts, selected based on high TPT non-completion. Causes were investigated by triangulating data from EMR, individual treatment charts and pharmacy stock cards from individuals who had been reported as not having completed TPT during 2021 and 2023.
Results/Impact: In 2021, the major cause of non-completion was EMR challenges (mainly misclassification), which was addressed by extensive adaptations of the EMR software and orientations of staff, causing strong improvement in correct reporting. In 2023, provider mistakes (mainly failure to prescribe during scheduled visits) caused nearly half of the non-completions, leading to intensified supervision and mentorship. Reduced attrition from care was noted from 2021 to 2023 (Table). Between these time points overall TPT completion had increased from 48% to 62%.

		2021		2023	
Deficiency category	**Details**	**N**	**%**	**N**	**%**
Provider mistakes	Not prescribing TPT at client visit; under-dispensing	158	16%	247	49%
EMR challenges	Misclassifications	266	27%	15	3%
	Data entry errors	47	5%	2	0.4%
TPT interruptions	6H >2 months; 3HP >1 month	10	1%	42	8%
Stock outs	Stock out of pyridoxine, H and/or 3HP	0	0%	59	12%
Attrition	Defaulted from care	208	21%	71	14%
	Transfer out	181	18%	46	9%
	Died	14	1%	2	0.4%
	Stop (pregnancy, BF, client initiative, side effects)	4	0.4%	18	4%
TB related issues	Stop TPT due presumptive TB	4	0.4%	5	1%
	Stop TPT due to active TB disease	0	0%	5	1%
Total		892	100%	512	100%

TPT, tuberculosis preventive therapy; EMR, electronic monitoring record; H, isoniazid; P, rifapentine; TB, tuberculosis

Table. Causes of TPT non-completion in 2 districts in Malawi, 2021 and 2023

Conclusions: Repeated root-causes analysis demonstrated that causes of TPT non-completion varied as 3HP implementation progressed. While overall TPT completion increased, further improvement is needed, especially at the level of individual health care workers-prescribers.

PP39-1168-16 Completion and correlates of TB preventive therapy in a cohort of people living with HIV in KwaZulu-Natal, South Africa

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Background: Despite WHO and South African national recommendations for TB preventive therapy (TPT) for people living with HIV (PLHIV), multiple barriers to successful implementation remain.
Design/Methods: We evaluated TPT initiation and completion rates in a prospective cohort of PLHIV screened for TB at the time of ART initiation in two public health clinics (rural, peri-urban) in KZN Province. PLHIV were enrolled between 11/2021- 3/2024. Six months of isoniazid (IPT) was the only TPT available until 9/2023 when 3HP was introduced in public clinics as a second option. Participants were assessed at baseline through structured interviews, examination, and medical record review. TPT initiation and completion were assessed through quarterly follow-up interviews and medical record reviews. Logistic (Poisson) regression models were used to identify predictors of TPT completion.
Results: Among 402 participants, 71% (285/402) initiated TPT, with 81% (232/285) receiving IPT and 19% (53/285) receiving 3HP. Among participants with adequate follow-up time to assess TPT completion, 104 (46%) completed TPT. TPT initiation and completion rates were higher among participants aged 30-50 years, female, enrolled at the peri-urban clinic, unemployed, not married, with

higher education, and living in formal housing. IPT and 3HP completion were 43% and 100%, respectively with 56% lower IPT completion than with 3HP (aRR 0.44, 95% CI: 0.24, 0.89, p = 0.015). Participants who were unemployed and enrolled at rural clinic were more likely to complete TPT compared to employed and peri-urban enrolled participants. No socio-demographic, clinical (including CD4 count, BMI, or TB history) or behavioral factors (including smoking or alcohol use) were significantly associated with TPT completion.

		n(completed)/N	Unadjusted			Adjusted		
Variables	**Reference**	**Total follow-up (N=224)**	**RR**	**95% CI**	**p-value**	**aRR**	**95% CI**	**p-value**
TPT regimen	*3HP*	13/13	-	-				
	IPT	91/211	0.43	0.25, 0.81	**0.011**	0.44	0.24, 0.89	**0.015**
Enrollment site	*Peri-urban clinic*	56/134	-	-		-	-	
	Rural clinic	48/90	1.28	0.87, 1.88	0.22	1.12	0.72, 1.72	0.6
Employment status	*Employed*	28/80	-	-		-	-	
	Unemployed	76/144	1.51	0.99, 2.36	0.056	1.49	0.91, 2.50	0.12

RR = Risk Ratio
CI = Confidence Interval
IPT = Isoniazid Preventive Treatment (6 months daily isoniazid)
3HP = 3 months of once-weekly rifapentine and isoniazid

Table. Factors influencing TPT completion among persons initiating ART: Univariate and Multivariate regression analyses adjusted for age, sex, employment, education, clinic type and housing.

Conclusions: Although nearly three-quarters of PLHIV in this cohort initiated TPT along with ART, less than half of TPT initiators completed TPT. 3HP completion was significantly higher than IPT, with few other predictors of completion emerging. Clinics should be supported to provide shorter TPT regimens.

PP39-1160-16 Breaking the TB transmission cycle: Strengthening monitoring of TPT uptake among TB contacts in Zimbabwe

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Background and challenges to implementation: Zimbabwe is a high TB burden country with an incidence of 204 cases/100,000 population in 2022. TB preventive therapy (TPT) uptake among household contacts of TB patients is therefore recommended to reduce the risk of TB transmission in this high-risk group. Despite this, TPT coverage among household TB contacts was only 22% in 2022. In October 2023, OPHID started implementing the USAID-funded TB Treatment Access and Prevention (TB-TAP) program across 24 high TB burden districts in Zimbabwe(6 Provinces). Program goals include curbing community TB transmission by improving TPT uptake among household contacts of bacteriologically confirmed TB contacts.
Intervention or response: National TPT targets were disaggregated by week-to-site level for better performance tracking. Community TB screening of household TB contacts was further standardized and enhanced through 383 community lay cadres using an ODK mobile phone-based four-symptom screening tool. Those with presumptive TB were referred to a facility for sputum collection and TPT initiation for those screening negative. Site-level weekly reporting in DHIS2 enabled automated weekly performance monitoring through a Power-BI dashboard and was complemented by programme narratives to inform corrective actions.
Results/Impact: Between October 2023 to February 2023, 3,217 TB contacts were elicited of whom 2,818(87%) were successfully traced to their household and screened for TB. There were 1,961(70%) screened negative and were eligible for TPT of whom 969 (49%) were started on TPT. TPT coverage ranged between 13% to 100% among those eligible. The suboptimal TPT coverages in selected districts were attributed to stock ruptures due to inconsistent supplies of TPT medicines.
Conclusions: Improved monitoring systems, leveraging on digital analytical tools and hybrid contact tracing through community lay cadres are pivotal in improving TPT coverage among TB household contacts for preventing TB transmission and reducing the global disease burden.

PP39-1161-16 Systematic follow-up to enhance TB prevention therapy adherence and to evaluate long-term outcomes among recipients in Telangana, South India: A prospective study

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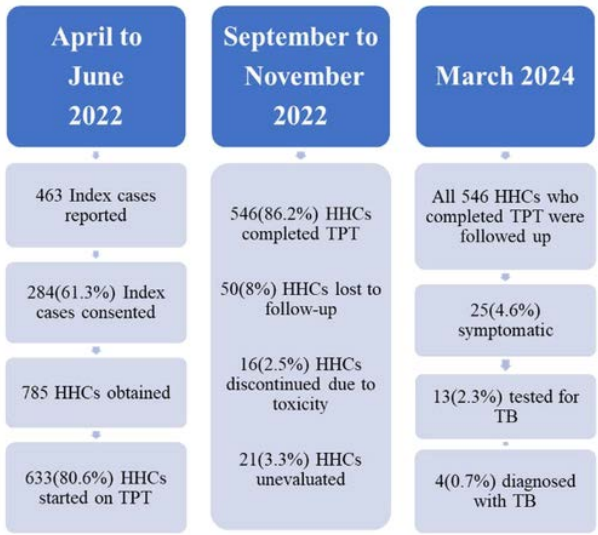
Background and challenges to implementation: According to the World TB Report 2023, India accounts for 27% of global TB cases, with a prevalence of 312 cases per lakh individuals. Transmission rates are high at 75%. TB preventive treatment (TPT) reduces transmission by 60%. However, TPT completion rates in Telangana are only 55.17%, below the national average of 77%, raising concerns about reduced protection. To tackle this, we implemented a follow-up intervention to enhance TPT adherence and assess long-term outcomes.

Intervention or response: Under the JEET 2.0 project in Hanumakonda and Karimnagar districts of Telangana, India TPT was implemented. This involved obtaining patient consent, conducting intensive household contact (HHC) tracing, and providing a 6-month TPT regimen(6H). Eligible family members received screening and referral to nearby health centres. Follow-up included monthly or fortnightly home visits, tele-calls every two weeks to monitor TPT and adverse reactions. Success was defined as taking 80% of doses within 133% of the regimen's duration. Following successful completion of TPT, TB parameters were assessed telephonically after 1.5 years.

Results/Impact: Out of 463 people reported with TB, 284(61.3%) consented, and 785 HHCs were obtained, of which 633(80.6%) started on TPT. Among them, 546(86.2%) completed treatment within 6 months, while 50(8%) were lost to follow-up, and 16(2.5%) discontinued due to toxicity; 21(3.3%) remained unevaluated. All TPT recipients were followed up after 1.5 years by JEET staff. Telephonic assessment in March 2024 revealed that 25(4.6%) were symptomatic, 13(2.3%) of the symptomatic individuals underwent testing, resulting in 4(0.7%) TB diagnoses.



Conclusions: Thorough follow-up is essential for enhancing TPT adherence and completion, as well as for long-term surveillance. This approach not only reduces TB incidence but also mitigates the burden of the disease effectively.

PP39-1167-16 Scaling up TB preventive therapy uptake in a southwestern state, Nigeria: Need for a choice-based task-shifting treatment system

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Background and challenges to implementation: TB preventive therapy is one health care intervention available to reduce the risk of latent TB infection from progressing to active TB disease. The current recommendation includes the provision of TPT not just to children under five years but also to older age groups who are household contacts of people with TB. Contact investigation and TPT Initiation are commonly done by health workers in TB units who are also involved in other public health programs in the facility. Given this, only 316 (representing 43%) of the eligible older age groups were provided with TPT in Oyo state in 2021.

Intervention or response: The USAID TB-LON 3 project supported 56 facilities in Oyo State to strengthen contact investigation and TPT uptake by training contact tracers, linkage coordinators, and community volunteers with an emphasis on TPT uptake among household members greater than 5 years old that are contacts of drug-susceptible pulmonary TB. Needed materials (such as bag to carry a weighing scale) to commence community initiation of TPT were provided. A monthly tracking tool was developed to monitor the stock status of TPT medicines (6H and 3HR) in the state, and the distribution of TPT drugs to the facilities was also carried out.

Results/Impact: The number of eligible older age groups placed on TPT increased from 316 in 2021 to 4,952 in 2022. A similar increase took place in 2023 as 7,224 eligible were enrolled. This represented a 1467% and 5079% increase in 2022 and 2023 respectively in comparison with 2021. About 66% and 67% of the eligible in 2022 and 2023 were started on TPT respectively. In the same period, 40% and 44% of the eligible were enrolled through community initiation.

Conclusions: A choice-based task-shifting system can help address gaps in TPT uptake and promote the achievement of good outputs in TB prevention.

PP39-1166-16 TB contact investigation: The gateway to scaling up TB preventive treatment among contacts of people with TB

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Background and challenges to implementation: Nigeria has an estimated TB incidence rate of 219/100,000 population. TB preventive treatment (TPT) is one of the key strategies to reduce TB incidence in the country, However, uptake of TPT was a challenge, especially among contacts aged 5 years and above. In 2021, 17,517 contacts, including 4,420 aged 5 years and above (25%) were started on TPT. This study illustrates how TB contact investigation drives TPT uptake in USAID TB LON projects implemented across 18 states in Nigeria.
Intervention or response: Health workers line listed bacteriologically confirmed pulmonary TB cases (index TB cases). They traced the household and other close contacts of the index cases and screened them for TB. Those who screened negative and/or were not diagnosed with TB were started on TPT, if eligible. A cascade analysis, starting with TB contact investigation and ending with TPT cascade, was conducted weekly to track performance, identify gaps and course correct to improve TPT uptake.
Results/Impact: After two years of implementation (April 2022 to March 2024), a comparison of performance indicators between the first quarter (Q1 2022) and the last quarter of implementation (Q4 2024) shows significant improvement (Table 1). The number of index cases whose contacts were investigated increased from 12,510 to 22,084, with the contact:index case ratio increasing from 5 to 6. Equally the number of contacts screened doubled from 66,918 to 133,678, while the number started on TPT tripled from 10,330 to 29,565 (93% were contacts aged 5 years and above). The TPT enrolment rate increased from 16% to 23% with no significant difference reported by sex.
Conclusions: Ensuring that TPT is the last step in the TB contact investigation cascade enhances TPT uptake, especially among contacts aged 5 years and above. National TB programs are encouraged to adopt policies where contact investigation is not complete, until TPT is provided.

PP36 Reaching people with TB

PP36-1130-16 Efficiency of integrated TB and NCDs screening in Vietnam's border regions

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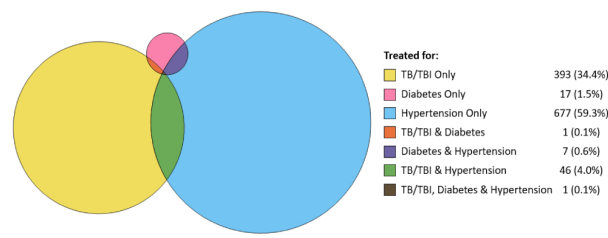
Background: Vietnam faces high rates of TB and non-communicable diseases (NCDs). Community-based, integrated screening events have the potential to improve healthcare access and to reduce the cost of service delivery, compared to siloed programs.
Design/Methods: 25 screening events were implemented in ethnic minority communities across three provinces of Vietnam between March and November 2023. Participants were screened by chest X-ray (CXR) and tested for TB when radiographic abnormalities were detected. Contacts were injected with tuberculin at the events and returned for result reading within 48-72 hours. Participants aged ≥40 years also had their blood pressure and blood sugar levels measured. Individuals with suspected hypertension and/or diabetes were referred to the public system for disease confirmation and treatment. Individuals diagnosed with TB disease or a TB infection (TBI) were linked to appropriate treatment at the closest District TB Unit.
Results: 7,375 individuals were screened by CXR, resulting in the detection of 82 people with TB (1,112 / 100,000 – more than 6.3x the national incidence rate) and the treatment of 76 (92.7%). Tuberculin was administered to 2,434 participants, resulting in the detection of 470 (19.3%) people with a TBI and the linkage of 365 (77.7%) to short-course TB preventive therapy. 4,865 participants had their blood pressured measured, resulting in the diagnosis of 740 (15.2%) people with hypertension and the treatment of 731 (98.8%). 4,427 participants had their blood sugar measured, resulting in the diagnosis and treatment of 26 (0.6%) people with diabetes. Just 1 (0.1%) participant received treatment for all three diseases, while 54 (4.7%) received treatment for two.



Conclusions: Community-based integrated screening for TB and NCDs is a feasible strategy to equitably improve access to care and increase treatment for key diseases. Future studies may assess the cost effectiveness of this approach.

PP36-1129-16 WOK intervention to end TB in hard-to-reach areas: The KNCV Imo State experience

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Background and challenges to implementation: Years back, there have been lots of challenges to end TB in Nigeria. Although, various diagnostic interventions have helped by playing their significant roles, there are still limitations in ending TB such as the inability to reach people with TB in remote areas, unavailability of point-of-care testing, lack of publicity, and so on. KNCV Nigeria, with support from USAID, is implementing the TB LON Regions 1 and 2 project. The project pilots Wellness On Keke (WOK) Community ACF as an intervention to end Tuberculosis (TB) in hard-to-reach areas. The intervention is spread across selected 7 states with a high prevalence of TB in Nigeria.
Intervention or response: WOK starts with sensitization to the creation of awareness (due to the design of the Keke), and TB cascade (identification, testing, evaluation, and treatment of TB patients). It also houses a Portable Digital X-ray (PDX) machine, which brings mobile healthcare services to people who find it difficult to access their health facilities. WOK tactically drives into these areas, providing TB Screening and diagnostic services to people at their doorstep.
Results/Impact: The table below gives the results achieved so far with WOK in Imo State.

Quarter	Total number screened	Total TB presumptive	% Presumptive Yield	Total TB yields	% TB Yield
Quarter 2, 2023	4226	980	23%	65	7%
Quarter 3, 2023	3022	1148	38%	74	6%
Quarter 4, 2023	4500	1064	24%	76	7%
Quarter 1, 2024	4609	1775	39%	82	5%
Quarter 2, 2024	5165	1073	21%	62	6%
Total	21522	6040	28%	359	6%

From the table above, the WOK provided TB Screening services to 21,522 people, tested 6,040 presumptive TB cases and diagnosed 359 TB cases since it's commencement in February 2023.
Conclusions: Strategic Deployment of the WOK across LGAs in Nigeria can significantly increase TB case finding and contribute to ending TB.

PP36-1128-16 Local outreach-based missed TB case finding among the vulnerable population improves overall TB treatment coverage: Lessons from West Shewa province of Oromia region in Ethiopia

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Background and challenges to implementation: In Ethiopia, socio-economic challenges associated with climatic changes and political unrest have resulted in rapid internal population movements (IDPs) and exacerbated socio-economic difficulties. In turn, this has led to an increase in the number and types of key and vulnerable segments of the general population (KVPs) who are prone to TB. Most of these KVPs cannot easily access the conventional facility-based TB diagnosis and treatment services as legal, occupational, and/or structural barriers limit their access.
Intervention or response: From February 27 to March 31, 2023, the USAID Eliminate TB Project carried out outreach-based community awareness creation activities and actively screened for TB among KVPs at selected health facilities, schools, prisons, and community chambers found in West Shewa province of Oromia. All members of the screened KVPs who were presumed with TB were evaluated through sputum examination using GeneXpert.
Results/Impact: During the one-month outreach-based TB case finding, about 67% of the total 485,045 KVPs were accessed and screened for TB and 353 TB cases were detected, which could have been missed otherwise through the conventional facility-based TB case finding efforts. It is noteworthy that some types of KVPs, like prison inmates with case notifications of 1,111 per 100,000 population, were disproportionately affected by TB, followed by other KVPs screened at hospitals such as people living with HIV, urban slums and under-5 children (CNR 1,072/100,000) (Table 1).
Conclusions: TB continues to be missed among the KVPs as their access to facility-based TB services is compromised for structural and legal reasons. Thus, unless a targeted response is instituted for the KVPs, the conventional facility-based TB case finding alone will not end the TB epidemic.

Type of KVP	Total population (#)	Number screened (#/%)	Presumptive TB (#/%)	TB diagnosed (#/%)	CNR/100K
Contacts of BCPTB	47,537	45,358 (95)	3,270 (7)	129 (4)	284
School children	205,485	128,743 (63)	5,589 (4)	8 (0.1)	6
Diabetes mellitus	351	342 (97)	58 (17)	2 (3)	585
Prison inmates	168	90 (54)	40 (44)	1 (3)	1,111
Health care workers	2,511	2,223 (89)	80 (4)	0 (0)	0
Uniformed (Military & police officers)	205,653	128,833 (63)	5,629 (4)	2 (0.04)	2
Employees of mega projects	2,084	1,384 (66)	47 (3)	1 (2)	72
Other KVPs screened at hospitals	21,256	19,592 (92)	963 (5)	210 (22)	1,072
Summary	485,045	326,565 (67)	15,676 (5)	353 (2)	108

Table 1. Number & proportion of TB cases detected among different categories of KVP, February 27–March 31, 2024

PP36-1136-16 Assessing the effectiveness of contact tracing for people who are clinically diagnosed with TB in Nigeria

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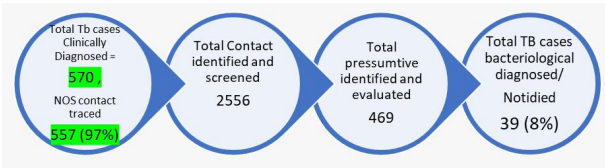
Background and challenges to implementation: The emphasis on contact investigation in tuberculosis (TB) programs has traditionally targeted cases diagnosed bacteriologically. However, in Nigeria, approximately 30% of the TB cases diagnosed per quarter are clinically diagnosed Consequently, the contacts of this 30% are often overlooked for investigations.
Recognizing this gap, the National TB program initiated contact investigations for individuals diagnosed with TB through clinical diagnosis in selected states. This study presents the outcomes of this initiative.
Intervention or response: This intervention was implemented in two states, Anambra and Ebonyi state Nigeria, all clinically diagnosed TB cases from January to December 2023 had contact investigations done for them. The intervention was done by the staff already engaged in contact tracing for bacteriologically diagnosed cases just expanding their scope to include contact tracing for clinically diagnosed cases.
Monthly reports were compiled using the national template and reviewed regularly monthly.
Results/Impact: From January to December 2023 a total of 570 people were diagnosed with TB through clinical diagnoses in the two states. Contact investigations were successfully conducted for 557 of these cases, and 2,556 contacts were screened. Of these, 469 were identified as presumptive TB cases, and 39 persons were diagnosed with TB: all 39 were bacteriologically positive. All diagnosed individuals were initiated on treatment. below is the achievements along the cascade.



Conclusions: Conducting contact investigations for clinically diagnosed TB cases is of paramount importance in identifying the missing TB cases. This strategy strengthens TB programming and enhances the overall effectiveness of the TB program.

PP36-1135-16 Dastak Abhiyan: A door-to-door outreach strategy to improve TB detection in Uttar Pradesh, India

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Background and challenges to implementation: Active Case Finding (ACF) helps to reduce delays in early diagnosis and facilitates prompt treatment initiation. In resource limited settings, the integration of ACF campaign for Tuberculosis (TB) screening with other national health programmes is important for optimal utilization of resources. In 2021, the state of Uttar Pradesh (UP) widely implemented an integrated community-based door to door outreach screening campaign known as 'Dastak Abhiyan'.
This study aims to understand the impact of this campaign on improving TB detection.
Intervention or response: The campaign was a pan state roll out covering all population groups where systematic screening of TB was integrated with all national health programmes. A mixed method study was conducted from 2021-2023 which included quantitative and qualitative components. The quantitative variable included number of presumptive persons who were screened, number of

persons who were tested and number of persons subsequently diagnosed for TB. The qualitative component included interview of community health workers which comprised questions regarding their experience and view in a semi-structured interview guide.

Results/Impact: Total 182,243,923 were mapped out of which 158,323,329 (87%) people were screened. Out of persons who were screened 812,522 (0.5%)underwent sputum examination. This resulted in diagnosis of 59,255 persons with TB translating to a yield of 7.2%. The Annual TB notification rate of UP increased 15-fold from 2020 (157/100,000) to 2023 (2595/100,000), Presumptive TB examination rate increased 2-fold in 2023 (1298/100,000) from 2020 (373/100,000). The converging theme which emerged was delivery of multiple health services in single house visit by peripheral health worker and access to vulnerable populations.

Conclusions: A single platform approach for ACF for all national health programmes, is an essential strategy in resource limited settings. This study demonstrates the effectiveness of this initiative and thus needs to be scaled up in high burden TB settings.

PP36-1134-16 Impact of Mobile Medical Vans for TB case detection in out-of-reach populations of Yamunanagar, Haryana, India

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Background and challenges to implementation: National Strategic Plan for ending TB by 2025 framed under the National Tuberculosis Elimination Programme (NTEP) of India has given due emphasis to active search of Tuberculosis (TB) cases through various modalities targeting the outreach populations. Mobile medical vans (MMV) equipped with nucleic acid amplification (NAAT) testing and portable X-ray machines used in the outskirts of Haryana for active case finding to enhance TB case detection.

The objective of the study is to assess the impact of MMV on TB detection in outreach populations.

Intervention or response: A Mobile Medical Van equipped with a portable X-ray and NAAT machine was used to screen the entire population of two health blocks (Pratap Nagar and Bilaspur) of district Yamunanagar from January 2023 to June 2023.

Initial screening was done using portable X-ray device and persons with chest X-rays suggestive of TB were offered on-the-spot NAAT testing. The data was entered into Ni-kshay (India's TB surveillance portal), extracted and compiled in MS Excel, and analyzed in SPSS version 21.

Parameters such as the proportion of presumptive tested and diagnostic yield were assessed. Two-proportion z-test was applied to test the significance of additional yield.

Results/Impact: During the 6 month campaign, 9540 symptomatic persons were screened out of which 1638 (17%) were found chest X-rays suggestive of Tuberculosis and further tested with NAAT resulting in the detection of 59 persons with TB. A diagnostic yield of 3.4% was observed as a result of the intervention contributing to an additional yield of 63.6% for the two blocks in comparison to the year 2022 (Yield in 2022:2.2%, z-score: 2.57 p-value:<0.001).

Conclusions: Active case finding conducted through Mobile Medical Van equipped with sensitive screening tools has proven to be a successful strategy in improving the diagnostic yield and aiding in progress towards achieving end TB goals.

PP36-1133-16 TB active case finding among special population: TB LON 3 project experience in correctional centres in Oyo and Osun States, Nigeria

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Background: Within correctional facilities, conditions such as overcrowding, inadequate ventilation, restricted healthcare access, and a heightened prevalence of risk factors facilitate the transmission of tuberculosis (TB) among inmates. Prompt identification and treatment of TB cases are imperative to curb the progression of active disease and mitigate transmission within these settings.

This study elucidates the results of active case-finding initiatives conducted among inmates in correctional centers across Oyo and Osun States, Nigeria.
Design/Methods: A Portable Digital X-ray (PDX) device was utilized for participant screening, with an artificial intelligence-enabled system employed to interpret chest X-ray images, identifying abnormalities indicative of tuberculosis (TB). Sputum samples were collected from individuals showing presumptive TB symptoms and positive screening results for further diagnostic assessment. Conversely, chest X-ray images showing negative results underwent radiologist review to confirm the findings. Individuals with confirmed TB diagnoses were subsequently enrolled in appropriate TB treatment regimens.
Results: A total of 20,945 inmates were screened over 15 months (January 2023 to March 2023), and 3,879 inmates (18.5%) were identified as presumptive TB cases. All (100.0%) of the presumptive cases were evaluated, with 435 (11.2%) of the cases diagnosed. Among these, 406 (93.3%) of the cases were enrolled. The overall presumptive TB and TB case yield were 18.5% and 11.2%, respectively. The numbers needed to treat (NNT) and numbers needed to screen (NNS) were 9 and 48, respectively.
Conclusions: The data reflects a successful tuberculosis screening and diagnosis program among inmates, with a high enrollment rate for confirmed cases. This implies that further intervention efforts should be directed at this population group to reduce missed TB cases mitigate the impact of tuberculosis in correctional facilities and work towards a healthier and safer environment for inmates and the community at large.

PP36-1132-16 Enhancing TB notifications in Nigeria: Insights from health facility-based intensified case finding under the USAID TB-LON 3 project

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Background and challenges to implementation: Enhanced tuberculosis (TB) case detection within healthcare settings is essential for achieving global TB control objectives. By actively screening and identifying individuals with TB symptoms and facilitating their diagnosis and treatment, this approach serves as a crucial link in improving TB notification rates, thus playing a vital role in reducing TB-related mortality. This paper aims to highlight the impact of the USAID TB-LON 3 project on intensified case finding efforts within health facilities, particularly focusing on its contribution to TB notifications in Nigeria.
Intervention or response: Intensified TB case-finding activities were implemented across all supported public and private health facilities (HFs) by deploying screening officers to high-volume facilities. In contrast, linkage coordinators supported TB screening efforts in high-volume private facilities as well as spokes facilities, which include stand-alone labs (SALs), community pharmacies (CPs), and patent and propriety medicine vendors (PPMVs). The project engaged 271 Screening Officers to support screening in high-burden health facilities, 17 Linkage Coordinators, 39 Cascade Monitors, and 44 Network Officers who also provide supportive supervision to facilities. Case-finding activities were intensified among 1,932 providers across the four (Oyo, Osun, Ogun and Lagos) States that supported the TB-LON 3 project.
Results/Impact: A total of 2,999,056 (93.8%) out of 3,198,306 eligible clients were symptomatically screened, and 161,558 presumptive TB were identified, giving a 5.4% presumptive TB yield. Among these, 159,942 (99.0%) were tested which gave a TB yield of 13,211 (8.3%).TB cases were diagnosed with a treatment enrolment rate of 12,594 (95.3%).
Conclusions: The outcome of this project showed that intensified tuberculosis case finding at health facilities plays a crucial role in improving TB detection, treatment, and overall public health. It is therefore recommended that this should be integrated with existing health services (e.g., HIV clinics, antenatal care) to reach a wider population.

PP36-1131-16 Prevalence of TB among special population: A case study of Ilesha and Ife correctional facilities, Osun-State, Nigeria

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Background and challenges to implementation: Introduction: Despite the relentless efforts being made to eradicate Tuberculosis (TB) in Osun State and by extension Nigeria, the disease continues to be a major cause

of morbidity and mortality. Undoubtedly, various TB interventions are being carried out at both the Community and Facility level, yet there is a need to extend the screening beyond to certain groups/Population who are at increased risk for TB. However, Prison falls into this category of Population. The overcrowding and poor ventilation of prisons make inmates more vulnerable to the diseases, thus, making Tuberculosis (TB) a leading cause of morbidity and mortality in prison with a large chunk of inmates facing several barriers to Tuberculosis. This paper however addresses the prevalence of TB among inmates at Ilesha and Ife Correctional Facilities, Osun-State, Nigeria.

Intervention or response: Methodology: As part of activities to reduce the prevalence of Tuberculosis (TB) and finding all missing Tuberculosis (TB) cases in Osun State, Nigeria and globally, Tuberculosis (TB) screening was carried out at both Ilesha Correctional Facility and Ife Correctional Facility in the State. The screening was conducted in the years 2022, 2023 and 2024 respectively with the use of Portable Digital X-ray (PDX) Machine. All the inmates presumed to have signs and symptoms of TB were identified, their sputum samples were collected and sent to the Laboratory for evaluation.

Results/Impact:

Year	Prison	Number Screened	Presumptive Identified	Presumptive Yield (%)	Total Case Diagnosed	Case Yield (%)	Case Notified
2022	Ilesha Correctional Facility	727	116	16%	19	16%	19
2022	Ife Correctional Facility	223	54	24%	3	6%	3
2023	Ilesha Correctional Facility	616	78	13%	11	14%	11
2024	Ilesha Correctional Facility	649	50	8%	6	18%	6
Total		2215	298	13%	39	13%	39

Conclusions: Virtually all prisons in Nigeria admits new inmates on a daily/weekly basis thereby congesting the prisons and making prisons a potentially transmitting abode and a fertile place for Tuberculosis (TB). The poor structure, overcrowding, coupled with the poor ventilation make inmates to be more vulnerable to Tuberculosis (TB) diseases. Inmates should be screened for Tuberculosis (TB) at the point of entering and this should be repeated often among them for earlier detection and treatment to reduce and eradicate its prevalence.

LATE BREAKER PRESENTATIONS WEDNESDAY 13 NOVEMBER 2024

LB01 The Union-WHO HIV and other comorbidities late-breaker session

LB01-1200-13 Does TB alter cardiometabolic profiles of TB survivors? A cross-sectional study among people living with HIV in Uganda

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Background: Tuberculosis (TB) survivors are at risk of major adverse cardiovascular events, but underlying mechanisms remain unclear, especially among people with HIV (PWH). We compared cardiometabolic profiles of PWH with and without previously treated active TB and determined if prior TB is associated with cardiometabolic profiles.

Design/Methods: We conducted a cross-sectional study at Kiruddu National Referral Hospital in Kampala, Uganda, from October 2023 to May 2024. Participants were randomly sampled PWH aged ≥18 years on antiretroviral therapy, with TB survivors having successful treatment of bacteriologically confirmed TB. Anthropometric measurements, blood pressure, fasting blood glucose (FBG), lipid profile, and glycated hemoglobin were assessed.

Results: A total of 396 participants were enrolled (196 TB survivors and 200 controls). The median time since TB cure for TB survivors was 11.8 (IQR: 5.2 – 28.6) months. There were no significant differences in the proportions on dolutegravir-based antiretroviral therapy, pre-existent diabetes mellitus (DM), hypertension, dyslipidemia, smoking or alcohol use between the two groups. TB survivors had higher median FBG (5.5 vs. 5.1 mmol/l, p<0.001) and a higher prevalence of DM (17.9% vs. 9.5%, p=0.015) (**Table**). However, they had lower body mass index (23.0 vs. 25.1 kg/m², p<0.001) and waist circumference (81.0 vs. 84.0 cm, p=0.026). Further, TB survivors had higher HDL-c levels (1.0 vs. 0.8 mmol/l, p<0.001), lower LDL-c levels (2.7 vs. 3.1 mmol/l, p<0.001) and lower prevalence of dyslipidemia (81.7% vs. 96.5%, p<0.001). Adjusted analyses revealed TB survivors had increased risk of elevated FBG (adjusted prevalence ratio (aPR) 1.79, 95% CI 1.10-2.92) and DM (aPR 2.34, 95% CI 1.11-4.94), but decreased risk of obesity (aRR 0.42, 95% CI 0.20-0.88).

Characteristic	Total N=396	No TB history N=200	Previous active TB N=196	p-value
Age, Median (IQR), Years	41.5 (32.0-50.0)	41.0 (31.0-50.0)	42.0 (33.0-50.5)	0.470
Male sex	185 (46.7)	74 (37.0)	111 (56.6)	<0.001
Obesity (BMI ≥ 30 kg/m²)	64 (16.2)	49 (24.5)	15 (7.7)	<0.001
Central obesity (waist circumference of ≥102/88 cm and/ or a waist-hip ratio of ≥0.90/0.85 in males/females, respectively)	196 (49.7)	109 (54.5)	87 (44.8)	0.055
Systolic blood pressure, Median (IQR), mmHg	121.5 (111.5-135.0)	122.5 (111.8-132.0)	120.0 (111.5-136.5)	0.540
Diastolic blood pressure, Median (IQR), mmHg	80.5 (74.0-88.5)	81.0 (75.2-88.5)	79.5 (73.0-88.5)	0.260
Diabetes Mellitus (FBG≥7.0 mmol/l and/or HbA1c ≥6.5% and/or use of anti-hyperglycemic agents)	54 (13.6)	19 (9.5)	35 (17.9)	0.015
Hyperglycemia (FBG ≥5.6 mmol/L and/or HbA1c ≥ 5.7%)	184 (46.6)	77 (38.5)	107 (54.9)	0.001
Dyslipidaemia (total cholesterol >5.0 mmol/l, LDL-c >4.14 mmol/l, triglyceride level ≥1.7 mmol/l, and/ or HDL-c <1.03 mmol/l for men and <1.29 mmol/l for women)	349 (89.3)	193 (96.5)	156 (81.7)	<0.001

Conclusions: TB survivors with HIV exhibit distinct cardiometabolic profiles, including a higher risk of DM but lower risk of obesity compared to those without a history of TB. There is need for blood glucose monitoring among TB survivors.

LB01-1201-13 Multimorbidity and health-related quality of life after TB treatment in Zimbabwe: A pilot feasibility assessment and comparison to household controls

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Background: Chronic conditions drive development of tuberculosis and result from the disease and its treatment. Despite growing awareness of post-tuberculosis lung disease, data on other health conditions and their impact on post-TB wellbeing are limited.

Design/Methods: In this cross-sectional study, we offered adults with pulmonary tuberculosis in Zimbabwe an integrated health check at or after treatment completion; assessing uptake and yield of screening (i.e. new diagnoses made). Other members of the same households participated in a similar intervention.

Selecting household members without prior or current tuberculosis as a comparator, we calculated odds ratios (OR) for chronic conditions (HIV, diabetes, hypertension, underweight, anaemia, mental health, memory impairment, vision impairment and impaired lung function) and multimorbidity among people with recent tuberculosis, adjusted for age and sex. Health-related quality of life (median [with interquartile range; IQR] EQ5D value) was compared across groups.

Results: Of 275 people with tuberculosis contacted, 96 (36%) participated (median age 38 years, 56% men, median 356 days from diagnosis). Common reasons for non-participation were having moved away or work commitments.

Chronic conditions were common (Table) and, other than HIV, usually undiagnosed (e.g. 9/11 people with diabetes vs 0/28 people with HIV undiagnosed).

Compared to 285 household controls (median age 34, 69% women) and after adjustment for age and sex, people with recent tuberculosis were more likely to have HIV (OR 1.65 [95%CI 0.96–2.86]), common mental health disorders (1.56 [0.96–2.54]), memory impairment (2.27 [1.34–3.85]), impaired lung function (3.28 [1.54–7.00]) and be underweight (4.58 [2.27–9.23]). EQ5D values were lower among people with recent TB compared to controls (median [IQR] 0.86 [0.84-0.90] vs 0.90 [0.86-0.90], p=0.007).

	No TB	Recent TB
	N = 285	N = 96
HIV	18.8% (14.1–23.5%)	27.7% (18.4–37.0%)
Diabetes*	6.8% (3.8–9.7%)	10.4% (4.4–16.4%)
Hypertension	30.6% (23.9–37.2%)	14.7% (7.0–22.3%)
Memory impairment	20.8% (15.8%–25.8%)	37.3% (15.8–25.8%)
Common mental health disorder	33.6% (27.9–39.3%)	44.1% (34.0–54.3%)
Vision impairment	26.7% (20.6–32.9%)	21.7% (12.1–31.3%)
Impaired lung function*	21.4% (14.9–28.0%)	47.3% (31.5–63.0%)
Underweight*	5.7% (2.8–8.5%)	21.5% (12.7–30.4%)

Predicted percentage (95% confidence interval) of people with chronic conditions after adjustment for age and sex, by recent TB or not (N=381)

Footnotes: Estimates are from a logistic regression model, treating each chronic condition as the outcome. Models are adjusted for age (4-level variable: 18–29, 30–39, 40–49, 50+ years) and sex, other than for those indicated * where a linear term for age was used. ≥1 condition and multimorbidity were defined as at least one or at least two of. The other conditions shown in the table, respectively. Diabetes was assessed using a point-of-care HbA1c device (A1c Care; SD biosensor); hypertension as systolic blood pressure ≥140mmHg or diastolic ≥90mmHg; memory impairment by asking "in the past 12 months, have you had difficulty remembering things or following a story or conversation?"; common mental health disorder as a Shona symptom questionnaire score of ≥8; vision impairment using Peek Acuity; impaired lung function using spirometry with Global Lung Initiative African American reference standard; Underweight as body mass index <18.5kg/m2 and anaemia using point-of-care haemoglobin (Hemocue), as defined by the World Health Organization.

Conclusions: Uptake of chronic disease screening among people with recent tuberculosis was low, but prevalence of chronic conditions was high. Holistic approaches to treatment which enable these conditions to be identified and addressed are needed.

LB01-1202-13 Impact of HIV on recurrent TB after successful first-line TB treatment in the Western Cape Province, South Africa

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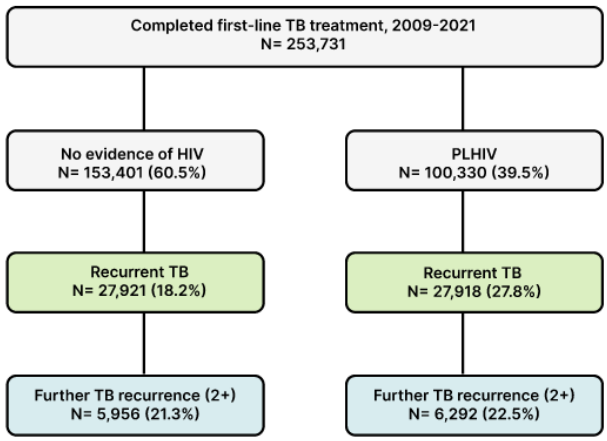
Background: Individuals previously treated for TB face a high risk of recurrence even after successful treatment. While PLHIV may face increased TB recurrence risk due to both relapse and reinfection, data quantifying this increased risk are limited, with significant heterogeneity in reported risk. Using routinely collected public health

data, we aimed to determine the impact of HIV on recurrent TB incidence in individuals who have successfully completed standard first-line TB treatment.

Design/Methods: This was a retrospective study of TB patients who had completed first-line TB treatment between 2009 and 2021 inclusive, attending public health facilities in the Western Cape Province, South Africa. Patients were followed up through the WC Provincial Health data Centre, which integrates routinely collected public health data within the province. Recurrent episodes were defined based on laboratory diagnosis, TB registrations and prescriptions. We conducted a time to event analysis to assess the impact of HIV on recurrent TB risk from TB treatment completion.

Results: There were 253,731 TB patients who completed TB treatment between 2007 and 2019 inclusive: 112,033 (44.2%) females, median age 33.8 (IQR, 25.3 – 44.2) and 100,330 (39.5%) PLHIV (Figure 1). Overall, 27,918 (27.8%) of PLHIV and 27,921 (18.2%) HIV negative individuals experienced a recurrent TB episode. PLHIV with CD4 cell counts of 0-99 had double the risk [HR 1.96 (95%CI, 1.90-2.02)] of recurrent TB compared to HIV-negative individuals. Those with more than 20 healthcare encounters had almost a five-fold risk [HR 4.86 (95%CI, 4.69-5.04)] compared to individuals with no healthcare encounters. Males had a 37% higher risk of recurrent TB than females.



Conclusions: The study shows an TB recurrence is extremely high in the Western Cape. There is higher risk TB recurrence after successful treatment in PLHIV with lower CD4 cell counts, males and individuals with a higher number of healthcare encounters.

LB01-1203-13 Time to hepatotoxicity among people in prison in Malaysia receiving 26H vs. 3HP

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Background: As tuberculosis (TB) disproportionately affects those in incarcerated settings, implementation of TB preventive therapy (TPT) is critical to curtail TB incidence, yet little data exists regarding tolerance of TPT among people in prison.

Design/Methods: We conducted a prospective randomized control trial in Malaysia's largest prison, comparing the tolerability of 26H vs. 3HP. Latent TB was diagnosed with a positive Tuberculin Skin Test and negative clinical and sputum evaluation (i.e. Xpert, smear, culture). Symptoms and liver function tests (LFTs) were monitored monthly. Hepatotoxicity was defined as grade 3 (5.0- 10.0x ULN) or grade 4 (≥10.0x ULN). Time to toxicity was defined as days between treatment initiation and LFTs demonstrating grade 3 or 4 toxicity, regardless of symptoms.

Results: Among 312 participants with latent TB, 41 (13.1%) were living with HIV, 139 (44.6%) had hepatitis C (HCV), and 237 (76%) had opioid use disorder (OUD). In the 26H arm, 14 (9 %) experienced Grade 3 or 4 toxicity at a median of 67 days (IQR 60-119), while in the 3HP arm, 5 (3.2%) patients experienced grade 3 or 4 toxicity at a median of 59 days (IQR 34-64), p=0.14. Furthermore, the median time to grade 3 or 4 toxicity for people with HIV and HCV in the 26H arm was 62.5 days (IQR 39.75-121.25), while in the 3HP arm it was 59 days (IQR46.5-61.5), p=0.49. Similarly, comparing time to grade 3 or 4 toxicity amongst people with HCV (8.63%) and without HCV (5.04%) was not statistically significant.

Conclusions: TB preventive therapy was well-tolerated among people in prison with a high prevalence of HIV, hepatitis C, and OUD. There was no significant difference in the timing of hepatoxicity among those receiving 26H or 3HP, including among those with HIV and HCV. These findings support strengthening TPT implementation in incarcerated settings, regardless of regimen.

LB01-1204-13 Feasibility and acceptability of a TB survivor-led peer support intervention using motivational interviewing to address TB/HIV intersectional stigma in South Africa

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Background: TB and TB/HIV intersectional stigma remain major barriers to TB care engagement, yet stigma interventions are lacking. Our prior work identified the lack of counselling that addresses the psychological impact of TB and a potential role for TB survivors to provide support to people currently engaged in TB care. We developed and tested a TB survivor-led peer support intervention for people with TB and TB/HIV.
Design/Methods: As part of a community-based participatory research study in Khayelitsha, Cape Town, we trained two TB survivor peer research associates on motivational interviewing. Informed by prior data, we identified common stigma experiences that informed topic areas for the counselling sessions and developed a counselling guide. We undertook thematic analysis using the Behaviour Change Wheel Framework and evaluated feasibility and acceptability.
Results: We completed 10 counselling sessions with 6 people with TB and 4 people with TB/HIV. Most participants encountered long TB diagnostic delays but expressed motivation to complete treatment. Almost all experienced stigma within families and communities due to their TB diagnosis and HIV intersectional stigma, although some had family support.
The use of motivational interviewing identified key themes for which participants appreciated peer support: disclosure of their TB diagnosis, dealing with anticipated, enacted, and intersectional stigma, empowerment to reduce internal and intersectional stigma, and motivation to complete treatment and move on with their lives.
Participants engaged with the counselling intervention, including requesting further sessions for themselves and others with TB/HIV and expressing gratitude for this support from TB survivors. These themes mapped to the Behaviour Change Wheel framework interventions of modelling, enablement, and persuasion.
Conclusions: Delivery of a peer support intervention by TB survivors trained in motivational interviewing was feasible and acceptable to people with TB and TB/HIV. Peer support interventions are aligned with person-centred TB care delivery and should be integrated into TB/HIV care programmes.

Theme	Illustrative quotation
Disclosure	*I was forced to disclose because at the counselling room they did mention that there are children and they could get TB so it was mandatory to disclose my TB status to my family.* *It's a bit difficult to [disclose my TB diagnosis to my parents] sis I don't know where to start; let's move forward I'm not confident.*
Dealing with anticipated, enacted, and intersectional stigma	*I got scared to be called names, because if I disclose, they will call me by names now or people will distance themselves from me. It's not easy to just tell everyone that you have TB, you can't tell everybody that you have TB.* *I will never tell friends that I have TB. I must tell my family but friends will make me a laughing stock. They will go around gossiping about me. People look down on someone with TB in the community.*
Empowerment to address internal and intersectional stigma	*I feel lonely in this journey I feel like I'm the only one who walked this journey.* *I thought it was over for me, I thought it was the same thing as HIV, I will have TB for the rest of my life*
Motivation to complete treatment	*I told myself that I will take my TB treatment until I heal. I told myself that TB is curable if I take the TB treatment well.*
Acceptability of the counselling intervention	*It makes a huge difference to talk with you.. As we speak, I feel more relaxed and relived and I feel motivated because now I'm motivated by someone else; it's not the same as when I was motivating myself. I feel free now I have someone like you to talk to. I like this session a lot.* *I feel relieved, my brain mentally, emotionally and social I feel 100%. I feel the difference.. because it's the first time I have met with a TB counsellor like you.*

Table. Themes related to TB and TB/HIV intersectional stigma that were identified as opportunities for behaviour change through a TB survivor-led peer support intervention using motivational interviewing.

LB01-1205-13 Alveolar macrophages from persons with HIV undergoing antiretroviral therapy mount impaired TNF signaling networks and ineffective immune responses against M. tuberculosis infection

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Background: Pulmonary tuberculosis (TB) caused by *Mycobacterium tuberculosis* (Mtb), is the leading cause of mortality in people with HIV (PWH). Despite substantial improvements in clinical outcomes under antiretroviral therapy (ART), PWH have significantly higher risk for developing TB, compared to people without HIV (PWoH). To elucidate this increased susceptibility, we hypothesized that PWH on ART have defective pulmonary immunity to Mtb, leading to poor bacterial control.
Design/Methods: We enrolled two groups: PWH stable on ART (N=7; median CD4=493 cells/ul, undetectable viral load) and PWoH (N=9) from the Veterans Medical Center in Atlanta, GA and obtained bronchoalveolar lavage (BAL) samples. To comprehensively characterize immune cells in BAL and to study their transcriptional responses to Mtb infection, we conducted high-dimensional flow cytometry and single cell RNA sequencing

(scRNAseq, 10X Genomics) at baseline and after 4hr of infection with Mtb, followed by extensive bioinformatics analyses.

Results: PWH and PWoH had comparable distributions of cellular subsets in their airways, dominated by alveolar macrophages (AMs). Single cell transcriptional profiling of BAL cells showed significant differential gene expression across multiple myeloid and lymphoid subsets in PWH at baseline and following Mtb infection compared to PWoH. We identified a unique proinflammatory AM subset present in PWoH, but absent in PWH, that sequentially acquired TNF signaling capacity following Mtb infection. Further, cell-cell communication analyses revealed robust interactions between these AM subsets and effector memory T-cells within TNF, chemokine, and costimulatory networks in PWoH. Importantly, these networks were lacking in PWH after Mtb infection, where anti-inflammatory AMs, T regulatory cells and dusregulated dysregulated T-cells dominated.

Conclusions: We show that PWH on ART are unable to mount effective lung immune responses against Mtb and propose a model where impaired TNF-signaling and aberrant AM-T cell crosstalk result in impaired control of TB despite ART, opening new potential avenues for treatment.

LB02 The Union-CDC late-breaker session (treatment and clinical trials)

LB02-1206-13 Pharmacokinetics and safety of 12-weeks rifapentine and isoniazid in children for TB prevention

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Background: Young children (<2 years) are at high risk of progressing to tuberculosis; however, their exclusion from most clinical trials prevents access to short-course preventive treatment. We aimed to determine safety and optimal dosing of once-weekly rifapentine and isoniazid over 12 weeks (3HP) in children aged 0-12 years.

Design/Methods: TBTC Study 35, a pharmacokinetic dose-finding and safety study, enrolled children aged 0-12 years as close contacts of people with drug-susceptible TB or proof of TB infection, across 3 South African sites. Children aged 4 -12 and 2-3 years (cohorts 1, 2) were enrolled , then children aged 1and < 1 years (cohorts 3, 4) were enrolled, receiving model-informed rifapentine doses. Safety and pharmacokinetics of rifapentine based on pre-defined adult targets (area-under-the-concentration-curve; AUC = 522; range 392-914 mgh/L) were assessed. Non-linear mixed-effects modelling was used. Safety targets were defined as no more than 1 grade ≥3 suspected adverse reactions associated with 3HP in the first 6 participants per cohort.

Results: Overall, 69 children (n=38 <2 years) were enrolled between October 2019-December 2023 (median age 1.9 years; median weight 11.9 kilograms), including 7 living with HIV. The last-patient-visit was 8 May 2024. Rifapentine doses started at 25 mg/kg in children <2 years; dose increases were required (up to 42 mg/kg) to achieve targets.

The final model was a 1-compartment with transit compartment absorption, allometric scaling on clearance, with age affecting clearance and bioavailability. Safety targets were met, with a total of 2 grade 3 reactions (2.2%) at least possibly associated with 3HP, in separate cohorts.

Study Cohorts[¥]	Mean initial rifapentine dose (range)	AUC at initial rifapentine dose	Mean increased rifapentine dose (range)***	AUC at increased rifapentine dose	Total Grade 1-2 adverse reactions (possibly related to 3HP)	Total Grade 3-4 adverse reactions (possibly related to 3HP)¶
Cohort 1 (4 -12 years) n=18	522 mg (300-750 mg)	609	N/A	N/A	6 (0)	1 (1)
Cohort 2 (2-3 years) n=13	339 mg (300-450 mg)	421	N/A	N/A	18 (6)	0 (0)
Cohort 3 (1 year) n=19 (n=6 dosed at the initial dose; 13 at the increased dose)	250 mg (200-300 mg)	299**	308 mg (250-400 mg)	392**	41(4)	3 (1)
Cohort 4 (< 1 year) n=19 (including 7 with HIV)* (n=8 dosed at the initial dose; 11 at the increased dose)	184 mg (75-300 mg)	316**	223 mg (125-300 mg)	418**	21 (2)	3 (0)

¥ Cohorts are based on age at the day of enrolment and include those at any point in the age range (e.g. Cohort 3 includes those ≥ 1 year and < 2 years).
* All children with HIV received once-daily dolutegravir dosing; all were virologically suppressed at study entry and remained suppressed at 12 weeks following 3HP completion.
** Initial rifapentine doses did not meet AUC targets for Cohorts 3 and 4 (<2years of age). After increased dosing, targets were met. (AUC target = 522 mgh/L, range 392-914 mgh/L)
***Final rifapentine doses by weight band: 3 – 4.9 kg: 125 mg; 5.0 – 6.9 kg: 175 mg; 7.0 – 8.9 kg: 250mg; 9.0 – 12.9 kg: 300 mg; 13.0 – 15.9 kg: 350mg; 16-17.9kg: 400mg; 18-23.9kg: 450mg; 24-30.9kg: 600mg; 31-40kg: 750mg
¶ No grade 5 reactions occurred in the study.

Table 1: Pharmacokinetic and safety data in children aged 0-12 years enrolled in TBTC Study 35.

Conclusions: 3HP was safe and well-tolerated in children across all ages, including with HIV. Higher mg/kg rifapentine doses were required in children <2 years to achieve target rifapentine exposures. Standard weight-

banded dosing using WHO harmonized weight-bands developed from this trial will inform global guidelines, supporting access to 3HP in young children.

LB02-1207-13 Bedaquiline and clofazimine resistance following an interruption in treatment for rifampicin-resistant TB

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Background: Bedaquiline-based regimens for RR-TB are associated with improved outcomes, but treatment interruptions remain common. Interruptions pose a risk of inadvertent bedaquiline monotherapy due to its long terminal elimination half-life and the emergence of resistance as other drugs in the regimen are cleared rapidly. We sought to determine the prevalence of bedaquiline and clofazimine resistance in patients returning to care following a treatment interruption.
Design/Methods: We enrolled RR-TB participants returning to care after having interrupted treatment in South Africa. We collected sputum for culture and phenotypic bedaquiline and clofazimine DST. Resistance to each drug was defined as MIC ≥2 μg/mL using liquid culture. Clinical, laboratory, and demographic data were collected through interviews and medical record review and were used to identify risk factors for having a positive sputum culture post-interruption.
Results: To date, we have enrolled 219 participants: median age 34 years, 138 (63%) male; 152 (69%) were living with HIV. Median duration of treatment before interruption was 119 days (IQR 72-175) and the median treatment interruption period was 144 days (IQR 91-254). 73 (33%) participants had a positive sputum culture upon returning after the treatment interruption. In multivariable analysis, a positive last sputum culture prior to the interruption was predictive of post-interruption culture-positivity (aOR 18.8, 95%CI 6.2-56.7). 32 (53%) of the 60 available post-interruption sputum culture isolates were resistant to bedaquiline and 18 (30%) were resistant to clofazimine.
Conclusions: Participants who were culture-positive at their last visit prior to the interruption were more likely to be culture-positive when returning to care. Among those who were culture-positive after the interruption, resistance to bedaquiline and to clofazimine were common. This emphasizes the need for routine DST in this high-risk cohort and suggests such patients should be presumed to have bedaquiline and clofazimine resistance when they return to care, pending the results of susceptibility testing.

LB02-1208-13 Association between daily linezolid dose and BPaL regimen safety in a multi-country operational research study

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Background: The BPaL (Bedaquiline, Pretomanid, Linezolid) regimen has shown over 90% treatment success in individuals with drug-resistant tuberculosis in clinical trials and multi-country operational research (OR). Based on clinical trials, WHO recommends a daily Linezolid dose of 600 mg over 1200 mg for better BPaL regimen safety, but limited multi-country OR data exist.
We assessed the association between a daily Linezolid dose and BPaL regimen safety in a multi-country OR cohort.
Design/Methods: Between April 2021 and March 2023, individuals with MDR-TB treatment intolerance, non-response, or additional fluoroquinolone resistance were enrolled in BPaL treatment under OR conditions in Nigeria, Kyrgyzstan, Uzbekistan, Indonesia, Vietnam, and the Philippines. Binary logistic regression was used to assess the association between Linezolid dose and the occurrence of myelosuppression and peripheral neuropathy, controlling for age, gender, and treatment country.
Results: Among the 350 individuals, the median age was 41 (IQR 29-54), 208 (59.44%) were males, 53 (15.14%) received a daily Linezolid dose of 600 mg, and 297 (84.86%) received 1200 mg. A daily 1200 mg Linezolid was linked to higher odds of myelosuppression (aOR 6.15, 95%CI 2.51-15.07) and peripheral neuropathy (aOR 4.36, 95%CI 2.21-8.62) compared to 600 mg. Age ≥50 years was associated with higher odds of myelosuppression (aOR 2.59, 95%CI 1.48-4.52) and peripheral neuropathy (aOR 1.96, 95%CI 1.17-3.31).

The odds of myelosuppression were higher in Vietnam (aOR 4.07, 95%CI 1.34-12.37), the Philippines (aOR 5.04, 95%CI 1.85-13.76), and Indonesia (aOR 9.85, 95%CI 3.52-27.57) compared to Uzbekistan. The odds of peripheral neuropathy were higher in Indonesia (aOR 4.97, 95%CI 2.11-11.75), the Philippines (aOR 5.49, 95%CI 2.35-12.80), and Kyrgyzstan (aOR 5.91, 95%CI 2.26-15.41) than in Uzbekistan.

Conclusions: In the multi-country OR cohort, a daily 600 mg Linezolid dose improves BPaL regimen safety. Age ≥50 increases the odds of myelosuppression and peripheral neuropathy. Adverse event reporting varies significantly across countries implementing the BPaL regimen.

LB02-1209-13 High efficacy of BPaL regimen among people with TB in the Philippines with M. tuberculosis lineage 1

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Background: WHO recommends the bedaquiline-pretomanid-linezolid (BPaL) regimen for treatment of multidrug- or rifampicin-resistant (MDR/RR-) tuberculosis (TB) with additional resistance to fluoroquinolones, and BPaLM (with moxifloxacin [M] added) for MDR/RR-TB. However, there is limited BPaL(M) efficacy data from Southeast Asia and the Indian subcontinent, where *Mycobacterium tuberculosis* (MTB) lineage 1 (L1) is prevalent. L1 is less susceptible to pretomanid than other lineages.

Design/Methods: 103 patients were enrolled in the Philippine BPaL Operational Research Study. Treatment outcomes were evaluated at the end-of-treatment and month 6 post-treatment (month 12 pending). Whole genome sequencing (WGS) of MTB isolates was carried out on Oxford Nanopore Technologies and Illumina platforms, and lineage identification was performed using the TB-Profiler version 6.2 pipeline. Pretomanid minimum inhibitory concentrations (MICs) were determined in the MGIT 960.

Results: Baseline MTB isolates from 34/103 enrolled participants were available for WGS and pretomanid MICs. L1 (23/34, 68%) was most common, followed by L4 (9/34, 26%) and L2 (2/34, 6%). Consistent with previous reports, 21/22 L1 isolates tested exhibited pretomanid MICs ≥1 mg/L. In contrast, isolates from other lineages had MICs between 0.125 and 0.5 mg/L. All 34 participants with characterized baseline isolates had culture converted by end-of-treatment. By July 2024, 29/30 participants who provided sputum on month 6 follow-up remained culture negative – the single culture-positive participant harbored a MTB L4 strain. Similarly high success rates at both timepoints were observed for the entire cohort of 103 participants.

Conclusions: In this study in the Philippines, participants infected with MTB L1 responded to BPaL treatment as well as those infected with other lineages, supporting the worldwide implementation of BPaL-based regimens, irrespective of MTB lineage distribution.

LB02-1210-13 One vs. three months of rifapentine and isoniazid to prevent TB in people exposed in the household or workplace in Brazil: The Ultra-Curto Trial (NCT04703075)

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Background: Short-course tuberculosis preventive therapy with isoniazid and rifapentine is recommended by the World Health Organization, but the acceptability and safety of one month of daily HP (1HP) versus three months of weekly HP (3HP) in people without HIV infection is not been determined.

Design/Methods: We conducted a randomized trial of 1HP vs 3HP in PPD/IGRA+ adolescents and adults without HIV with household or workplace exposure to tuberculosis in Brazil. Household clusters (max n=2) were assigned the same treatment. Primary outcomes were completion of >90% of treatment and occurrence of Grade ≥2 targeted safety events or discontinuation for any side effects. Completion was validated by self-report, pill counts, and urine and dried blood spot drug monitoring. We hypothesized that 1HP would have a higher proportion of successful treatments and fewer targeted safety events than 3HP.

Results: 500 individuals were enrolled in Rio de Janeiro and Manaus; 193 males and 307 females, median age of 39 years. Preliminary results from 24-week follow-up that ended on 10Jun2024 are presented. Successful completion

of treatment was 89.6% for 1HP recipients versus 84.1% for 3HP recipients (risk difference 5.5%, [95% CI: -0.42%, 11.4%], P=0.07, Table). Targeted adverse events or treatment discontinuation was 16.1% for 1HP participants and 10.4% for 3HP participants (Risk difference 5.7%, [95%CI: -0.21%, 11.6%], P=0.06). The proportion who discontinued treatment for side effects was 7.2% in the 1HP arm and 4.4% in the 3HP arm. Hepatotoxicity occurred in 13 1HP vs 10 3HP recipients, nausea/vomiting in 12 vs. 5, hypersensitivity in 2 vs 8, and rash/fever in 12 vs 4. No active tuberculosis occurred during six months of follow up.

Conclusions: Both 1HP and 3HP had high rates of treatment success, with 1HP being somewhat higher, but with more targeted safety events, mostly low-grade. Most participants were successfully treated. These data will help inform TPT guidelines.

	1HP	3HP	P Value
Successful completion	223/249 (89.6%)	211/251 (84.1%)	0.07
Targeted safety event ≥Grade 2 or discontinuation for side effects	40/249 (16.1%)	26/251 (10.4%)	0.06
Targeted safety event	36/249 (14.5%)	23/251 (9.2%)	0.07
Discontinued due to side effects	18/249 (7.2%	11/251 (4.4%)	0.17
Grade 3+ targeted safety event	9/249 (3.6%)	7/251 (2.8%)	0.72

Table. Completion, Safety and Treatment Discontinuation for Side Effects.

LB02-1211-13 Acquisition of resistance to bedaquiline, delamanid, clofazimine, linezolid, and fluoroquinolones during treatment in the endTB trial

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Background: The endTB trial included 754 participants with pulmonary, rifampin-resistant, fluoroquinolone-susceptible tuberculosis, who were randomized to the 18-month control regimen or five 9-month experimental regimens, of which three showed efficacy non-inferior to the control (Table).

Design/Methods: For participants with paired positive cultures (baseline and at least one at ≥ 16 weeks post-randomization), all *M.tuberculosis* isolates available during treatment were evaluated by whole genome sequencing (WGS), or concurrent sediments by Deeplex Myc-TB if isolate were not retrievable. For samples classified with same *M.tuberculosis* strain (≤12 SNP [single nucleotide polymorphisms] difference), or likely the same (concordant lineage and similar genotype; i.e., no substitutions or reversion to wild type of mutations at >90% frequency in *rpoB*, *gyrA* and *pncA* genes), we evaluated acquisition of resistance to bedaquiline, clofazimine, delamanid, fluroquinolones (moxifloxacin/levofloxacin) and linezolid using genotypic (WGS + TBprofiler V6.0 and/or Deeplex Myc-TB) and phenotypic (broth micro dilution) methods.

Results: Of 754 participants, 45 (6%, 95%CI 4.4, 7.9) had paired culture positive on site, and 40 could be tested. Thirty-one (77.5%) had (likely) same strains at baseline and ≥16 weeks and nine (22.5%) were (likely) different. Among these 31 participants, resistance at baseline was present in 19 (61.3%) for pyrazinamide and in 1 (3.2%) for fluoroquinolones. Acquisition of resistance to ≥1 drug was detected in 15/31 (48.4%), corresponding to an in-

cidence of 2% (95% CI 1.1, 3.3) among 754 participants. Among experimental regimens, the incidence was higher for regimens not containing bedaquiline (5.3% vs 0.5%, p=<0.001). Acquisition of resistance occurred mainly for fluoroquinolones and delamanid and was rare for bedaquiline, clofazimine and linezolid.

Treatment arms (non-inferiority comparison)	Total	endTB1 9BLMZ (NI[a])	endTB2 9BCLLfxZ (NI[b])	endTB3 9BDLLfxZ (NI[a])	endTB4 9DCLLfxZ (not NI)	endTB5 9DCMZ (not NI)	endTB6 Control
Confirmed pairs among participants with positive cultures at ≥ 16 weeks	31/45	4/9	4/5	0/3	11/13	9/11	3/4
Drugs tested	n of new resistance/pairs tested (%)						
Bedaquiline	2 (6.5%)	0 (0.0%)	1 (25.0%)	0 (0.0%)	-	-	0 (0.0%)
Clofazimine	2 (6.5%)	-	1 (25.0%)	-	0 (0.0%)	1 (11.1%)	0 (0.0%)
Delamanid	8 (25.8%)	-	-	0 (0.0%)	3 (27.3%)	5 (55.6%)	0 (0.0%)
Fluoroquinolone[c]	9 (29.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (18.2%)	7(77.8%)	0 (0.0%)
Linezolid	1 (3.2%)	0 (0.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	-	0 (0.0%)
Total participants with acquisition of resistance (%)	15/754 (2.0%)	0/127 (0.0%)	2/124 (1.6%)	0/128 (0.0%)	5/125 (4.0%)	8/120 (6.7%)	0/130 (0.0%)

NIa = non-inferior at 73 weeks in modified intention-to-treat and per-protocol populations; NIb = non-inferior at 73 weeks in per-protocol and superior at 73 weeks in modified intention-to-treat populations; c=moxifloxacin or levofloxacin. - = drug not included in the regimen; bedaquiline (B), clofazimine (C), delamanid (D), linezolid (L), pyrazinamide (Z)

Table. Frequency of acquisition of new drugs resistance among endTB trial study participants (N=754) by regimen.

Conclusions: The incidence of acquisition of resistance was low (2%), occurring mostly to delamanid and fluoroquinolones and in participants whose regimen was not non-inferior and did not contain bedaquiline.

LB02-1212-13 WX-081, a novel compound against M. tuberculosis

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Background: WX-081, an innovative diarylpyridinated drug, has shown comparable efficacy to its similar scaffold compound, bedaquiline, but with an improved safety profile against Mycobacterium tuberculosis (Mtb) in both animal models and nonclinical safety pharmacology studies. Nevertheless, the early bactericidal activity (EBA) and therapeutic implications of WX-081 in patients with drug-susceptible and drug-resistant pulmonary tuberculosis require further investigation.

Design/Methods: In this multi-center, open-label, controlled phase II trial, sputum culture, pharmacokinetic, and safety data were compiled. 59 patients with drug-susceptible TB were randomly assigned to receive WX-081 (150, 300, or 450 mg/day) or conventional treatment for 14 days. Additionally, 40 patients with drug-resistant TB received WX-081 (400 mg/day) or bedaquiline (400 mg/day) for 2 weeks, followed by a 6-week combination with background treatment.

The analysis included early bactericidal activity (EBA), measured by the decrease rate in logCFU and the prolongation rate of time to positivity (TTP), sputum culture conversion (SCC) rate, and safety.

Results: In patients with drug-sensitive TB, an obvious decline in logCFU was observed in the WX-081 groups from D7. The EBA_{CFU} on D7-14 Period in groups of 150mg/d, 300mg/d and 450mg/d were 0(0.09), 0.10(0.12), and 0.13(0.20). Prolonged EBA_{TTP} were observed in all periods.

For patients with drug-resistant TB, the median time for sputum culture conversion (SCC) in both groups was 42 days. After 8 weeks, 69.23% of patients in WX-081 group and 66.67% in bedaquiline group achieved sputum culture conversion. CFU counts decreased by 100% in the WX-081 group and by 85% in bedaquiline group compared to baseline. The safety results showed it is good tolerable of WX-081 for both patients with drug-sensitive TB and drug-resistant TB.

Conclusions: WX-081 demonstrates commendable early bactericidal activity (EBA) and exhibits promising efficacy and safety in the treatment of both drug-susceptible and drug-resistant TB patients. WX-081 currently is under phase 3 trial in Chinese patients with RR-TB.

LB02-1213-13 endTB-Q: Interim results of a randomised controlled trial testing a shorter treatment strategy for pre-XDR TB

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Background: Pre-extensively drug-resistant (pre-XDR, resistant to rifampin and fluoroquinolones) tuberculosis has unsatisfactory outcomes. New and re-purposed drugs have improved treatment options. However, no randomized, internally controlled trials have been conducted which are powered to draw inference on pre-XDR TB.

Design/Methods: endTB-Q is a randomized, internally-controlled Phase 3 trial evaluating efficacy and safety of bedaquiline, delamanid, clofazimine, and linezolid (BDCL) compared to WHO-recommended longer regimens. People with pulmonary pre-XDR TB, without known resistance to BDCL, were randomized (2:1) to the experimental, stratified-medicine strategy (BDCL: 6 months for limited and 9 months for extensive TB disease) and the control. This preliminary analysis uses interim data extracted for a data safety and monitoring board meeting.

We report frequency of favorable and unfavorable outcomes at 39 weeks post-randomization and of serious adverse events (SAEs) occurring during treatment or follow-up and reported prior to data extraction. Full results, available in September 2024, will be presented including risk differences and non-inferiority evaluation at 73 weeks post-randomization of the efficacy of experimental strategy versus the control using the -12% non-inferiority margin.

Results: 323 participants were randomized across 6 WHO regions, 218 (67.5%) to the experimental strategy and 105 (32.5%) to the control. All control arm participants received bedaquiline, linezolid, and clofazimine. Favorable outcomes at 39 weeks occurred in 187 (85.8%) experimental strategy participants and 92 (87.6%) in the control arm. 42 (19.3%) and 25 (23.8%) participants experienced at least one SAE in the experimental strategy and control regimen, respectively. Deaths occurred in 9 participants, 7 (3.2%) and 2 (1.9%) in the experimental strategy and control regimen, respectively.

Characteristics & Outcomes	Total (N=323)	Experimental strategy (N=218)	Control arm (N=105)
Baseline characteristics			
Age in years, median (IQR)	30 (21, 42)	30 (21, 42)	27 (20, 40)
BMI in kg/m², median (IQR)	17.6 (15.5, 20.2)	17.6 (15.6, 20.2)	17.9 (15.4, 20.2)
Male sex, %	173/323 (53.6)	123/218 (56.4)	50/105 (47.6)
Baseline QTcF[&] in ms, median (IQR)	394 (379, 409)	395 (380, 409)	394 (375, 412)
Diabetes mellitus, %	38/291 (13.1)	27/198 (13.6)	11/93 (11.8)
HIV infection, %	3/323 (0.9)	2/218 (0.9)	1/105 (1.0)
HCV infection, %	20/323 (6.2)	12/218 (5.5)	8/105 (7.6)
Efficacy at week 39			
Favorable outcome, %*	279 (86.4)	187 (85.8)	92 (87.6)
Unfavorable outcome, %*	38 (11.8)	28 (12.8)	10 (9.5)
Not yet available, %	6 (1.9)	3 (1.4)	3 (2.9)
Safety			
Participants with ≥1 serious adverse event#, %	67 (20.7)	42 (19.3)	25 (23.8)
Deaths, %	9 (2.8)	7 (3.2)	2 (1.9)

IQR = interquartile range; [&]QTcF = QT interval corrected according to the Fridericia formula, median of the two highest values reported from triplicate electrocardiograms;*All culture results are negative from samples collected between week 36 and week 39 post-randomization; **Addition or replacement of ≥1 drug in experimental strategy or ≥2 drugs in control; death; any positive culture from samples collected between weeks 36 week 39; or no culture result between weeks 36 and 39. #Serious adverse event = any event that results in any of the following: death, a life-threatening adverse event, requires inpatient hospitalization or prolongation of existing hospitalization, a persistent or significant disability or incapacity, a congenital anomaly or birth defect, or any other medical important event.

Table. endTB-Q participant characteristics, efficacy and safety outcomes in randomized population (interim results).

Conclusions: Interim results from endTB-Q, the first-ever controlled trial designed exclusively to inform treatment of pre-XDR TB, provisionally reveal that an experimental strategy containing BDCL offers a promising, shorter, tailored alternative to longer regimens.

LATE BREAKER PRESENTATIONS THURSDAY 14 NOVEMBER 2024

LB03 The RIT/JATA student late-breaker session

LB03-1214-14 Barriers to LTBI treatment in project JEET: A prospective observational operations research

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Background: Individuals with Latent Tuberculosis Infection (LTBI) serve as reservoirs for active TB cases. An estimated 1.7 billion people worldwide have LTBI, with 5-15% progressing to active disease. To meet WHO End-TB-Strategy targets, reducing the LTBI reservoir through preventive therapy is crucial. India's Project JEET, launched in 2018, aims to address the TB epidemic in high-burden regions by managing LTBI. However, numerous barriers hinder its success.
This study aims to understand the reasons for LTBI treatment refusal from the subjects' perspective.
Design/Methods: It was a questionnaire-based cross-sectional study conducted over a period of 6 months in different parts of northern India. The participants of this survey were subjects who were otherwise eligible for LTBI treatment but refused. The questionnaire was pretested among the staff involved in the programme and was refined accordingly.
Results: During the study period, 827 cases were diagnosed with LTBI, and 428 (51.8%) refused treatment. Of these, 250 agreed to a telephonic interview. Among the study population, 53.6% were males, with a mean age of 34.91±14.2 years, and 74.8% lived in urban areas. The majority were unemployed (30%), 25.2% lacked formal education, and 19.2% were from the upper class. The primary reason for refusing LTBI treatment was the belief they didn't have TB (71.2%), followed by concerns about potential side effects (16%) and the long treatment course (7.6%).
Additionally, 94.4% felt uncomfortable with healthcare worker visits at home, and 78.4% doubted the efficacy of prophylactic treatment. Chi-square analysis revealed significant results: 47.45% of unskilled workers were uncertain about treatment outcomes, 60.60% of educated individuals distrusted government-supplied medicines, and 81.8% of the upper class resisted long-term medication. Moreover, 90.4% of the lower class believed the treatment would financially burden their families.
Conclusions: Study highlights the multifaceted nature of LTBI treatment non-adherence, encompassing beliefs, knowledge, socioeconomic factors, and healthcare system perceptions.

LB03-1215-14 Impact of strategic public health interventions to reduce TB incidence in Brazil: A Bayesian Structural Time-Series scenario analysis

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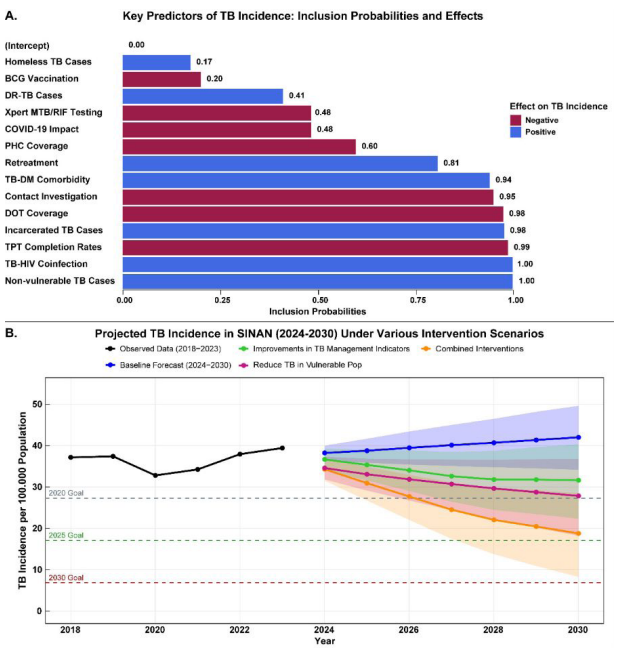
Background: Despite government efforts, tuberculosis (TB) remains a public health threat in Brazil. TB incidence in 2023 was 39.8 cases per 100,000 population, far above the World Health Organization's (WHO) goal to reduce incidence by 80% in 2030, relative to 2015. Using national-level datasets, we investigated and forecasted the estimated impact of several public health interventions on reducing TB incidence in Brazil.
Design/Methods: Monthly TB surveillance data (January 2018-December 2023) were collected, from Brazilian national reporting systems: SINAN-TB (TB cases), SITE-TB (TB drug-resistance), and IL-TB (preventive therapy). These data were updated in May 2023 by the Brazilian Ministry of Health and used to create a multivariable Bayesian Structural Time-Series (BSTS) model, with 5000

Monte-Carlo simulations, which identified key predictors of TB incidence and forecasted these rates from 2024 to 2030 under various scenarios.

Results: Vulnerabilities including incarceration, TB-HIV coinfection and TB-diabetes mellitus, as well as coverages of directly observed therapy (DOT), contact investigation and preventive treatment (TPT) completion rates, were identified as key predictors of TB incidence *(Figure 1A)*. Under current trends, we forecasted TB incidence in Brazil to be 42·1[34·1-49·8] per 100,000 person-years by 2030. However, a 34·2%[26·2%-47·5%] reduction in projected TB incidence was found in a scenario considering decreases in the number of TB cases among vulnerable populations. Additional reductions were seen in scenarios with increased coverage of these key TB management indicators (25·0%[18·9%-35·2%]) and by combining both interventions (56·1%[43·0%-77·2%]) *(Figure 1B)*.



Conclusions: Our findings demonstrate how interventions focused on enhancing health policies which targeted decreasing TB cases among vulnerable populations, including individuals with TB-HIV coinfection, incarcerated populations, and TB-diabetes comorbidity, along with improvements in health management indicators such as DOT participation and contact investigation coverage, as well as TPT completion rates, are effective in reducing TB incidence nationwide.

LB03-1216-14 TB treatment outcomes following release from prison in Mato Grosso do Sul, Brazil: A retrospective cohort study

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Background: Incarcerated populations are disproportionately impacted by tuberculosis (TB). For people who are diagnosed with TB while incarcerated, transfers and releases from prisons may disrupt care, contributing to poor treatment outcomes. In Brazil, which has the third largest prison population in the world, the effect of prison transfers and releases on TB treatment outcomes is unknown.

Design/Methods: We linked the Brazilian notifiable diseases database (SINAN) with incarceration data from Mato Grosso do Sul state. We constructed a retrospective cohort of individuals diagnosed with tuberculosis while incarcerated between 2011 and 2018. We followed the cohort for two years post diagnosis, comparing treatment outcomes between individuals who remained in one prison over the course of treatment and individuals who were transferred and/or released prior to treatment completion.

	Released from prison (N=217, 16.83%)	Transferred to other carceral facilities (N=222, 17.22%)	Remained in same prison (N= 850, 65.94%)
Cured	91 (41.94%)	140 (63.06%)	660 (77.65%)
Diagnosed and presumably still being treated	13 (6%)	3 (1.35%)	10 (1.18%)
Referred to another health facility with no follow up record	25 (11.52%)	31 (13.96%)	18 (2.12%)
Abandoned with no follow up record	42 (19.35%)	19 (8.56%)	46 (5.41%)
Referred/abandoned, restarted, and presumably still being treated	17 (7.83%)	2 (.90%)	10 (1.18%)
Unknown	21 (9.68%)	21 (9.46%)	76 (8.94%)
Death	3 (1.38%)	1 (.45%)	23 (2.71%)
Other	5 (2.30%)	5 (2.25%)	7 (.82%)

Results: We identified 1,289 individuals diagnosed with TB in prison. Of these, 850 (65.94%) remained in the same prison, 222 (17.22%) experienced transfers to other carceral facilities, and 217 (16.83%) were released from prison within six months following diagnosis.

Compared to those who remained in the same prison, treatment completion rates at 8 months following diagnosis were 36% (95%CI: 29, 43) lower among individuals who were released and 15% (95%CI: 8, 22) lower among individuals who were transferred from prison.
Among individuals released from prison who were referred to another health facility or lost-to-follow-up within 8 months of diagnosis, 31 (37.80%) were linked to care, and 18 (21.95%) completed treatment in the state within 2 years.
Conclusions: Transfers and releases from prisons disrupt continuity of care, resulting in decreased treatment completion and higher rates of loss-to-follow-up. Strategies for improving linkage to care are needed to address treatment disruptions for individuals moving within and out of the carceral system.

LB03-1217-14 Within-country heterogeneity in patterns of social contact relevant for TB transmission, prevention and care

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Background: *Mycobacterium tuberculosis* (*Mtb*) transmission is driven by variable social, environmental, and biological factors, including the number and duration of indoor contacts. Social contact surveys provide insight into potential transmission patterns.
Design/Methods: A social contact survey was conducted in three communities with comparable population sizes in South Africa: an urban township in Western Cape, and peri-urban and rural areas in KwaZulu-Natal. Participants reported the indoor settings they visited over 24-hours, the duration of each visit, and the estimated number of people present halfway through the visit. We compared mean indoor contact hours (MICH) across the communities as the product of duration and the number of people present given three location-based scenarios:
1. Contact occurring in any building type,
2. Contact occurring in buildings excluding participants' own homes, and;
3. Contact occurring outside the participants' communities.

Results: The rural community exhibited the highest overall MICH (83.5, 95% CI: 79.3-87.6), followed by the peri-urban (68.8, CI: 65.4-72.7) and urban communities (32.2, CI: 30.2-34.2). MICH was more consistent across communities when household contact was excluded; the urban community reported 15.6 (CI: 14.1-17.1), while the peri-urban and rural communities were similar, 18.3 (CI: 16.6-20.2) and 18.4 (CI: 16.6-20.5), respectively. MICH occurring outside the study community was highest among urban participants (11.0, CI: 9.8-12.2) followed by rural (6.9, CI: 5.8-8.2) and peri-urban (3.8, CI: 3.1-4.7) participants.

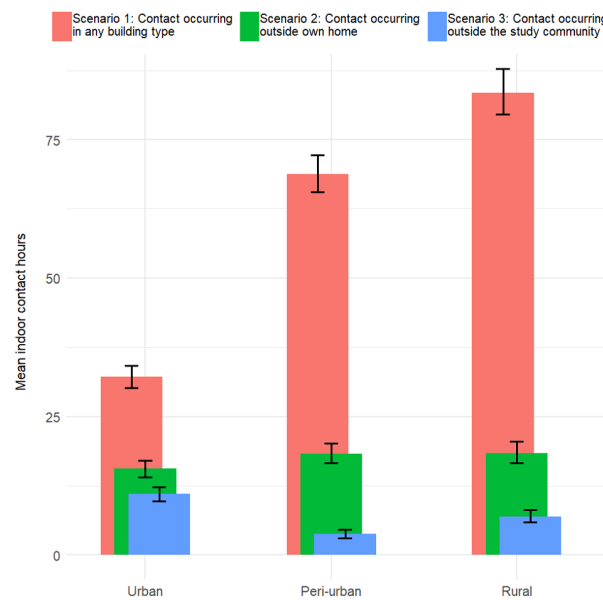

Figure. Mean indoor contact hours by study community and scenario.

Conclusions: Our findings show the existence of large amounts of heterogeneity in contact patterns across communities in South Africa, which may have implications for TB care and prevention. For instance, the potential yields of household contact tracing may be higher in the rural community, while spatially targeted active case finding may have the highest impact on community incidence in the peri-urban community. Tailored interventions, considering these variations in contact and movement patterns, are essential to effectively reduce TB burden in diverse settings.

LB03-1218-14 Impact of intense exercise on innate bacterial killing capacity of close contacts of people with TB/MDR-TB

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Background: Close contacts of multidrug-resistant tuberculosis (MDR-TB) patients are at high risk of getting MDR-TB due to limitation of conventional chemoprophylaxis. Exercise is known to enhance lung infection defense. This study aimed to evaluate whether intense exercise can increase bacterial innate immunity of these close contacts in *in vitro* killing of intracellular *Mycobacterium tuberculosis*.

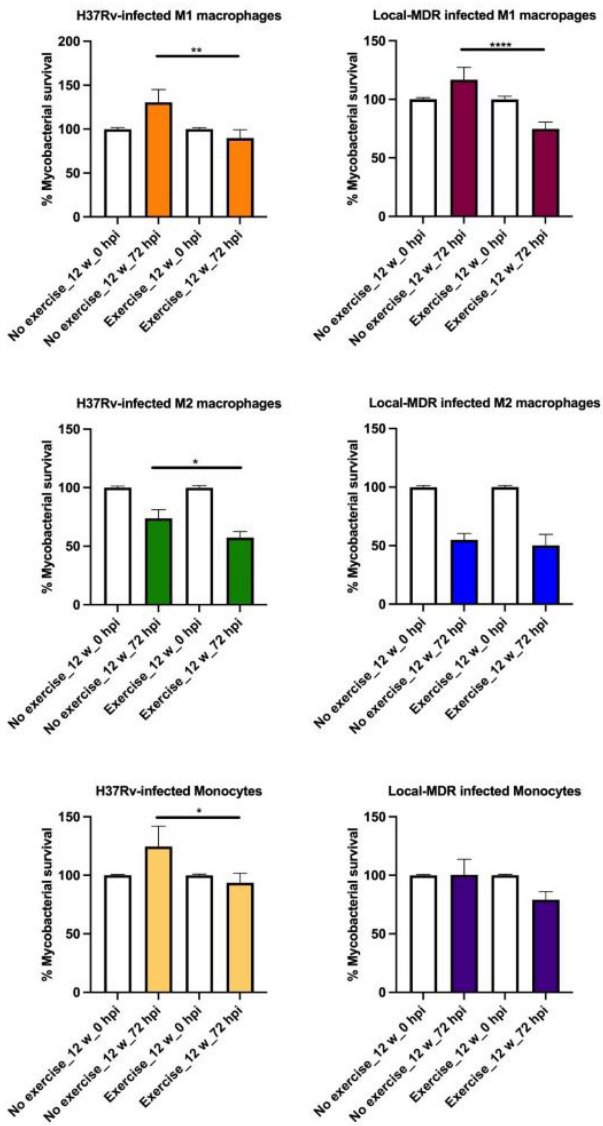

Figure 1: The percent mycobacterial survival of H37Rv and the Local -MDR strain in monocytes, inflammatory M1, and anti-inflammatory M2 macrophages isolated from the exercise and control groups.

Design/Methods: Twelve men aged 20-40 from a TB clinic were randomly assigned to exercise and control groups. The exercise group underwent high-intensity cycle ergometry (60-70% HRR) for 30-60 minutes, three days/week for 12 weeks. Controls did self-directed exercises. At both pre-and post-program periods, blood monocytes were isolated and differentiated to inflammatory M1 and anti-inflammatory M2 macrophages.
We then infected the isolated monocytes, M1 and M2 macrophages with the mCherry-expressing laboratory reference *M. tuberculosis* strain H37Rv and a local strain of MDR-TB (MOI 10) for 0 and 72 hours and mycobacterial survival was then determined by high content imaging.
Results: The number of mycobacteria per cell was obtained and percent mycobacterial survival in each group was computed normalized to the respective 0-hour infection control set to100%. In the exercise group with H37Rv infection, percent mycobacterial survival was significantly decreased when compared to that of the control group observed in monocytes, M1, and M2 macrophages.
Interestingly, when the local-MDR strain was used for infection, such benefit was observed only in the M1 macrophages but not in monocytes or M2 macrophages.
Conclusions: Intense exercise may enhance mycobacterial killing in individuals living with TB patients, potentially improving immune function against TB/MDR-TB infection. Thus, intense exercise should be promoted among them.

LB03-1219-14 Extensively-drug-resistant TB: Back to the pre-antibiotic era? A TBnet/ESGMYC multi-country study

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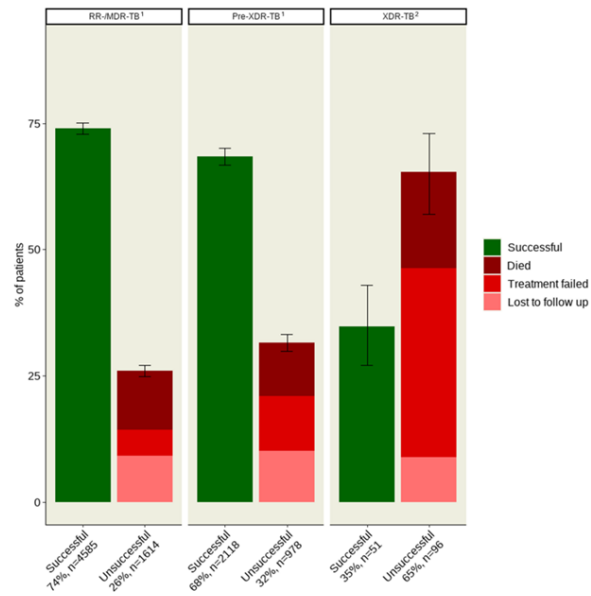
Background: In 2021, the World Health Organization (WHO) redefined extensively drug-resistant tuberculosis (XDR-TB) to include resistance to any fluoroquinolone and at least one Group A drug (bedaquiline or linezolid). Given the lack of multinational data on managing these patients, we aimed to describe XDR-TB treatment outcomes in Europe under the new definition.

Design/Methods: This observational, retrospective cohort study included patients with XDR-TB, diagnosed by phenotypic and/or genotypic drug susceptibility testing from January 2017 to December 2023 in the WHO European Region. Participating centers collected patient-level data for XDR-TB and aggregate data for consecutive rifampicin-/multidrug-resistant TB (RR-/MDR-TB) and pre-extensively drug-resistant tuberculosis (pre-XDR-TB) patients (defined as MDR-TB with additional fluoroquinolone resistance), using a standardized electronic case report form. We applied 2021 WHO treatment outcome definitions and evaluated risk factors for unsuccessful outcomes using logistic regression.

Results: Overall, we included 179 XDR-TB patients from 15 countries. Of these, 50% were resistant to bedaquiline (n=90/179), 31% to linezolid (n=56/179), and 18% to both drugs (n=33/179). On average, patients were prescribed six anti TB-drugs, with three being effective. Outcomes were not evaluated for 18% (n=32/179). Among the 147 evaluated patients, 35% achieved successful outcomes (95% confidence interval [95% CI] 27%-43%) (n=51/147). Compared to RR-/MDR-TB and pre-XDR-TB, treatment outcomes were significantly worse for XDR-TB patients (Figure 1).

Adjusted for disease severity, each additional effective drug reduced the odds of unsuccessful outcomes by 30% (adjusted odds ratio [aOR]: 0.70, 95% CI: 0.50-0.96, p = 0.033), whereas treatment in middle-income countries compared with high-income countries increased the odds 15-fold (aOR: 15.9, 95% CI: 4.4-68.5, p < 0.001).

Figure 1. Comparison of treatment outcomes for patients with rifampicin-/multidrug-resistant, pre-extensively drug-resistant, and extensively drug-resistant tuberculosis.



Abbreviations: RR-/MDR-TB, rifampicin-/multidrug-resistant tuberculosis; Pre-XDR-TB, pre-extensively drug-resistant tuberculosis; XDR-TB, extensively drug-resistant tuberculosis.

[1]based on aggregate data from the participating centers.

[2]based on patient-level data from the participating centers.

Conclusions: Only 35% of XDR-TB patients achieved successful outcomes, significantly lower than for RR-/MDR-TB and pre-XDR-TB. Each additional effective drug significantly reduces the odds of unsuccessful outcomes, highlighting the need for optimized drug susceptibility testing methods and new TB compounds in compassionate use programs.

LB03-1220-14 Characterisation of the Targeted Universal Tuberculosis Testing (TUTT) care cascade among people living with HIV in rural and urban districts in South Africa

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Background: South Africa implemented the World Health Organization-recommended Targeted Universal Tuberculosis Testing (TUTT) strategy among high-risk groups regardless of symptoms in 2021 – a shift from the former symptom-based testing approach. We assessed the TUTT care cascade to describe its implementation within the continuum of care.
Design/Methods: This retrospective analysis used descriptive statistical methods to analyze routinely collected TB/HIV program data from a cohort of people living with HIV (PWH) in high disease-burden rural and urban settings during fiscal years 2022–2023.
Results: In total, 104,139 and 104,431 PWH presented to care in fiscal year 2022 and fiscal year 2023, respectively. In fiscal year 2022, 99.9% underwent symptom screening, 62.6% had an Xpert MTB/RIF Ultra (Xpert) test, and 4.7% tested positive, of whom 94.6% initiated treatment. In contrast, in fiscal year 2023, Xpert testing coverage declined to 32.3%, yet positivity remained similar at 4.8%, and 95.6% initiated treatment. In the rural district, 43.9% had an Xpert test, and 2.6% tested positive, while in the urban district, 21.0% received an Xpert test, and 9.3% tested positive. Tuberculosis treatment initiation was high in both rural (95.0%) and urban (96.5%) districts.
Conclusions: The halving of Xpert test coverage in fiscal year 2023 indicates inconsistent implementation of the TUTT policy, underscoring the need for improved training, mentorship, and supervision of healthcare workers. Differences between rural and urban districts reflect variations in tuberculosis epidemiology, healthcare infrastructure, and tuberculosis testing practices.

LB03-1221-14 RR-TB treatment and the PrEP continuum of care: Opportunities to better integrate HIV prevention efforts into South Africa's TB services

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Background: Rifampicin-resistant tuberculosis (RR-TB) management requires frequent clinical evaluations over six months of treatment and six months of post-treatment follow-up. For people living with HIV, this period is often associated with efforts to improve viral suppression. However, for HIV-negative people, there is little data on integrating HIV Pre-Exposure Prophylaxis (PrEP) into services for this group.
The aim of this pilot study was to evaluate HIV risk factors and assess awareness of and engagement in HIV prevention among patients being treated for RR-TB.
Design/Methods: Data from the BringBPal2Me (BB2) trial, collected from September 2023 through June 2024. BB2 is a cluster-randomized, non-inferiority trial comparing nurse-led to physician-led outpatient RR-TB treatment. Participants were recruited from 57 clinic clusters in two South African provinces (KwaZulu-Natal and Eastern Cape). Among HIV-negative participants, descriptive statistics assessed patient demographics and PrEP engagement across three domains: (1) identifying HIV risk, (2) increasing PrEP awareness, and (3) facilitating PrEP access.
Results: Among the 251 participants, 110 (43.8%) were HIV-negative at trial enrollment. The majority were male (77, 70.0%), black South African (73, 66.4%), with a mean age of 38 (range 18-77). Analysis of the PrEP continuum for HIV risk included 33 (30.0%) reporting condomless sex in the past three months, and 9 (8.2%) were treated for a sexually transmitted infection during RR-TB care. Only 43 participants (39.1%) were aware of PrEP. PrEP was offered to 29 participants (26.4%), yet only 5 (4.5%) agreed to start PrEP. One participant seroconverted.
Conclusions: While report of condomless sex was low, people with RR-TB are at risk of HIV infection, yet they are not benefiting from PrEP. The frequent visits associated with RR-TB treatment presents an opportunity to engage people with RR-TB in HIV prevention. Further research is required to evaluate effective strategies to integrate PrEP programs into RR-TB services that are feasible and acceptable.

LATE BREAKER PRESENTATIONS FRIDAY 15 NOVEMBER 2024

LB04 The Union-CDC late-breaker session (epidemiology and programmatic)

LB04-1222-15 Pharmacokinetics and safety of bedaquiline in infants, children, and adolescents with rifampicin-resistant TB

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Background: Bedaquiline forms the backbone of current RR/MDR-TB treatment regimens, yet data on optimal and safe dosing has lagged dramatically in children, precluding access to shorter, safer effective regimens.
Design/Methods: P1108 (FDA IND 31,832) is a dose-finding study evaluating the pharmacokinetics, safety and tolerability of bedaquiline over 24-weeks in children 0 <18 years with RR-TB, over 96-120 weeks' follow-up.
Younger children (Cohort 2: ≥2 to <6 years,–Cohort 3: ≥0 to <2 years) were enrolled in parallel after pharmacokinetic and safety targets were met in 12 participants in Cohort 1 (6-<18 years), using model-predicted weight-banded doses, with interim analysis after 6 new participants per cohort completed week-2 intensive pharmacokinetic sampling.
The observed median weekly bedaquiline area-under-the-curve at steady state (wAUCss) within each cohort was estimated and compared with the pre-defined adult target range (50-400 µg*h/mL).
Nonlinear mixed-effects modelling was used to estimate wAUCss based on week-24 clearance and weekly dose. Safety review was in real-time. Data through May 24, 2024, were analyzed.
Results: Of 55 participants enrolled, data were included on 54, ranging from 1 month-17.2 years at enrolment; 24 (44%) were male, 40 (74%) African and 14 (26%) mixed-race. Eight children (5 in Cohort 1) were living with HIV, 5 received lopinavir/ritonavir. Ten children (Cohort 1) were on 400mg daily bedaquiline for 14 days, then 200mg 3x/week for 22-weeks (400/200 mg), 39 (8 in Cohort 1, 18 in Cohort 2, 13 in Cohort 3) on 200/100mg, and 5 (Cohort 3) on 100/50 mg. Retention was 100% at 24-weeks. Pharmacokinetic and safety data are shown in Table 1.

	Cohort 1 (6 -<18 years) (n=18)	Cohort 2 (2 -<6 years) (n=18)	Cohort 3 (0 -<2 years (n=18)	Overall (n=54)
Pharmacokinetics $wAUC_{ss}$ in µg*h/mL (median, Q1-Q3) Target: 50-400 µg*h/mL	132 (108, 217)	199 (180, 225)	312 (220, 376)	205 143, 312)
Safety: n (%) Study drug termination due to a bedaquiline-related adverse event	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grade ≥3 adverse related to bedaquiline	1* (6%)	0 (0%)	0 (0%)	1* (2%)
Absolute QTcF interval ≥500 msec	1* (6%)	0 (0%)	0 (0%)	1 *(2%)

Conclusions: Bedaquiline was safe and well-tolerated in children across all ages at doses evaluated, with exposures (predicted wAUCss) within adult target range. The population pharmacokinetic model developed will be useful to further optimize paediatric bedaquiline dosing strategies and regimens.

LB04-1223-15 Recovery of Pre-XDR M. tuberculosis and M. orygis from slaughtered cattle in Chennai, India

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Background: India has the highest global burden of human tuberculosis (TB) and the largest cattle herd with endemic bovine TB (bTB). Yet, the extent of cross-species transmission and the zoonotic spillover risk, including drug-resistant *Mycobacterium tuberculosis* complex (MTBC) strains circulating in cattle, remains uncharacterized.
This study identified the presence of *Mycobacterium tuberculosis* complex (MTBC) organisms including pre-extensively drug-resistant (Pre-XDR) *M.tuberculosis* strains in slaughtered cattle in Chennai, India.

Design/Methods: Tissue samples (mediastinal and bronchial lymph nodes) from 500 apparently healthy cattle at a slaughterhouse in Chennai were investigated during 2021-2023. Culture and Drug susceptibility testing (DST) was performed with standard first-line drugs. For samples resistant to first-line drugs, DST was also performed for pyrazinamide, levofloxacin, linezolid, clofazimine,bedaquiline,delamanid,and moxifloxacin. Molecular methods (PCR and spoligotyping), and whole genome sequencing (WGS) (Illumina) were used for species identification. WGS results were assessed with Galaxy/vSNP, and phylogenies were constructed with RAxML. RD Analyser and RDScan localized regions of difference (RD) within sequences. Histopathology was carried out with Hematoxylin and Eosin staining.
Results: Seventeen out of 500 (3.4%) cattle were MTBC-positive: fourteen were *Mycobacterium orygis,* one was a mixed infection of *M. tuberculosis* and *M. orygis*, and two were pre-extensively drug-resistant (pre-XDR) *M. tuberculosis* Lineage 2 (Resistant to streptomycin, isoniazid, rifampin , ethambutol , levofloxacin , moxifloxacin, and pyrazinamide) . No *M. bovis* was detected. The H&E staining revealed stage I-IV granulomas. Phylogenetic analyses showed restricted genetic diversity in *M. orygis*, suggesting cattle-to-cattle transmission.

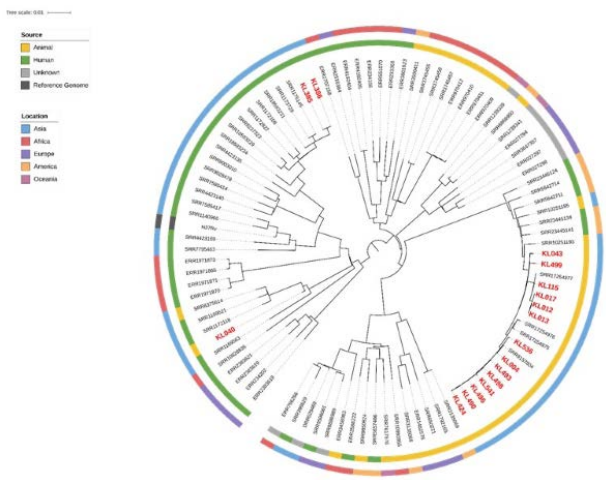

Figure 1. Whole genome sequence-based maximum-likelihood-based phylogeny of representative human-adapted and animal-adapted MTBC lineages showing placement of the MTBC isolates recovered from cattle during slaughter in Chennai, India.

Conclusions: Our findings indicate that bTB in this region is primarily due to *M. orygis* and *M. tuberculosis*, not *M. bovis*. The detection of pre-XDR *M. tuberculosis* in cattle highlights significant public health concerns, since controlling human TB alone may be insufficient without addressing bovine TB, particularly if cattle were a reservoir of drug-resistant TB with spillover potential.

LB04-1224-15 Field-based performance of TB-specific antigen-based skin tests among healthcare workers in Sevagram, India

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Background: In most tuberculosis (TB) high-burden populations, test and treat policies are necessary to rule out potential false-positive results from BCG vaccination and high prevalence of TB infection (TBI), for tuberculosis preventive treatment (TPT). TB-specific antigen-based skin test (Cy-TB, Serum Institute of India) delivers interferon-gamma release assay (IGRA)-like results in a field-friendly format. However, there is limited data on Cy-TB diagnostic performance in India. We sought to compare Cy-TB and IGRA results among a cohort of healthcare workers (HCWs) in Sevagram, India.
Design/Methods: During July 2023–June 2024, we screened HCWs working at Kasturba hospital for TBI and active disease. Briefly, Cy-TB antigen-specific skin test of 0.1 mL dose was administered intradermally by standardized Mantoux technique. All tests were read within 48–72 hours, and indurations of ≥5mm were considered as positive. IGRA tests (QuantiFERON-TB® Gold In-Tube Plus, QIAGEN, Hilden, Germany) were processed as per the manufacture's manual of procedures. We compared Cy-TB diagnostic test performance [*i.e.*, accuracy, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and percent agreement (*Kappa*) with confidence intervals (95%CI)] relative to individually paired IGRA-based results as the gold standard.
Results: In all, 1233 HCW had paired test results; 331 (26.8%) were positive by IGRA, and 293 (23.8%) by Cy-TB. Overall, test accuracy (92.1%; 95%CI: 90.4–93.5%), sensitivity (79.5%; 95%CI: 74.7–83.7%), and specificity (96.7%; 95%CI: 95.3–97.7%) were high. NPV (92.8%; 95%CI: 91.2–94.1%) and PPV (89.8%; 95%CI: 86.0–92.6%), and percent agreement (*Kappa*: 0.79; 95CI%: 0.75, 0.83) demonstrated comparable test performance of antigen-based skin tests relative to more complex and expensive laboratory-based IGRA tests *(Table)*.
Conclusions: Cy-TB performed well relative to IGRA under field-based conditions and amongst at-risk HCWs. The field-friendly format and ease of use may improve test and treat initiatives and might expand TPT coverage for HCW and other high-risk populations in India.

IGRA				
Cy-TB		Positive	Negative	Total
	Positive	263	30	293
	Negative	68	872	940
	Total	**331**	**902**	**1233**

	%	95%CL
Prevalence	26.8	24.4-29.4
Sensitivity (true positive)	79.5	74.7-83.7
Specificity (true negative)	96.7	95.3-97.7
Positive Likelihood Ratio	23.9	16.7-34.1
Negative Likelihood Ratio	0.21	0.17-0.26
Positive Predictive Value	89.8	86.0-92.6
Negative Predictive Value	92.8	91.2-94.1
Accuracy	92.1	90.4-93.5
Kappa	0.79	0.75-0.83

Table. Individually paired test comparison of antigen-specific skin test (Cy-TB) and interferon-gamma release assay (QFT Gold In-tube Plus) among healthcare workers - Sevagram, India.

LB04-1225-15 Detection of lipoarabinomannan (LAM) from serum in people with and without HIV with active TB disease

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Background: The World Health Organisation (WHO) has highlighted the need for biomarker-based diagnostic tests for TB disease. Existing point-of-care assays detect lipoarabinomannan (LAM) in the urine of people living with advanced HIV, however accuracy is variable in all cohorts and low in people without HIV. This study aimed to evaluate a novel diagnostic test for the detection of LAM from serum in patients with active TB disease.
Design/Methods: We evaluated a novel diagnostic test for the detection of LAM from serum of people living with HIV and people without HIV who had TB-related symptoms and were being evaluated for TB disease. Thirty serum samples from individuals with active TB disease (positive Xpert® TB/RIF Ultra or *Mtb* culture) from South Africa, and 29 serum samples from individuals without TB were tested from the United Kingdom and South Africa. HIV status was recorded for all participants and DETERMINE™ TB LAM Ag LFT was performed in South African cohorts.
Results: The sensitivity and specificity of detecting serum LAM using our test was 96.6% (95% confidence interval [CI] 82.8%-99.8%) and 96.7% (95% CI 83.3%-99.8%) respectively. Serum LAM was detected above the cut-off of 41 pg/mL LAM (defined by ROC curve analysis) in all HIV negative TB-positive participants. Serum LAM was also detected in all TB-positive urine LAM positive participants, and in 17 out of 18 TB-positive urine LAM negative participants. The AUC for the serum LAM assay was 0.9885.

Cohort	Number	Tuberculosis status	HIV Status	LAM detected in serum (%)
All UK TB negative	26	Negative	Negative	0 (0.0%)
All South Africa TB negative	9	Negative	Positive	1 (11.1%)
All South Africa TB positive	29	Active disease	Positive/ negative	28 (96.6%)
South Africa TB positive living with HIV	23	Active disease	Positive	22 (95.7%)
South Africa TB positive without HIV	6	Active disease	Negative	6 (100.0%)
South Africa TB positive, urine LAM negative	12	Active disease	Positive	11 (91.7%)
	6	Active disease	Negative	6 (100%)
South Africa TB positive, urine LAM positive	11	Active disease	Positive	11 (100.0%)

Table 1: Detection of serum LAM above cut-off value.

Conclusions: In this pilot evaluation study, LAM can be detected in serum in both HIV negative and positive people with TB disease. The novel serum LAM assay was highly accurate in this small cohort, exceeded the WHO target product profile (TTP) criteria for a biomarker-based test, and may provide an attractive target for novel non-sputum-based diagnostics for active TB disease.

LB04-1226-15 Optimising TB case finding and preventive therapy among close contacts in Indonesia

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Background: Close contacts (CC) of tuberculosis (TB) patients, particularly those living in the same household (HHC), are at higher risk for TB infection and disease. This initiative aims to increased TB case finding and to improve the coverage of TPT among contacts.
Design/Methods: Systematic active TB case finding (ACF) among HHC and CC were conducted from November 2023 to June 2024 in 25 districts/municipalities in 8 provinces of Indonesia. Contacts were screened for TB symptoms; those with symptoms underwent Xpert-MTB/RIF testing, followed by clinical examination by a physician and chest x-ray (CXR) if the Xpert test were negative. Individuals without symptoms were referred for CXR and subsequently for Xpert-MTB/RIF testing if the CXR suggested TB. Non-presumptive TB individuals eligible for TPT were offered a TST, followed by TPT if TST positive.

Results: A total of 184,771 individuals were screened, with 177,219 (95,9%) asymptomatic and 7552 (4,1%) symptomatic. Among the symptomatic group, 5627 (74.5%) were tested using Xpert-MTB/RIF with 484 (8.6%) testing positive. Additionally, 370 (4.9%) underwent CXR testing with 280 (75.7%) being clinically diagnosed as TB. Among the asymptomatic group, 170,787 (96.4%) underwent CXR testing, with 17,152 (10.0%) suggestive of TB. Xpert tests were performed on 14,030 (81.8%) with 1512 (10.8%) testing positive. Additionally, 4025 (23.4%) were clinically diagnosed as TB.
TST were performed on 24,055 asymptomatic individuals with 7241 (30,1%) testing positive and 4834 (66.7%) receiving TPT. Among symptomatic individuals, 399 received TST, with 255 (63.9%) testing positive and 122 (47.8%) receiving TPT. The yield of bacteriologically-confirmed TB among symptomatic contacts was 8.6% and 10.1% among asymptomatic contacts but CXR suggestive TB.
Conclusions: Combining CXR and Xpert MTB/RIF tests proved effective in diagnosing TB. While TPT coverage was relatively high among asymptomatic individuals, there is room for improvement to ensure higher coverage and prevent the progression of TB infection to active disease.

LB04-1227-15 A cartridge-based assay for improved detection of multi-drug-resistant M. tuberculosis directly from sputum

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Background: Multi-drug resistant (MDR) tuberculosis (TB) is a global health threat complicated by increasing rifampin-resistance due to *rpoB* Ile491Phe (I491F) mutations, which are difficult to detect by phenotypic susceptibility testing and not included in current molecular resistance tests. We have developed a prototype cartridge-based assay (MDRmDx) suitable for near-patient diagnosis from sputum using the GeneXpert instrument. MDRmDx detects *Mycobacterium tuberculosis* (MTB), rifampin-resistance due to mutations in the *rpoB* core region and *rpoB* I491F, and isoniazid resistance due to mutations in *katG*, *fabG1* and the *inhA* promoter.
Design/Methods: MTB strain H37Rv-mc²6230 (H37Rv), clinical MTB strains, *M. bovis* BCG, and non-tuberculous mycobacteria (NTMs) were tested to evaluate the limit of detection (LOD), inclusivity and exclusivity respectively, of MDRmDx compared to the MTB/RIF Ultra (Ultra) assay (Cepheid Sunnyvale, CA). A comprehensive mutant DNA panel was tested to detect rifampicin and isoniazid resistant MTB.
Results: The LOD for detecting H37Rv in sputum was 22.1 CFU/ml (95% confidence interval [CI], 17-34.5) versus 18.9 CFU/ml (95% CI, 15.1-27.3) for MDRmDx versus Ultra, respectively. The LOD for detecting BCG in sputum was 54.8 CFU/ml (95% CI, 43.3-80.5) versus 72.9 CFU/ml (95% CI, 58.6-101.6) for MDRmDx versus Ultra, respectively demonstrating comparable performance. The LOD for rifampin-susceptibility detection was 109.9 CFU/ml (95% CI, 85.1-160.8) versus 102.1 CFU/ml (95% CI, 76.3-161.9) for MDRmDx versus ULTRA, respectively. The isoniazid-susceptibility detection LOD was 89.6 CFU/ml (95% CI, 68.8-133.9).
The MDRmDx assay identified all *rpoB* mutations tested including D435G and Q432L mutations which were missed by Ultra, and it also detected I491F mutants. MDRmDx was 100% specific against NTM strains and detected all lineages of MTB.
Conclusions: MDRmDx aims to be the first near-patient test to include TB diagnosis, rifampin (including I491F mutation) and isoniazid resistance detection that can potentially improve rapid MDR TB diagnosis and treatment when used in appropriate settings.

LB04-1228-15 Drug resistance profiles of M. tuberculosis using targeted next-generation sequencing: A preliminary study from Indonesia

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Background: The emergence of drug-resistant tuberculosis (DRTB) poses a threat to global TB control, including in Indonesia, with only a 56% treatment success rate in 2023. One essential component of DRTB care is drug susceptibility testing (DST). Recently, the WHO recommended using targeted next-generation sequencing (tNGS) for DRTB detection. Therefore, we aimed to assess and characterize drug resistance profiles among newly diagnosed DRTB patients using tNGS in West Java, Indonesia.

Design/Methods: From January to June 2024, 52 sputum samples from rifampicin-resistant tuberculosis (RR-TB) cases were collected for tNGS using the Deeplex Myc-TB™. The diagnostic accuracy of tNGS was compared to phenotypic DST and Xpert MTB/XDR results.
Results: A total of 42 samples were successfully sequenced using tNGS. Spoligotyping showed that the majority of the samples are of the Beijing strain (57.1%), followed by H (9.5%), EAI (4.8%), LAM (2.4%), and T (2.4%) genotype. Resistance to rifampicin and isoniazid was detected in 97.6% and 54.8% of the samples respectively. Additionally, 38.1% were multi-drug resistant (MDR), 11.9% were pre-extensively drug-resistant (pre-XDR), and 2.4% were extensively drug-resistant (XDR) TB.
The concordance of tNGS results to standard tests is relatively high (85.7-100%). Furthermore, the sensitivities of tNGS, against pDST and Xpert MTB/XDR, for most drugs are 80.0% and above, except for pyrazinamide (69.2%), while the specificities are relatively higher (91.7%-100%). However, the agreement between tNGS and standard tests varied slightly to moderately.

	pDST				Xpert MTB/XDR			
Drug	Concordance, %	Sensitivity, %	Specificity, %	Kappa	Concordance, %	Sensitivity, %	Specificity, %	Kappa
Isoniazid	91.2	87.0	100	0.533	88.6	87.0	91.7	0.527
Pyrazinamide	85.7	69.2	95.5	0.499	-	-	-	-
Fluoroquinolone	94.4	80.0	96.8	0.448	97.3	100	96.9	0.562
Linezolid	100	NA	100	0.097	-	-	-	-
Bedaquiline	100	NA	100	0.203	-	-	-	-
Clofazimine	100	NA	100	0.203	-	-	-	-
Ethionamide	-	-	-	-	96.6	100	96.4	0.363

Table. Performance of tNGS compared to pDST and Xpert MTB/XDR.

Conclusions: Early findings of our study suggest that tNGS has comparable accuracy to current standard drug susceptibility tests, with shorter turnaround time and broader drug resistance coverage. This demonstrates the potential use of tNGS as a routine drug susceptibility testing method for DRTB.

LB04-1229-15 Expanding Xpert MTB/RIF Ultra® for TB diagnosis among HIV-positive adults admitted to hospitals in Tanzania and Mozambique: A randomised controlled trial (the EXULTANT trial)

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Background: Tuberculosis (TB) is the main cause of death among hospitalized people living with HIV (PLHIV). Non-sputum-based diagnostics may improve patient-important outcomes. The EXULTANT trial aims to evaluate an expanded TB screening strategy among PLHIV in two high TB and HIV burden African countries.
Design/Methods: This pragmatic, individually-randomized controlled trial was conducted across eleven hospitals in Tanzania and Mozambique. We included consecutive adult PLHIV (>18 years), admitted within the previous 24 hours without an existing TB diagnosis or recent TB treatment. The intervention arm underwent Xpert Ultra® testing from sputum, stool, and urine, plus urine TB-LAM testing, irrespective of symptoms. The control arm included sputum Xpert Ultra if TB symptoms were present, and TB-LAM as per WHO recommendations. The primary endpoint was the proportion of participants with microbiologically-confirmed TB starting treatment within 3 days. Secondary endpoints included 8-week all-cause mortality and time to TB diagnosis.
Results: From Sep-2022 to Feb-2024 we screened 1489 participants, with 1170 (78.6%) randomised to the intervention (n=582) and control arms (n=590). At admission, 715 (61.0%) were female, 845 (75.4%) were on ART (median CD4 count of 232 cells/mL). In the control group 505 (85.6%) had TB-compatible symptoms and were eligible for Xpert Ultra testing and 538 (91.2%) met WHO criteria for TB-LAM testing. In the intention-to-treat analysis, 15.8% (95% CI:12.9-19.0) of the intervention group and 15.3% (95%CI: 12.4-18.4) of the control group were microbiologically-confirmed and started TB treatment within 72 hours (p-value: 0.86). Eight-week all-cause mortality was 25.8% in the intervention group and 28.8% in the control group (p-value: 0.270). Time to TB treatment initiation had a median of 0.92 days and 0.98 days in the intervention and control group respectively (p-value: 0.38).
Conclusions: An expanded screening strategy among admitted PLHIV did not increase the proportion of microbiologically-confirmed TB patients starting treatment or reduced 8-week mortality.

TBSCIENCE 2024 ORAL ABSTRACTS

TBS1B Implications of pathogen heterogeneity for intervention - Oral Abstracts

TBS1B-10 Novel approaches leveraging on genome mining of identical multi-repeat sequences for developing a highly sensitive molecular assay for the diagnosis of TB

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Introduction: Globally in 2022, approximately 1.3 million deaths occurred among HIV-negative people as a result of Tuberculosis (TB) infection. The COVID-19 pandemic has reversed years of progress in reducing TB cases. To manage TB, rapid, affordable and accurate diagnostic approaches are required. Nucleic acid amplification tests such as PCR offer high specificity and sensitivity for smear-positive TB but poorer sensitivity and specificity for smear-negative TB. These assays require specialized laboratory capacity and expertise. While being open systems, they are also at risk of contamination particularly in set-ups with sub-optimal laboratory infrastructure. Therefore, uptake of these assays in high-burden settings with resource scarcity is limited.
Methods: We used genome-mining approaches to identify identical multi repeat sequences (IMRS) distributed throughout the *Mycobacterium tuberculosis* (MTB) genome to design a primer pair that target 32 repeat sequences. Genomic H37Rv DNA was 10-fold serially diluted (100pg/µl to 1×10^{-3} pg/µl) and used as DNA template for PCR reactions using the MTB IMRS primers. The gold standard PCR with 16S rRNA primers was also run as a comparative test, and both assay products were resolved on agarose gel. Further, we cultured 20 sputum samples on Mycobacteria Growth Indicator Tubes (MGIT) and incubation was done in a BACTEC MGIT 960 instrument. Extracted DNA from instrument positive cultures was used as template for the MTB–IMRS and the gold standard 16S rRNA PCR assays, thereafter, amplicons were resolved on 2% gel.
Results: The MTB IMRS-PCR assay had an analytical sensitivity of 0.1259 pg/µl (2.6×10^{1} genome copies per µl), representing >200 times better sensitivity. We further showed that MTB-IMRS PCR is both sensitive for detecting MTB cultured isolates.
Conclusion: *De novo* genome mining of MTB IMRS as amplification primers can serve as a platform for developing ultrasensitive diagnostics for TB and potentially a wide range of infectious pathogens.

TBS1B-15 Spatial detection of M. tuberculosis mRNA and secreted antigens in Ziehl-Neelsen negative human tissues using RNAscope and immunohistochemistry

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Background: Detecting Mycobacterium tuberculosis (*Mtb)* in human tissues is essential for understanding its physiology and spatial distribution within TB lesions. The Ziehl-Neelsen (ZN) staining method, commonly used to identify *Mtb* acid-fast bacilli (AFB), often fails due to variability in staining, limiting research and diagnostic capabilities.
This study aims to overcome these limitations by detecting *Mtb* mRNA and secreted antigens in human tuberculous tissues.
Methods: We employed novel RNAscope, an RNA in situ hybridisation technique, to detect Mtb mRNA in antemortem and postmortem human TB tissues. Additionally, a dual ZN/immunohistochemistry (IHC) staining approach was developed to identify AFB and bacilli producing antigen 85B (Ag85B).
Findings: The study revealed *Mtb* mRNA within intact and disintegrating bacilli, as well as extrabacillary mRNA, distributed zonally within necrotic and non-necrotic granulomas. *Mtb* mRNA was found in ZN-negative lung tissue and Ag85B-positive bronchial epithelium, including the cytoplasm of host cells.
Interestingly, many AFB did not stain for Ag85B. Furthermore, *Mtb* mRNA was detected in ZN-negative antemortem lymph node biopsies.
Interpretation: The RNAscope and dual ZN/IHC staining methods are effective in identifying intact *Mtb* and bacillary remnants in human tissues. These techniques can detect *Mtb* mRNA in ZN-negative tissues, offering potential diagnostic utility in complex TB cases.
Funding: This research was supported by the Wellcome Leap Delta Tissue Program, the Wellcome Strategic Core Award, the National Institutes of Health (NIH, USA), the Mary Heersink Institute for Global Health at UAB, and the UAB Heersink School of Medicine.

TBS1B-20 Differential rates of M. tuberculosis transmission associate with host-pathogen sympatry

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Several human-adapted *Mycobacterium tuberculosis* complex (Mtbc) lineages exhibit a restricted geographical distribution globally. These lineages are hypothesised to transmit more effectively among sympatric hosts, i.e., those that share the same geographical area, though this is yet to be confirmed while controlling for exposure, social networks, and disease risk after exposure.
Using pathogen genomic and contact tracing data from 2,279 tuberculosis cases linked to 12,749 contacts from three low incidence cities, we show that geographically restricted Mtbc lineages were less transmissible than lineages that demonstrate a widespread global distribution.
Allopatric host-pathogen exposure, where the restricted pathogen and host are from non-overlapping areas, had a 38% decrease in the odds of infection among contacts compared to sympatric exposures. We measure 10-fold lower uptake of geographically restricted Lineage 6 strains compared to widespread Lineage 4 strains in allopatric macrophage infections.
We conclude that Mtbc strain-human long-term co-existence has resulted in differential transmissibility of Mtbc lineages and that this differs by human population.
**Dr. Gröschel and Dr. Pérez-Llanos are co-first authors and contributed equally.*

TBS1B-25 Dissecting the dominance of M. tuberculosis lineage 2: Phylogenomics, mutation rates, association studies and the rise of multi-drug resistance

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Mycobacterium tuberculosis (Mtb) lineage 2 is a highly disseminated global lineage that is worryingly associated with the increase in multidrug-resistant tuberculosis (MDR-TB) in Eurasia. Despite its widespread presence and impact on public health, a comprehensive understanding of the factors driving the success of lineage 2 remains elusive.
This study highlights the importance of an integrative approach combining evolutionary analyses and research into underlying mechanisms to elucidate the drivers of lineage 2 dominance.
With this methodology, we aim to shed light on this critical public health challenge and inform more effective strategies for tuberculosis control. We will also see how major socio-economic events reinforce ongoing epidemics. In the second part, which focuses on the underlying mechanisms, we will summarize how predictive simulations, epidemicity indices, genome-wide association studies and, finally, laboratory fluctuation assays have enabled us to make progress on this subject.
For example, we were able to show that the collapse of the Soviet Union and, later, the Russian economic crisis were the main drivers of epidemics rebounds. L2 strains showed a significant ($P < 0.01$) pattern of accelerating mutation rate along the branches of the tree, on a scale of only 30 years.
Furthermore, fluctuation assays showed that modern Central Asian lineage 2 strains acquire rifampicin resistance about twice as fast as ancestral L2 or Lineage 4 strains. The same applies to bedaquiline, for which basal Beijing strains outperform L4 strains. The fact that L2-derived strains have significantly higher mutation rates than other lineages is likely to enhance their adaptive landscape, as well as their propensity to acquire resistance/compensatory mutations.
Finally, using state of the art statistical models to detect selection signatures, we also studied the genetic mutations leading to resistance, tolerance and persistence.

TBS2B Fundamental advances in understanding pathogenesis - Oral Abstracts

TBS2B-10 Evaluation of tongue swab and sputum-dipped swab molecular testing for TB on the novel Pluslife platform

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Background: Accessible point-of-care (POC) testing methods are needed to aid TB case finding. Swabs are emerging as promising, easy-to-use sampling tools. The Pluslife platform includes a swab preparation device and a *Mycobacterium tuberculosis* complex (MTBC) test card that provides results within 30 minutes.

We assessed whether Pluslife's MTBC assay meets the draft WHO target product profile (TPP) accuracy thresholds for a near POC, non-sputum diagnostic (≥75% sensitivity and ≥98% specificity).

Methods: Between April-May 2024, we enrolled people ≥12 years with presumed TB at health centers in Kampala, Uganda. Two tongue dorsum swabs and sputum samples were obtained from each participant. Swabs were processed with Pluslife's sample prep device or a Biospec bead-beater, and tested using Pluslife's MTBC test card. A third swab was dipped into sputum, swirled 10 times, and processed for Pluslife testing. Diagnostic accuracy of swab-based testing was assessed against sputum Xpert Ultra.

Results: Of 58 participants enrolled to date, we excluded one with a trace result on sputum Xpert. Median age was 32.5 (IQR 23-41), 34 (59.7%) were male, 17 (29.8%) were living with HIV, 20 (35.1%) had diabetes, 6 (10.5%) had prior TB, and 13 (22.8%) had a positive sputum Xpert result. Both tongue swabs, processed with Pluslife device or Biospec bead-beating, demonstrated sensitivity of 92.3% [95% CI 64.0-99.8] and specificity of 100% [95% CI 92.0-100]. Sputum-dipped swabs achieved sensitivity of 100% [95% CI 75.3–100] and specificity of 95.5% [95% CI 84.5 - 99.4].

Conclusion: Our preliminary findings indicate that tongue swabs and sputum-dipped swabs tested on Pluslife's platform are likely to exceed the draft WHO TPP accuracy thresholds for a near POC, non-sputum TB diagnostic.

Further analysis with increased sample size and culture results is forthcoming. Future studies should explore Pluslife's performance in different populations and community screening settings.

	Measure	n/N	Value	95% CI
Tongue swab processed with Pluslife sample prep device and MTBC test card.	Sensitivity	12/13	92.3%	(64.0%, 99.8%)
	Specificity	44/44	100%	(92.0%, 100%)
Tongue swab processed with Biospec bead-beating and Pluslife MTBC test card.	Sensitivity	12/13	92.3%	(64.0%, 99.8%)
	Specificity	44/44	100%	(92.0%, 100%)
Sputum-dipped swab processed with Pluslife sample prep device and MTBC test card.	Sensitivity	13/13	100%	(75.3%, 100%)
	Specificity	42/44	95.5%	(84.5%, 99.4%)

Table1. Tuberculosis diagnostic accuracy for three swabs tested with Pluslife.

TBS2B-15 A controlled human infection/antigenic challenge model using pulmonary delivery of live BCG and PPD to gain insights into TB immunopathogenesis

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Background: Controlled human infection models (CHIMs) have facilitated vaccine development for several diseases but safety issues have precluded its use in TB. We have previously established the safety and feasibility of a mycobacterial CHIM, using pulmonary administration of BCG and PPD, in a high burden setting. We have now leveraged this model to investigate early events of TB immunopathogenesis in the lung.

Methods:BCG (10^4 colony-forming-units) and PPD (0.5 tuberculin-units) were bronchoscopically administered to healthy participants (n=74) with different TB susceptibility profiles ("protected": close contacts of index cases who did not develop TB; "susceptibles": persons ≥1 previous TB episode). Bronchoalveolar lavage (BAL) and blood were collected pre- and 3-days post-administration. Flow cytometry-based cellular immunophenotyping, RNAseq-based transcriptomic analysis, mass spectrometry-based proteomic profiling and microarray-based BAL antibody characterization were performed.

Results:Lung-administered BCG induced several innate (neutrophil, natural killer (NK) cells, complement) and adaptive (CD4 T-helper-1/17, tissue resident T-cells, γδ, B-cell, immunoglobulins) immune pathways. Mechanisms previously found to be associated with TB susceptibility (Type-1 interferons, matrix metalloproteases, vasular-endothelial-growth-factor, transforming-growth-factor-β) were highly upregulated in „susceptibles" whereas neuro-immune pathways were upregulated in the „protected" group.

Group-specific differences in IgG and IgA response magnitude and antigen specificity were also observed. Responses to PPD were similar to BCG but more robust, likely due to differences in antigen processing (protein vs. whole bacteria). Certain BCG-induced pathways (γδ-, B- and NK cell-mediated pathways, MHC I & II presentation) were upregulated in lungs but concomitantly reduced in blood indicating inter-compartment migration of specific cell populations.

Conclusion: These data indicate complex, compartment-specific host-pathogen interactions involving multiple immune mechanisms, with distinct differences observed between groups with varying TB susceptibility profiles.

This model can provide a better understanding of host immunity to mycobacterial infection at the site of disease and identify immune correlates of protection for evaluating vaccine candidates and host-directed therapies.

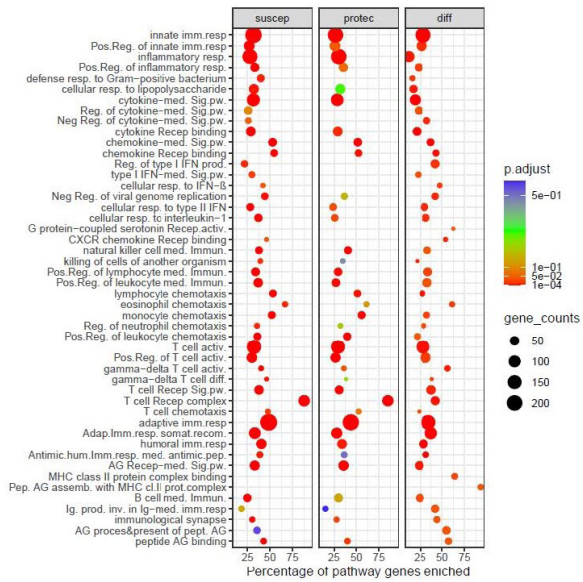

Figure: Preliminary transcriptomic analysis of bronchoalveolar lavage (BAL) cells in the different susceptibility groups following pulmonary BCG administration. A gene set enrichment analysis showing specific immune pathways that are up/downregulated in the protective and susceptible groups and the di erence between the two groups (susceptible vs protective). Responses are normalised to the pre-challenge BAL. A p-value of <0.05 is considered significant.

TBS2B-20 A 4-metabolite signature to diagnose pulmonary TB in adults and monitor treatment response

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Background: High-resolution metabolomics (HRM) has shown promise for identifying blood-based biomarkers of tuberculosis (TB) disease. In a multi-cohort study of adults with TB disease, we sought to develop a metabolic signature to diagnose TB disease and monitor response to treatment.

Methods: We performed plasma HRM in HIV-negative participants with microbiologically confirmed pulmonary TB in Addis Ababa, Ethiopia (n=82). Metabolite concentrations were compared to TB household contacts (HHCs) with a positive TB symptom screen, but negative evaluation for TB disease (n=104 total of whom 82 were QuantiFERON positive).

All participants with drug-susceptible (DS)-TB were successfully treated, and plasma samples were analyzed at TB diagnosis and 2, 6, and 12 months after treatment initiation. Metabolic signatures were validated in independent cohorts with DS-TB from the country of Georgia (n=89) and multidrug resistant (MDR)-TB from South Africa (n=85). Classification accuracy was assessed by calculating the area under the receiver operator characteristic curves (AUC) using logistic regression.

Results: Among the metabolites that most significantly differed in concentration between groups, we found tryptophan (trp) and retinol were significantly decreased among persons with TB disease while kynurenine (kyn) and glycocholate were significantly increased (q<0.0001 for all). The plasma kyn/trp ratio had excellent classification for TB disease (AUC=0.92), which improved by adding retinol alone (AUC=0.96) and in combination with glycocholate (AUC=0.97; *Figure 1*).

The 4-metabolite signature also had excellent performance among South Africans with MDR-TB living with HIV (AUC=0.97) and without HIV (AUC=0.96) as well as HIV-negative Georgians with DS-TB (AUC=0.95). Glycocholate and the kyn/trp ratio significantly decreased in the Ethiopia cohort with TB treatment while retinol significantly increased to similar concentrations as HHCs (baseline vs 6 months, p<0.0001 for all).

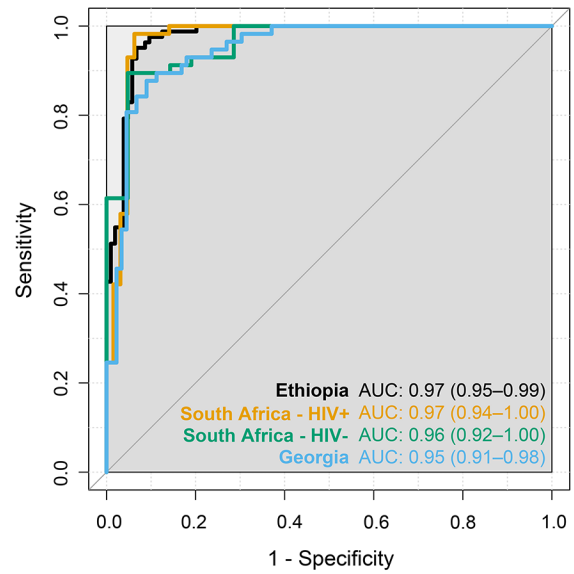

Figure 1.

Conclusions: These findings support using the plasma kyn/trp ratio, retinol, and glycocholate as a biomarker signature of TB disease and response to anti-TB treatment.

TBS2B-25 Platelets drive neutrophil-mediated neuroinflammation in TB meningitis

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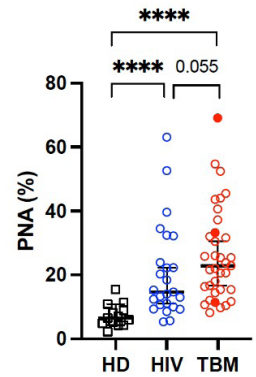
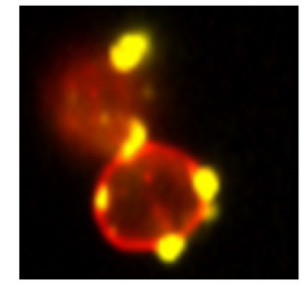
Introduction: Neutrophils drive inflammation and poor outcome in TB meningitis (TBM) yet mechanisms are poorly understood. Platelets are critical components of the immune response that link haemostatic and inflammatory pathways through aggregating with immune cells, such as neutrophils. In TBM, neutrophils infiltrate the central nervous system where they interact with astrocytes, key regulators of brain inflammation.
We characterised platelet-neutrophil aggregation in TBM patients and defined platelet-dependent effects on neutrophil immune responses to *M.tuberculosis (M.tb)*. In addition, we investigated how neutrophil-platelet interplay drives astrocyte immune activation in the context of *M.tb* infection.
Methods: Clinical samples were collected from TBM patients enrolled into a phase III clinical trial
and from people living with HIV (PWH) and healthy donors (HD) in South Africa. PNA (%) were quantified by flow cytometry and visualised using Imaging flow cytometry. Secreted mediators in plasma were quantified using Luminex bead array. Cellular co-culture using *M.tb*-infected neutrophils +/- platelets was utilised to explore platelet-dependent effects on neutrophil and astrocyte immune responses.
Results: PNA were significantly elevated in TBM patients vs. PWH and HD and were characterised by activated P-Selectin+ platelets. Neutrophil-derived MMP-8, a collagenase associated with matrix destruction in TB, and IL-8, a chemoattractant for neutrophils, were elevated in TBM vs PWH and associated with death. Plasma MMP-8 and IL-8 positively correlated with circulating PNA.
M.tb-infection of neutrophils in co-culture with autologous platelets significantly increased IL-8 secretion compared to *M.tb* infection of neutrophils alone which functionally resulted in increased neutrophil chemotaxis. Blocking PSGL-1, the ligand for platelet P-Selectin, significantly reduced neutrophil IL-8 secretion.
Conditioned media from *M.tb*-infected neutrophils in co-culture with platelets resulted in significantly increased astrocyte secretion of IL-8 and induced an A1 neurotoxic phenotype.





Conclusion: Platelets circulate in complexes with neutrophils in TBM, influencing neutrophil immune responses and astrocyte phenotype, suggesting a role in TBM immunopathology.

TBS3B Mechanisms underlying heterogeneous disease manifestations - Oral Abstracts

TBS3B-10 The development and multi-country evaluation of a vibroacoustic signature to classify TB severity

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Background: Individuals with less severe TB may be eligible for novel shorter treatment regimens, but classification of easier- vs. harder-to-treat phenotypes is dependent on chest X-ray (CXR). This impedes implementation in community-based settings and therefore support for trials of stratified treatment approaches.
We evaluated the accuracy of a vibroacoustic signature to classify TB severity that utilizes a point-of-care (POC) electronic stethoscope.

Methods: Between March 2022-October 2023, we consecutively enrolled people ≥12 years with presumptive TB at health centers in Uganda, South Africa, India, Vietnam, and the Philippines. All participants underwent CXR, which was read by an independent radiologist to identify key features of TB severity. The imPulse UNA electronic stethoscope was used to collect three minutes of audible sounds and vibrations at six chest sites (30 seconds per site). We trained a machine learning model to use vibroacoustic data to predict severe disease, defined as lesion(s) involving ≥50% of the thoracic cavity on CXR. A separate test dataset of participants with TB was used to assess the accuracy of the model.
Results: We collected vibroacoustic data for 1,346 participants, with median age 39 (IQR 29-52), 45% female, and 12% living with HIV. The vibroacoustic model achieved an area under the receiver operating characteristic curve of 0.856 (95% CI 0.769-0.934) in the test dataset, with a sensitivity of 84.0% (95% CI 68.0%-96.0%) and specificity of 83.5% (95% CI 75.3%-91.6%). Figure 1 shows visible differences in the vibroacoustic data depending on TB disease severity.

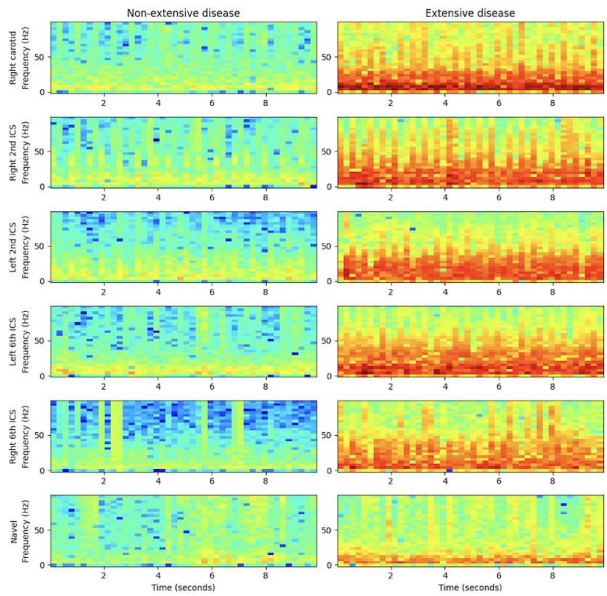

Figure 1. Spectrograms (frequency content vs. time) of the vibroacoustic data from a patient with mild disease (left) and a patient with severe disease (right). There was a large amount of signal power in the infrasonic frequency range (approximately <20 Hz). Each row indicates a different auscultation point. ICS=intercostal space.

Conclusion: A vibroacoustic signature that utilizes a POC electronic stethoscope shows strong potential to replace CXR in current TB treatment stratification algorithms. With further optimization, this could provide a simple tool to support TB drug development clinical trials and implementation of shorter TB regimens.

TBS3B-15 Characterising the spectrum of TB: A multi-state model analysis of a cohort of household contacts

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Background: The conceptualisation of tuberculosis (TB) has undergone a paradigm shift from a binary state to a spectrum of disease. Analytical approaches such as multi-state modelling may offer value in quantifying the progression and regression across the continuum.
Methods: ERASE-TB is a prospective longitudinal cohort study in southern Africa (Zimbabwe, Tanzania, and Mozambique) aiming to evaluate diagnostics for the early TB states. Recruited household contacts are followed up 6-monthly for 18- 24 months with comprehensive TB investigations at each visit. A Markov multi-state model was applied based on the ICE-TB framework with one initial state (*Mtb* elimination), two intermediate states (Mtb infection, non-infectious disease [subclinical and clinical]), and one absorbing state (infectious disease [subclinical and clinical]) (Figure 1). Transition probabilities were predicted.

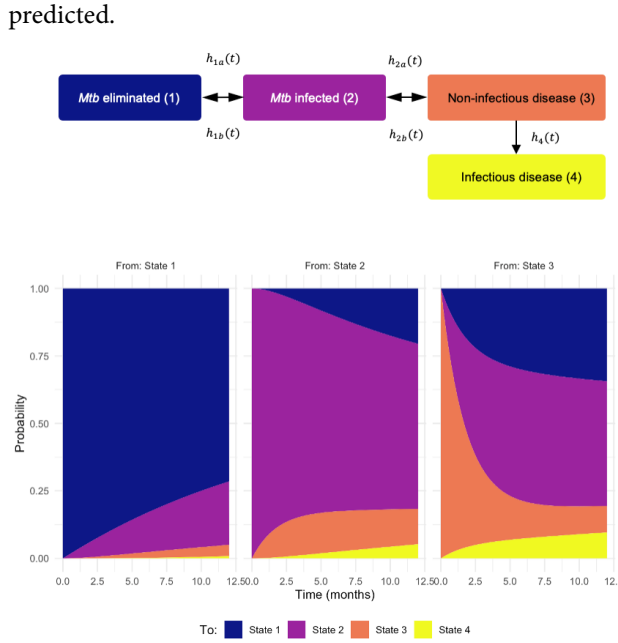

Figure 1: Conceptual multi-state model for the progression pathways along the spectrum of TB based on the ICE-TB framework and predicted transition probabilities over 12 months.

Results: Of the 2,109 recruited HHCs, 1,846 (87.5%) were included in this study (at least two time points with defined state classification and not diagnosed with coprevalent TB). At enrolment, the majority did not have *Mtb* infection (990 [53.6%]), with 632 (34.2%) having Mtb infection, and 224 (12.1%) having non-infectious disease. The transition probability after one year from *Mtb* elimination to infection was 17.1%, from *Mtb* infection back to elimination 16.9%, from *Mtb* infection to non-infectious disease 9.3%, from non-infectious disease back to *Mtb* infection 42.8% and from non-infectious to infectious disease was 5.5% (Figure 1).
Conclusion: Despite having to make simplifying assumptions due the limited sample size of each state in the spectrum of TB, a multi-state approach proves useful in understanding progression and regression pathways. Application of this method to other observational cohort studies, especially individual person datasets, can provide valuable information in the absence of natural history studies.

TBS3B-20 Insights into post-TB lung disease severity from immune characterisation, PET-CT imaging, and lung function testing

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Background: Post TB lung disease is one of the many potential lifelong effects for the estimated 155 million survivors of tuberculosis (TB), with residual lung function abnormality, and chronic lung lesions with ongoing inflammation in the majority. Little is known about the underlying mechanisms driving this multi-factorial and heterogenous disease, with no established standard-of-care interventions.
Design/methods: In the Post Function study, we performed extensive clinical phenotyping through quantification of fluorine-18 fluorodeoxyglucose (FDG) positron emission tomography (PET)-computed tomography (CT) scans, pulmonary function testing, and symptom and quality of life questionnaires, of adults who completed TB treatment within 6 months prior. We then characterised their immunologic characteristics on blood and bronchoalveolar lavage fluid (BAL) with a multiplex bead-based immunoassay and flow cytometry.
Results: We recruited 48 participants, and found that the number of lobes with any residual lesions on CT significantly correlated ($P<0.001$) with 1) decreased total lung capacity and functional vital capacity (FVC), 2) decreased forced expiratory volume in the first second (FEV1), and 3) increased residual volume. Inflammatory markers on PET were also associated with proteins markers in serum that implicate Type 1 (IFN-γ, TNFa, Il-12), Type 2 (Il-4, Il-33), ongoing remodelling of lung tissue (MMPs), airways and vasculature (VEGF), as well as subsets of CD8 and CD4 T-cells in keeping with ongoing pro-inflammatory and antigen-specific stimulation. Subjective symptom scores and effort tolerance test scores correlated with inflammatory PET markers, but not with pulmonary function tests and CT characteristics, indicating that Post TB Lung Disease is often subclinical.
Conclusion: We found that markers of various disease processes were correlated to the extent of lung involvement, rather than separate disease entities, and that dysregulation and chronic stimulation of inflammatory cells persist which will likely be detrimental to repair processes and decrease effective immunity.

TBS3B-25 Single gene transcripts for asymptomatic TB: An individual participant data meta-analysis

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Background: Translation of blood RNA signatures for subclinical TB may be accelerated by identifying more parsimonious biomarkers. We tested the hypothesis that single-gene transcripts provide comparable accuracy to multi-gene signatures and benchmarked their clinical utility to interferon-γ release assays (IGRAs).
Methods: We identified datasets where participants had RNA sampling and at least 12 months of follow-up for progression to TB. We performed a one-stage individual participant data meta-analysis to compare multi-gene signatures and single-gene transcripts to detect subclinical TB, defined as asymptomatic prevalent or incident TB (diagnosed ≥21 days from enrolment, irrespective of symptoms). We calculated diagnostic accuracy over a 12-month interval. We performed decision curve analysis to evaluate the net benefit of RNA biomarkers, IGRA, alone or in combination, compared to treating all or no individuals with preventative treatment.
Results: We evaluated 81 single-genes and eight multi-gene signatures in a pooled analysis of four RNAseq and three qPCR datasets, comprising 6544 total samples and including 283 samples from individuals with subclinical TB. Six single-gene transcripts were equivalent to the best-performing multi-gene signature over 12 months, but none met the WHO minimum target product profile (Table 1). IGRA demonstrated much lower specificity in higher burden settings, while sensitivity and specificity of RNA biomarkers were consistent across settings. In higher burden settings, RNA biomarkers had greater

net benefit than IGRA, which offered little clinical utility over treating all with preventative therapy. In low burden settings, IGRA offered greater clinical utility than RNA biomarkers, but combining them provided the highest net benefit for services aiming to treat <50 people to prevent one case.

Signature	AUROC	Sensitivity	Specificity	N	Cases	Controls	p
BATF2	0.77 (0.73 - 0.81)	0.74 (0.67 - 0.8)	0.69 (0.67 - 0.7)	5,171	189	4,982	0.723
FCGR1B	0.77 (0.73 - 0.81)	0.65 (0.58 - 0.72)	0.79 (0.78 - 0.8)	5,170	189	4,981	0.877
Roe3	0.77 (0.73 - 0.81)	0.74 (0.67 - 0.79)	0.7 (0.69 - 0.71)	5,171	189	4,982	
ANKRD22	0.77 (0.72 - 0.81)	0.57 (0.48 - 0.65)	0.86 (0.85 - 0.87)	3,381	138	3,243	0.891
FCGR1A	0.77 (0.72 - 0.81)	0.8 (0.73 - 0.86)	0.6 (0.59 - 0.62)	3,382	138	3,244	0.971
GBP2	0.75 (0.71 - 0.79)	0.74 (0.67 - 0.79)	0.65 (0.64 - 0.66)	5,171	189	4,982	0.065
SERPING1	0.75 (0.71 - 0.79)	0.66 (0.59 - 0.73)	0.75 (0.73 - 0.76)	5,168	189	4,979	0.070

Interpretation: Single-gene transcripts are equivalent to multi-gene signatures for detection of subclinical TB, with consistent performance across settings, but have limited predictive ability alone. IGRA or a combined two-step testing approach offer greatest clinical utility in low burden settings.

TBS4B Pharmacological considerations for optimising new regimens - Oral Abstracts

TBS4B-15 Using long-term evolution models to define drug resistance mechanisms to DDU209, a novel TB drug candidate

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Nearly all drugs developed for tuberculosis (TB) treatment lack testing and surveillance strategies when released for commercial use. To better protect new anti-TB drugs and reduce rampant resistance development, molecular and phenotypic assays should be developed alongside the drug and utilized upon commercial use.
We established an *in vitro* evolutionary model which employs low-concentration drug exposure to select mutants with an array of resistant phenotypes which predicated well resistance mechanisms for bedaquiline similar to clinical *Mycobacterium tuberculosis* complex (Mtbc) strains. In the framework of ERA4TB, a large consortium dedicated to the development of new treatment regimens for TB, we applied our method to the novel compound DDU-209, a promising drug candidate developed at Dundee University, which inhibits lysyl-tRNA synthase. We found five genes potentially related to DDU-209 resistance, with the most important resistance determining region (RDR) throughout Rv3598c-Rv3599c. This region is essential to bacterial survival, where single nucleotide polymorphisms, codon deletion, and even gene duplication were identified as modes of resistance. With the mutation catalogues generated, we found phylogenetic SNPs in clinical Mtbc strains in the defined RDR. Finally, with this collection of mutant clones we found no cross-resistance with other anti-TB drugs. With the future publication of this and other work produced by ERA4TB we will have a better standing on surveillance and treatment strategies for DDU-209 and other novel and repurposed drugs.
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.

TBS4B-20 The clinical-stage drug BTZ-043 fully penetrates murine TB lesions and is effective against M. tuberculosis in the necrotic center

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The formation of granulomas with central necrosis containing *Mycobacterium tuberculosis* (Mtb) is a hallmark of human tuberculosis (TB). For new anti-TB treatments to be effective, they must penetrate both the cellular and necrotic regions of these lesions and reach sufficient concentrations to eradicate Mtb. BTZ-043, a novel antibiotic, has shown potent bactericidal activity in humans during a phase IIa trial.
This study reveals that BTZ-043 achieves lesional concentrations several times above the minimal inhibitory concentration and demonstrates significant local efficacy in interleukin-13-overexpressing mice, which mimic the granuloma necrosis observed in human TB. Using high-resolution MALDI imaging, we observed that BTZ-043 diffuses into and accumulates within the cellular compartment and fully penetrates the necrotic center of granulomas.
This is the first study to visualize the efficient penetration and accumulation of a clinical-stage TB drug in human-like granulomas with central necrosis which additionally assesses its lesional activity. Our findings suggest

that BTZ-043 has a substantial bactericidal effect in the challenging-to-reach areas within TB lesions: it reaches the necessary concentrations within the lesions and maintains its bactericidal activity in these environments. This dual ability to penetrate and act within granulomas positions BTZ-043 as a potentially powerful antibiotic in the fight against TB. Our findings provide a strong basis for further clinical development and highlight the importance of targeting both the cellular and necrotic compartments of TB lesions to achieve complete eradication of the pathogen.

TBSCIENCE 2024 E-POSTERS

TBS-EP01 Implications of pathogen heterogeneity for intervention | Part 1

TBS-EP-05 Identification of chemical scaffolds that inhibit the M. tuberculosis respiratory complex succinate dehydrogenase

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Drug-resistant *Mycobacterium tuberculosis* is a significant cause of infectious disease morbidity and mortality for which new antimicrobials are urgently needed. Inhibitors of mycobacterial respiratory energy metabolism have emerged as promising next-generation antimicrobials, but a number of targets remain unexplored.

Succinate dehydrogenase (SDH), a focal point in mycobacterial central carbon metabolism and respiratory energy production, is required for growth and survival in *M. tuberculosis* under a number of conditions, highlighting the potential of inhibitors targeting mycobacterial SDH enzymes.

To advance SDH as a novel drug target in *M. tuberculosis*, we utilised a combination of biochemical screening and *in-silico* deep learning technologies to identify compounds that compete with quinone, the molecule that subsequently connects SDH with the rest of the respiratory chain. Mode of action studies on lead compounds demonstrate that the specific inhibition of SDH activity dysregulates mycobacterial metabolism and respiration and results in the secretion of intracellular succinate.

Interaction assays demonstrate that the chemical inhibition of SDH activity potentiates the activity of other bioenergetic inhibitors and prevents the emergence of resistance to a variety of drugs. Overall, this study shows that SDH inhibitors are promising next-generation antimicrobials against *M. tuberculosis*.

TBS-EP-07 Diagnostic performance of 6-mRNA loop mediated isothermal amplification assay for rapid diagnosis of childhood TB disease

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Background: Early diagnosis of tuberculosis (TB) in children is crucial to reduce morbidity and mortality associated with this disease. Transcriptomic approach shows promise in diagnosing TB, tracking disease progression and monitoring treatment response. Currently, host transcriptomic signatures are validated using reverse transcription-polymerase chain reaction (RT-qPCR), which requires a thermal cycler that is less accessible in low-resource settings (LRS). Point-of-care-tests (POCT) to measure host gene expression signatures are limited. We present a novel diagnostic test using reverse transcription quantitative loop-mediated isothermal amplification (RT-qLAMP) for use in clinical settings on a POC device and compare its classification performance with RT-qPCR using clinical samples.

Methods: Using RNA-Seq data, a 6-gene signature distinguishing confirmed TB from unlikely TB was previously discovered in children seeking healthcare across South Africa, Malawi, Kenya, and The Gambia between 2008-2018, regardless of their HIV status. We performed an independent validation study involving 239 patients from the same population using RT-qPCR, achieving an AUC of 89.3% [CI_{95}%: 82.5-96.1], sensitivity 90.4% [CI_{95}%: 80.8-96.2] at a fixed specificity of 70%, meeting the minimum WHO Target Product Profile (TPP) criteria. To translate the signatures to point-of-care test, RT-qLAMP assays were developed and evaluated for clinical performance in 66 patients (33 confirmed TB, 33 unlikely TB) from the same population to allow comparison with RT-qPCR diagnostic outcomes.

Results: Assessing clinical performance between RT-qLAMP and RT-qPCR, resulted in AUC of 90.7% [CI95%: 83.7-97.6], sensitivity 93.9% [CI95%: 84.9-100] and specificity 75.8% [CI95%: 60.6-90.9] with RT-qLAMP; and AUC of 96.6% [CI95%: 93.0-100], sensitivity 87.9% [CI95%: 75.8-97.0] and specificity 93.9% [CI95%: 84.8-100] with RT-qPCR. The RT-qLAMP assays met the WHO set TPP for biomarker-based triage test, demonstrated a linear dynamic range, and achieved a time to positive in 23 minutes while maintaining the sensitivity and specificity during translation of 6-gene signature from RT-qPCR to RT-qLAMP chemistry.

TBS-EP-08 Evaluation of novel compact rapid PCR system for the detection of M. tuberculosis

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Background: Kyorin Pharmaceutical Co Ltd has developed a new reagent for the detection of *Mycobacterium tuberculosis* (MTB) using GeneSoC® mini (Figure) , a rapid nucleic acid-based portable system. The testing time is only 15 minutes.
We performed a basic evaluation of the assay using 182 mycobacterial species including five MTB variants, and clinical specimens from TB patients.
Methods: The *in vitro* sensitivity of GeneSoC assay was examined with MTB cultures of 10^3–10^7 cfu/ml (BCG tokyo and 7 clinical isolates, n=2), and the cross-reactivity was assessed using 182 *Mycobacteirum* type strains including 5 MTB variants with 2 concentrations (n=2). Twenty bacteriologically MTB-positive and 25 negative clinical sputa were also tested for proof of concept. DNA extraction was performed using a magLEAD 12gC (Precision System Science, Matsudo, Japan) with 400 µL of positive cultures of the strains or NALC-NaOH-treated sputum. MTB detection was performed by GeneSoC® mini using 5 µL of extracted DNA.
Results: All MTB samples of 10^3–10^7 cfu/ml ($9.6x10^0$–$9.6x10^4$ DNA copy in 5µL sample) were detectable using GeneSoC assay. The 177 NTM type strains were negative by GeneSoC assay but 5 variants of MTB were detected (100% species specificity).
MTB was detected in all MTB-positive specimens but negative in all MTB-negative clinical specimens. Smear results of MTB-positive specimens were 1 scanty and 19 ≥1+.

Conclusions: GeneSoC is a compact and rapid NAT assay. No cross-reactivity was observed with 177 NTMs and MTB was correctly detected in clinical specimens. This study indicated that the assay will be useful for detecting MTB.

TBS-EP-10 Uncovering mycobacterial genotypic diversity using culture-omics and differentially culturable states

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Treatment of tuberculosis (TB) is challenging when the host harbours mixed infections with hetero resistance, as treatment may not eradicate all strains. A growing body of evidence points to the presence of differentially culturable tubercle bacteria (DCTB) in sputum, which grow only in liquid media supplemented with or without mycobacterial culture filtrate (CF), but not on solid media. These culture conditions provide an environment for growth of non-replicating persistent bacteria, often missed under standard culture conditions.
Moreover, given the epidemiological success of certain mycobacterial clinical genotype families, different strains may have distinct mechanisms of adaptation and tolerance. Using an in vitro carbon starvation model, we showed that five Beijing strains were associated with a greater propensity to produce DCTB in the absence of CF supplementation whilst an equivalent number of LAM strains were dependent on CF for resuscitation.
Whilst in vitro models are useful to study mycobacterial

non-replicating persistence, how different mycobacterial clinical strains prevail in the host requires further investigation.

We used standard culture methods and the most probable number (MPN) assay with and without CF supplementation to identify mycobacterial sub-populations in a single sputum sample from TB infected participants. Whole genome sequencing of DNA from mycobacteria identified under different culture conditions delineated mixed strains/genotype families, confirming the presence of distinct heterogeneous bacterial populations in sputum from a single infected individual. DCTB identified by CF supplemented MPN assays also detected greater sub-lineages for both Beijing and LAM genotype families compared to other culture conditions.

These findings may partially explain the increased drug resistance, virulence and transmission of certain clinical genotype families and underscore the importance for improved culture methods to gain insights into the phenotypic and genotypic heterogeneity of mycobacterial populations, to better understand pathogenesis, resistance, and persistence during TB infection.

TBS-EP-11 Evaluating genetic resistance to fluoroquinolones and bedaquiline in model mycobacteria using CRISPR knockdown and complementation

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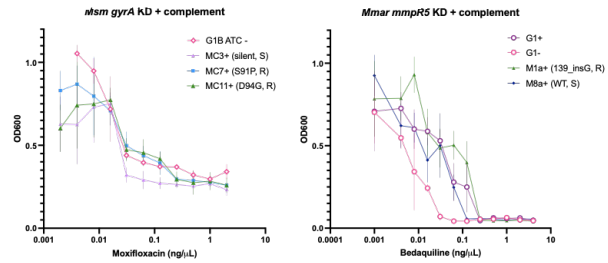
Introduction: Genomic tools to identify *Mycobacterium tuberculosis* (*Mtb*) drug resistance rely on catalogues that correlate genetic resistance-associated variants (RAVs) to phenotypic resistance. Many potential RAVs for new and repurposed drugs remain to be evaluated. We differentiate resistance and non-resistance causing variants to fluoroquinolones and bedaquiline in model mycobacteria *in vitro* by CRISPR knockdown of genes of interest and plasmid complementation with an edited variant-containing version.

Methods: We use *Streptococcus thermophilus* dCas9 to knock down *Mycobacterium smegmatis (Msm) gyrA* (linked to fluoroquinolone resistance) and *Mycobacterium marinum (Mmar) mmpR5* (linked to bedaquiline resistance). Guide RNAs targeting *gyrA* and *mmpR5* were cloned into plasmids. Complemented genes containing potential RAVs with constitutive promoters were synthesised and cloned into the same plasmid. Silent mutations were introduced into complemented gene PAM sites to prevent knockdown. Subsequent culture was performed in microtitre plates containing 7H9 and minimum inhibitory concentrations (MICs) calculated at day 2 (*Msm*) or 7 (*Mmar*).



Results: CRISPRi knockdown of *gyrA* in *Msm* led to elimination of bacterial growth at all concentrations of moxifloxacin. Complementation with wild-type *gyrA* or *gyrA* containing only silent mutations did not significantly change MIC (0.04 ng/μL [control] vs 0.06 ng/μL [*gyrA* wild-type], 0.03 ng/μL [*gyrA* + silent mutations]). Complementation with codon-adjusted variants known to cause resistance in *Mtb* led to increases in MIC (S91P = 0.15 ng/μL, D94G = 0.20 ng/μL) (Figure).

Knockdown of *mmpR5* in *Mmar* led to an increase in MIC (0.03 ng/μL to 0.22 ng/μL), in keeping with the known resistance mechanism. Complementation with a non-functional gene containing the 139_insG resistance-conferring *mmpR5* mutation did not lead to restoration of MIC (0.35 ng/μL), while using wild-type *mmpR5* partially restored MIC (0.17 ng/μL) (Figure).

Conclusion: CRISPR knockdown with synthetic complementation can differentiate resistance-conferring from inconsequential variants in model mycobacteria, and has the potential to evaluate new RAVs in *Mtb*.

TBS-EP-12 Diagnostic accuracy of a revised consensus protocol for tongue swab Xpert Ultra in 4 high-burden settings

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Background: Accessible and accurate screening and diagnostic tests are urgently needed to improve tuberculosis (TB) case finding and advance early detection in high burden settings.

Methods: Patients aged 12 years and older presenting for outpatient care in the Philippines, South Africa, Nigeria, and Zambia were screened as part of the R2D2/SMART4TB trial network. Eligible participants either reported >= 2 week cough, or a pre-specified risk factor (close contact, mining history, or people living with HIV [PLHIV]) with positive screening test (abnormal chest X-ray or elevated C-reactive protein).

All participants provided tongue swabs, which were collected into dry tubes and processed with GeneXpert SR buffer diluted with phosphate buffer (PB) or PBS (66% SR) buffer, and sputum samples, which were each tested with Xpert MTB/RIF Ultra (Xpert Ultra). Diagnostic accuracy of the tongue swabs was assessed against sputum Xpert Ultra results.

Results: Between 15 January to 20 May 2024, 523 participants were enrolled across the 4 country sites. Overall 259 (49.5%) of participants were female, with an average (median) age of 37 (interquartile range [IQR] 27, 48) years, 126 (24.4%) were PLHIV and 103 (19.7%) had confirmed TB.

The overall error or invalid rate of the tongue swab was 6.3% but varied by country. Relative to sputum, tongue swab test sensitivity was 75.4 % (95% CI 62.2-85.9 [43/57]; *Table*) with a specificity of 99.7% % (95% CI 96.3-100 [319/320]). Sensitivity ranged by country from 59.1% (13/22) in the Philippines to 100 % (8/8) in Zambia. Apparent positive association was observed between tongue swab test sensitivity and sputum Xpert semiquantitative grade.

	Total	Philippines	South Africa	Zambia	Nigeria
Invalid/error on first tongue swab test, % (n/N)	6.3% (26/415)	2.6% (3/117)	14.7% (23/156)	0% (0/76)	0% (0/66)
Tongue Swab Xpert in Reference to first sputum Xpert test*					
Sensitivity, n/N (%, 95% CI)	43/57 (75.4%, 62.2-85.9)	13/22 (59.1%, 36.4-79.3)	11/15 (73.3%, 44.9-92.2)	8/8 (100%, 63.1-100)	11/12 (91.7%, 61.5-99.8)
Specificity, n/N (%, 95% CI)	319/320 (99.7%, 98.3-100)	90/90 (100%, 96-100)	107/108 (99.1%, 94.9-100)	68/68 (100%, 94.7-100)	54/54 (100%, 93.4-100)

Table.

Conclusion: Across four high TB burden settings, tongue swabs demonstrated good diagnostic accuracy compared to sputum Xpert Ultra. Tongue swabs tested with Xpert Ultra processed under this protocol proffer a promisingly accurate and accessible TB diagnostic test.

TBS-EP-13 Estimating the global burden of viable M. tuberculosis infection

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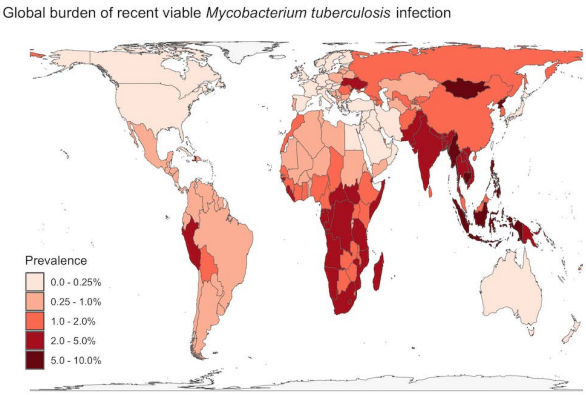
Background: Challenges to assumptions about permanent tuberculous immunoreactivity and lifelong infection warrant a re-estimation of the global burden of viable *Mycobacterium tuberculosis* (*Mtb*) infection.

Design/Methods: We developed a mathematical model incorporating reinfection and self-clearance to estimate recent (within 2 years) and distal viable *Mtb* infections. First, we constructed national trends in annual risk of infection (ARI) using direct estimates from nationally representative *Mtb* immunoreactivity surveys and indirect estimates using tuberculosis (TB) prevalence derived from WHO incidence. We adjusted ARI underestimation based on immunoreactivity reversion probabilities. Then, Gaussian process regression was used to generate country-specific ARI trajectories from 1950, and national mixing matrices were applied to obtain age-specific risks of infection.

Finally, we estimated self-clearance rates in line with recent findings and empirical data, exploring scenarios with variations in long-term clearance rates.



Results: In 2022, 2.0% (95% uncertainty interval [UI]:1.6-2.5) of the global population was recently infected with viable *Mtb*, amounting to approximately 156 million people (95%UI: 127-199); whereas the population with remaining distal infections was between 4.9% (95%UI: 4.4-5.6) and 7.7% (95%UI: 6.9-8.5) depending on assumptions of long-term self-clearance rates. Of those recently infected, 11.5% (95%UI: 10.5-12.3) were in children (<15 years).

Of all recent infections, the majority were found in Southeast Asia (47.9%; 95%UI: 37.6-59.4) and Western Pacific regions (25.7%; 95%UI: 17.6-35.8).

Conclusions: Our findings update previous estimates of *Mtb* infection burden, highlighting a substantial global population recently infected and at immediate risk of progression to disease.

These underscore the need for enhanced diagnostic and management strategies to identify and treat those at high risk of TB disease.

TBS-EP-14 Differential culturability of M. tuberculosis uncovers transmission links within households which are missed by standard diagnostic tests

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Tuberculosis (TB) transmission studies to date have predominantly used standard liquid and solid culture methods. However, the identification of differentially culturable tubercle bacilli (DCTB) which, cannot grow under standard culture conditions, suggests that the associated mycobacterial genetic diversity of these strains have been excluded from transmission mapping exercises.

To address this, we sought to identify transmission events in the household using standard and DCTB culture techniques. Index participants diagnosed with either drug sensitive or drug resistant TB, together with their respective household contacts (HHCs) were recruited. Sputum specimens collected from these individuals were analyzed longitudinally using both standard culture assays, and the most probable number (MPN) assays with and without supplementation in the form of culture filtrate (CF) to detect DCTB. From 293 index participants and 701 HHCs, both un-supplemented and CF-supplemented MPN assays were able to detect mycobacteria in HHCs, which would otherwise have been undetected by routine culture methods.

Genomic DNA from mycobacteria emerging under the different culture conditions were sequenced and analyzed to identify strain lineages and possible transmission inferences based on single nucleotide polymorphism (SNP) differences. Sequences from DCTB populations identified in CF-supplemented and un-supplemented MPN assays yielded more genotypic heterogeneity than bacteria identified using routine culture conditions. The DCTB population allowed for the inference of a significant proportion of transmission events between the index and HHCs based on SNP differences of <13, which would not have been evident using routine culture methods.

Our findings suggest that household transmission is underestimated and DCTB population assessment is important for identification of genotypic variability and may hold significant promise for understanding TB transmission.

TBS-EP-15 Detection of emerging drug resistance to new anti-TB drugs using TM4::*GeNL* reporter mycobacteriophage

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Early detection of drug resistant TB (DR-TB) remains the most effective strategy for averting DR-TB transmission, reducing DR-TB associated mortality, and improving treatment outcomes. There is an urgent need for a rapid diagnostic assay which can detect pre-treatment and treatment-emergent drug resistance in *Mycobacterium tuberculosis (Mtb)*.

In this study we performed phenotypic drug susceptibility testing (pDST) on paired pre-treatment and on-treatment clinical isolates using the novel TM4::*GeNL* reporter mycobacteriophage assay to detect emerging resistance to novel DR-TB drugs within 48 hours.

We selected paired pre-treatment and on-treatment *Mtb* clinical isolates from one patient demonstrating treatment-emergent bedaquiline and clofazimine resistance, and from another patient demonstrating treatment-emergent bedaquiline and pretomanid resistance by conventional pDST.

Additionally, we selected two patients demonstrating bedaquiline-clofazimine discordance by conventional pDST. We performed pDST using TM4::*GeNL* reporter mycobacteriophage. Bedaquiline and clofazimine were tested at 0.125 and 0.25 µg/ml, pretomanid at 0.5 and 1.0 µg/ml. Resistance was determined by measuring relative luminescence units (RLUs). The results were compared with the pre-existing conventional pDST and whole genome sequencing.

The control strain, H37Rv, and other clinical strains susceptible to the anti-TB drugs tested retained <5% RLUs at the concentrations tested. Strains with baseline and treatment-emergent resistance to bedaquiline and pretomanid had RLUs >50%. The results obtained correlated well with conventional pDST. The emerging resistance

to BDQ was attributed to mutations in the *Rv0678* gene, while for pretomanid resistance, the mutation was found in *fbiC* gene.
The resistance associated variants in *Rv0678* and *fbiC* genes were found to be ≤ 96% and ≤ 25%, respectively.
Phenotypic DST using TM4::*GeNL* reporter mycobacteriophage rapidly identified pre-treatment and treatment-emergent resistance to new anti-TB drugs. This method may offer an alternative to conventional culture-based pDST. By providing results within 48 hours, it has the potential to inform treatment choices and improve treatment outcomes in people with DR-TB.

TBS-EP-17 Identifying key transmission nodes in TB community surveillance through genetic and network analysis

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Background: Network analysis is used to identify superspreaders, which are nodes in the network that significantly impact other nodes. Genetic networks of Mycobacterium tuberculosis using SNP analysis can reconstruct transmission chains and identify clustered cases. This study aimed to clarify the association between the degree of centrality in the first cohort and the number of connections with new patients in the second cohort, and to measure the impact of TB patients' characteristics on cluster expansion.
Design/Methods: Two prospective TB cohort studies (Cohort 1: 2017-2020 and Cohort 2: 2020-2023) in Chiang Rai Province, Thailand, identified 118 clusters (≥2 patients per cluster) using whole genome sequencing with a 12 SNP difference cut-off. We focused on large clusters with more than 10 patients for sufficient node counts to calculate centrality measures within each cluster. Degree centrality, normalized by the maximum degree in each network, was calculated.
Results: Among five large clusters including 108 patients, 26.9% were diagnosed in Cohort 2. The number of edges from Cohort 1 connected to new patients in Cohort 2 increased for patients with high degree centrality. Nodes with more than two edges connected to Cohort 2 had a median normalized degree centrality of 0.85 (IQR: 0.76-1.00), compared to 0.21 (IQR: 0.11-0.47) for nodes without connections to Cohort 2. TB patients with a history of incarceration had a higher median degree centrality (0.85) compared to those without a history of incarceration (0.76), though this difference was not statistically significant (p-value=0.077, Mann-Whitney test).
Conclusions: High degree centrality measures in genetic networks can identify numerous connections with higher genetic similarity. These nodes may be influential or central nodes that impact subsequent transmission in the network. Such a node is likely to be the infection sources or having stronger connections with the infection source.

TBS-EP-18 Differences in the infectiousness of pulmonary TB by HIV status and sex in the ART era: A potential bio-social interaction?

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Background: Understanding infectiousness is key to guiding tuberculosis case-finding. We compared the relative infectiousness among people with pulmonary tuberculosis (PWTB) starting tuberculosis treatment by HIV and sex.
Design/Methods: We recruited programmatic sputum-positive index PWTB (≥15 years) starting treatment at 12 health facilities in uMkhanyakude district, KwaZulu-Natal and measured the prevalence of QuantiFERON-TB Gold Plus (QFT) positivity among their child household contacts (2-14 years). A multivariable mixed-effects logistic regression was used to derive predicted probabilities of QFT-positivity and risk ratio (RR) of intra-household transmission by index PWTB HIV status and sex. Confounder adjustment was informed by a directed acyclic graph.
Results: Between February 2022-December 2023, 362 PWTB were recruited and 819 child household contacts (of 306 index PWTB) were enrolled, of whom 755 (92%) had a valid QFT result. Table 1 shows the number of index PWTB stratified by HIV and sex, key characteristics and proportion of QFT-positive child contacts. Despite HIV-negative female PWTB having a similar prevalence of cavitation and sputum bacterial burden to HIV-negative male PWTB, the child household contacts of female PWTB had 2.5-fold higher risk of being QFT-positive compared to contacts of HIV-negative male PWTB (adjusted RR: 95% CI: 1.1 – 4.0). This difference in household contact infection risk by index case sex was not observed in HIV-positive PWTB.
Conclusion: Biologically plausible reasons for the observed interaction include heterogeneity due to differential intensity of exposure between index PWTB and

child contact (younger females spend longer time (caring roles) with children in the household) and heterogeneity of biological markers of infectiousness (HIV-positive women have paucibacillary disease and/or engaged in care and identified earlier in the course of disease). Our findings highlight the need to view household contact data through a gendered lens. A careful causal mediation analysis is planned to explore our hypotheses.

		Characteristics of index PWTB (N = 362)						Household contacts - measure of relative infectiousness (N = 755)	
		n	Median age in years (IQR)	Median CAD4TB v6 score (IQR)	Cavitation %	Median lowest Ultra C_T value (IQR); [N index]	Culture-positive %	Child contacts % QFT-positive (n/N)	Adjusted RR (95% CI)*
HIV+	M	101	39 (33 - 51)	75 (49 - 96)	13%	21 (18 - 27); [60]	65%	14% (29/213)	1
	F	131	36 (31 - 46)	52 (44 - 82)	6%	22 (18 - 28); [59]	41%	17% (49/289)	1.2 (0.6 - 1.8)
HIV-	M	77	37 (26 - 57)	90 (78 - 98)	31%	19 (17 - 23); [56]	76%	12% (18/148)	1
	F	53	27 (22 - 37)	81 (51 - 98)	26%	18 (17 - 21); [33]	65%	40% (42/105)	2.8 (1.2 - 4.5)

* Adjusted for household SES, age and sex of child contact, treatment clinic (proxy for residence); P-value for interaction 0.012

Table 1. Characteristics of index PWTB and measure of relative infectiousness.

TBS-EP-19 Cepheid Xpert TB/LTBI shows promising accuracy as a triage test for TB

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Background: Non-sputum triage tests are needed to improve TB detection in high-burden settings. The Xpert TB/LTBI cartridge (research use only, Cepheid, USA) is a novel assay that detects nine mRNA targets from MTB-antigen stimulated blood.

We evaluated its diagnostic performance as a TB triage test in comparison to QuantiFERON (QFT)-TB Gold Plus, and assessed whether it met WHO target product profile (TPP) accuracy targets (≥90% sensitivity, ≥70% specificity).

Methods: Between March-September 2023, we enrolled consecutive people ≥12 years at health centers in Uganda and Vietnam with presumptive TB.

Participants provided sputum for TB testing (Xpert MTB/RIF Ultra and culture) and venous blood for Xpert TB/LTBI and QFT-Plus.

We performed logistic regression to predict TB status using cycle threshold values for Xpert TB/LTBI mRNA targets and receiver operating characteristic analysis to assess accuracy in reference to sputum results.

Results: We included 216 people with valid QFT-Plus results. Median age was 42 years (IQR: 29-56), 123 (56.9%) were male, 20 (9.3%) were living with HIV, 20 (9.3%) had diabetes, 64 (29.6%) had confirmed TB and 129 (59.7%) were QFT-positive.

The area under the curve for Xpert TB/LTBI was 0.90 (95% CI 0.86-0.95). The specificity of Xpert TB/LTBI was 77.0% (95% CI 69.5-83.4) at a cut-point that achieved ≥90% sensitivity (90.6%, 95% CI 80.7-96.5), and was higher than for QFT-Plus (67.8% vs. 55.3%, difference=12.5% [95% CI 4.3-20.7, p<0.01]) at a cut-point that achieved the same sensitivity as QFT-Plus (95.3%, 95% CI 86.9-99.0). In people living with HIV, sensitivity was 100.0% (95% CI 39.8-100) and specificity was 81.2% (95% CI 54.4-96.0).

Conclusions: Xpert TB/LTBI exceeded WHO TPP accuracy targets for TB triage tests and outperformed QFT-Plus. Xpert TB/LTBI should be further evaluated as a tool to both screen for prevalent active TB and predict future risk of incident TB with a single test.

	Sensitivity n/N (95% CI)	Specificity n/N (95% CI)
Xpert TB/LTBI: At cut-point with ≥90% sensitivity	58/64 90.6% (80.7-96.5)	117/152 77.0% (69.5-83.4)
People living with HIV	4/4 100% (39.8-100)	13/16 81.2% (54.4-96.0)
Sputum Xpert semi-quantitative grade: Very low/Low	21/24 87.5% (67.6-97.3)	--
QuantiFERON (QFT)-TB Gold Plus	61/64 95.3% (86.9-99.0)	84/152 55.3% (47.0-63.3)
Xpert TB/LTBI: At cut-point with ≥QFT-Plus sensitivity	61/64 95.3% (86.9-99.0)	103/152 67.8% (59.7-75.1)

Table. Tuberculosis diagnostic accuracy of Xpert TB/LTBI and QuantiFERON (QFT)-TB Gold Plus, overall and among key sub-groups.

TBS-EP-20 Genomic evidence for transmission of asymptomatic TB identified through active case finding

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Background: Recent studies of household contacts have shown that subclinical tuberculosis (TB) may significantly contribute to transmission. However, due to the challenges in studying the infectiousness of TB states, alternative evidence is required to understand the relationship between TB symptoms and transmission.
Methods: We sequenced 1,956 *Mycobacterium tuberculosis* strains from prisons and the community in Mato Grosso do Sul, Brazil, collected from 2002 to 2022. From 2017 to 2022, active case finding was conducted in three major prisons in the state, collecting sputum from individuals regardless of symptoms and testing via GeneXpert and culture.
We compared two phylogenetic metrics of transmission—clustering (12-SNP threshold) and time-scaled haplotype density—between isolates from symptomatic and asymptomatic individuals.
Results: We sequenced 1,956 *Mtb* strains, of which 3.5% (70/1,956) were resistant to at least one drug, and 0.6% (12/1,956) were multi-drug resistant. Most strains (99%) belonged to lineage 4 and a total of 77% of isolates in a genomic cluster. Among 1,956 individuals with TB 614 were incarcerated at the time of diagnosis. Among these, 313 were identified through active case finding: 202 had symptomatic disease and 111 had subclinical TB. From these participants, 58% (178/313) of isolates were part of 33 genomic clusters defined by a 12-SNP threshold.
The proportion of isolates found in clusters was similar for symptomatic (55%; 111/202) and asymptomatic individuals (60.4%; 67/111) (p=0.404). The average cluster sizes were also comparable between symptomatic (5.55) and asymptomatic groups (5.15). Time-scaled haplotype density did not differ between symptomatic (median: 0.37, IQR: 0.05-0.63) and asymptomatic individuals (median: 0.52, IQR: 0.18-0.66; p = 0.096).
Conclusion: Subclinical TB cases identified through active case finding showed no differences in genomic transmission metrics compared to symptomatic cases, emphasizing the importance of subclinical TB in transmission and highlighting the need for early case detection and prevention.

TBS-EP-21 Spatio-temporal tolerance analysis of bio-resilience caused by hetero-population of M. tuberculosis

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Background: In recent years, single-cell analysis of *Mycobacterium tuberculosis* (Mtb) has revealed multiple phenomena(resilience) leading to tolerance as "clone". However, there is no measurement system to evaluate the "population" as an accumulation of "clone".
We previously designed a resonance circuit that oscillates at 65 GHz developed a contact-type sensor that utilizes the resonance frequency shifts according to the dielectric constant of the sensor surface.
Therefore, when the number of water molecules in free water in the culture solution is replaced by solutes or bacteria in this proximity region, the resonance frequency changes, and the amount of change can be measured in near real-time.
The 65-GHz frequency band was sensitive to changes in the number of bulk water molecules but is largely unaffected by larger molecules and ions.
Purpose: We confirm the resilience phenomenon of Mtb by using near-field sensor array that measures changes in the state of water molecules, which are essential for the growth activities of all organisms.
Methods: In a 12-well culture system equipped with a sensor on the bottom, H37Rv and multidrug-resistant Mtb isolates were used to quantitatively evaluate the resilience phenomenon under drug stress.
Results: Our sensor system enabled quantitative evaluation of water molecule changes over time associated with Mtb growth activities.
Furthermore, we successfully visualized the changes in the heterogeneous bacterial population in near real time.

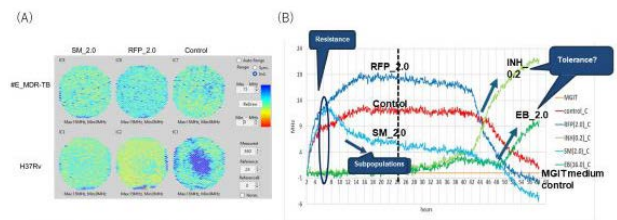

Figure. Array-sensitized growth ability of *Mycobacterium tuberculosis* in exposure of various drugs.
(**A**) Growth activities of MDR-TB and H37Rv to RFP and SM exposure, and the resulting difference in resonance frequency (MHz) over 24h is shown in heatmaps by sensor system. (**B**) Growth ability curve activities of Mtb to RFP, EB, INH, and SM exposure over 60h.

Discussion and Conclusion: Our sensor system can evaluate drug resilience due to the nature of subpopulations and interactions between subpopulations in a non-labeled and real-time manner. By taking advantage of this feature, we can elucidate the mechanism of resilience in heterogeneous Mtb populations, which may directly lead to optimization of Tuberculosis treatment in the future and in the clinical setting.
The fact that Mtb grows while maintaining heterogeneous populations in different states indicates that it is highly adaptive to stress.

TBS-EP-22 Genomic characteristics of prospectively sequenced M. tuberculosis from respiratory and non-respiratory sources in a low-incidence setting

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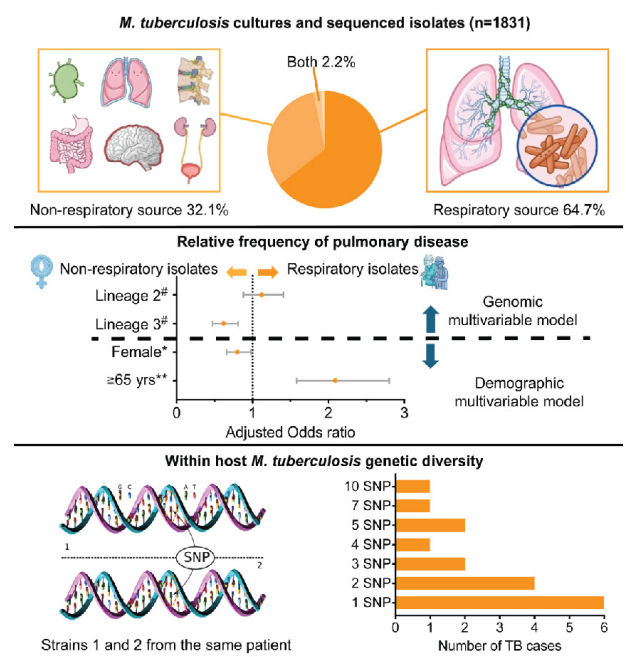
Tuberculosis (TB) control continues to pose a global challenge. Understanding the differences between *Mycobacterium tuberculosis* strains isolated from respiratory and non-respiratory sources may inform clinical care and control strategies. Genomic differences between respiratory and non-respiratory isolates have not been comprehensively assessed in a programmatic setting.
The implementation of routine sequencing (since 2016) of all culture-confirmed TB cases in New South Wales (NSW), Australia, presented a unique opportunity to compare genomic characteristics of *M. tuberculosis* strains isolated from different anatomical disease sites.
We conducted the detailed and representative description of routine sequencing and demographic data of all culture-confirmed TB cases notified between 1st January 2017 and 31st December 2021 in NSW, Australia. Our analysis involved demographic and genomic characteristics of *M. tuberculosis* cultures based on the specimen source (respiratory vs. non-respiratory).
We analysed the sequenced *M. tuberculosis* strains from 1831 patients. Among these, 64.7% were from respiratory, 32.1% from non-respiratory and 2.2% from both respiratory and non-respiratory sources. Our multivariate analysis demonstrated that female patients had a higher frequency of isolation from non-respiratory source (p=0.03), and older adults (≧65 years) from a respiratory source (p<0.0001). We observed that that lineage 2 strains were over-represented among respiratory isolates (p=0.01) and lineage 3 among non-respiratory isolates (p=0.0005), but could not demonstrate any lineage or sub-lineage specific tissue tropism. An interesting level of within host genetic variability, with a maximum 10-SNPs difference between strains, was observed in TB cases where cultures were collected from both respiratory and non-respiratory sources during the same disease episode (maximum 70 days apart).
Our findings reveal site-specific differences in demographic, microbiological, and genomic characteristics, which emphasizes the importance of tailoring diagnostic and treatment approaches to individual cases, with careful consideration of transmission risk and consideration of the most appropriate public health responses.



TBS-EP-23 Differentially expressed coding and non-coding RNAs reveal the mechanisms of transcriptome regulation and RNA signatures in clinical strains of M. tuberculosis

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Small RNA (sRNA) and other long non-coding RNAs (lnRNAs) are potential novel markers that can be exploited for TB diagnostics and treatments and show promise in the fight against clinical strains of *Mycobacterium tuberculosis* complex (MTBC).

The current study investigated the mechanisms of gene regulation and RNA signatures through RNA sequencing of total RNA and sRNA of clinical strains of lineage 2 (Beijing), and lineage 4 (F15/LAM4/KZN) compared to the laboratory H37Rv strain using a Hisat-Ballgown Bioinformatics pipeline.

All strains exhibited differential regulation of total RNA and sRNAs that were unique for each strain as follows compared to the laboratory H37Rv: Lineage 2 sRNA (217), Lineage 4 sRNA (155); Lineage 2 mRNA (481), Lineage 4 mRNA (295).

Characterization of all differentially expressed transcripts revealed the presence of well-known annotated transcripts, hypothetical proteins and ~30% unannotated transcripts. Unannotated transcripts included housekeeping and regulatory noncoding RNAs that were specific to either Lineage 2 or Lineage 4 strain compared to the laboratory H37Rv.

Furthermore, the regulatory noncoding RNAs (sRNA and lnRNAs) had high affinity for the repressed mRNA transcripts, providing insight into gene regulation of clinical strains of *M. tuberculosis* by these RNA markers. The RNA transcripts identified in the current study can offer insights into the growth and metabolism of the MTBC members, as well as be exploited for diagnostics purposes in clinical samples.

Identification and characterization of RNA signatures and gene regulatory mechanisms within the MTBC lineages may provide a novel perspective in control strategies against these human-adapted, globally prevalent infectious pathogens.

TBS-EP-24 Identifying resistance modifying mutations using a set of 44,710 uniformly processed M. tuberculosis genomes

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Background: The accuracy of phenotypic drug resistance predictions from genome sequence data is highly variable. Resistance to rifampicin can be predicted from genotype with sensitivity above 96%, while others, such as pyrazinamide drop to 80% [1]. For linezolid, the best models can only achieve a sensitivity of 30%.

More pressingly, resistance prediction to new and repurposed drugs including Bedaquiline, pretonmanid, Linezolid and Moxifloxacin remains challenging.

Methods: To improve the prediction of drug resistance from genotype, we have assembled a collection of 44,710 uniformly processed tuberculosis genomes with annotated drug resistance profiles. We hypothesise that this collection will help us to identify resistance modifying mutations, thus improving the concordance between phenotype and genotype-based prediction. We have evaluated three commonly used tools including TBProfiler, Mykrobe and DrPRG [1].

We have developed a new forward-selection approach (FS-PLS) which starts with output of these tools and iteratively finds minimal sets of mutations which improve their accuracy.

Our approach identified new resistance modifying mutations for Ethambutol, improving the area under the curve (AUC) in 5-fold cross validation from 0.915 to 0.943. For linezolid, we find mutations which improve AUC from 0.61 to 0.66 in the combined dataset, with greatest improvement in lineage 2, increasing from 0.65 to 0.73.

Conclusion: There remain substantial drug resistance modifying mutations to be found in Mycobacterium tuberculosis. Machine learning approaches can be adapted to use these mutations to improve accuracy of genotypic drug resistance predictions.

References:

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TBS-EP-25 Detection of genomic markers of drug resistance in M. tuberculosis populations utilising both culture-based whole genome sequencing and culture-independent targeted next-generation sequencing

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Identification of drug-resistant tuberculosis (TB) relies on identifying genomic markers of drug resistance through either whole genome sequencing (WGS) or targeted next-generation sequencing (tNGS). While most WGS analyses target majority populations in diagnostic samples, drug-resistant strains may exist as minority sub-populations. Minority variants of *Mycobacterium tuberculosis* harbouring mutations conferring resistance can become dominant populations during TB treatment, leading to treatment failure.
Additionally, between 2017 and 2021, 11.8 % of microbiologically confirmed TB cases in New South Wales (NSW), Australia, could not be cultured, affecting drug resistance inferences from WGS.
We investigated potential drug resistance-conferring minority variants in *M. tuberculosis* sequences recovered from culture-confirmed TB cases notified in NSW, Australia, from January 2017 to December 2021. We developed a multiplex PCR-based culture-independent tNGS assay for drug resistance detection, optimized for processed clinical specimens and sequenced on a MinION platform (Oxford Nanopore). This tNGS assay targeted 21 genes associated with resistance to 14 drugs.
Drug-resistant minority variants were detected in 3.5% (65/1831) of sequenced cultures; 84.6% (55/65) had majority strains that were drug-susceptible and 15.4% (10/65) had majority strains that were drug-resistant. Minority variants with high confidence drug resistance conferring mutations were 1.5 times more common when the majority strains were drug resistant. In testing on 16 clinical specimens, our tNGS assay successfully identified all targets with a read depth of at least 40 for each target at a Ct value of 25.2, outperforming the Deeplex Kit in these samples. It also detected genomic markers of drug resistance in three multi-drug resistant (MDR) specimens as tested by GeneXpert, without identifying subpopulations.
Drug resistance-conferring minority variants of *M. tuberculosis* can be detected from routine WGS data. Culture-independent tNGS has been developed and optimized as a sensitive and accurate method for detecting genomic markers of drug resistance in *M. tuberculosis*.

TBS-EP-26 A multicenter study to improve procedures to target the EUCAST inoculum range for M. tuberculosis

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ERA4TB (https://era4tb.org/) is a European consortium dedicated to accelerating the development of new tuberculosis regimens. Within the *in vitro* profiling activities, a multicenter capacity (six laboratories) has been created to implement the EUCAST protocol for MIC determination of anti-tuberculous agents against isolates of the *Mycobacterium tuberculosis* complex in Middlebrook 7H9 broth.
A critical step for assay validation is ensuring that the bacterial inoculum is within a range of $5x10^4$ to $5x10^5$ cfu/mL. This proves to be challenging and time-consuming. In addition, colony counting takes up to 21 days, which can delay MIC determinations when repetitions are needed. We hypothesize that variability in inoculum size depends on technician skills, consumables, equipment, and facilities.
ERA4TB laboratories conducted two rounds of inoculum preparation using the EUCAST protocol, each with five replicates prepared on different days. Experiments were performed using the ATCC 27294 or its equivalent ITM-500735/CT2008-03715 strain.
Despite standardized procedures and materials, only two out of the six laboratories consistently achieved the accepted inoculum range in both rounds. The other laboratories did not meet the desired results in the first round. However, after further revising the methodology, two additional laboratories met the desired range in a second round, resulting in four laboratories meeting the expected inoculum range.

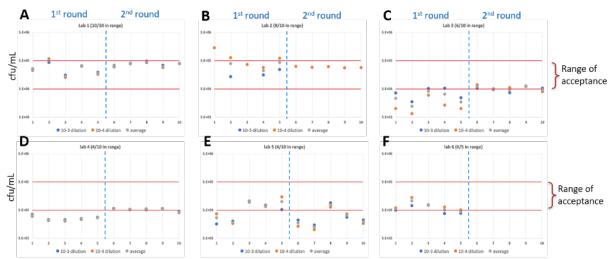

Figure 1. ERA4TB lab performance on the EUCAST method. Plots from A to F correspond to each laboratory. The Y-axis represents the assays for single inoculum preparation, and the X-axis represents the CFU/mL of the EUCAST inoculum. Colony counts were determined from serial dilutions of 10^{-3} (blue dots) and 10^{-4} (orange dots). Additionally, the averages are plotted with gray dots.

Our findings for improvement were reported to a recent EUCAST open consultation and included:
(i) spreading the bacterial inoculum immediately after plating;
(ii) controlling agar moisture content (solidification time of 40 minutes); and
(iii) effective and time-controlled vortexing to dissolve clumps.
In the next steps, ERA4TB will evaluate the impact of inoculum size variations on the actual MIC values of key anti-tuberculous drugs to address whether broadening inoculum ranges could improve adherence to the EUCAST protocol.
This work has received support from the Innovative Medicines Initiatives 2 Joint Undertaking (grant No 853989).

TBS-EP-27 Micro-variant detection in M. tuberculosis whole genome sequencing data: Pipeline benchmarking and investigation of bedaquiline-associated micro-variants and resistance

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Background and Methods: Micro-variants are variants present at read or allele frequency (AF) < 75% and present an opportunity for early and more comprehensive diagnosis of DR in *Mtb*. False micro-variant calls are common due to sequence homology, sequencing/split-read errors, and contamination. Previous benchmarking focused on sequencing error and did not evaluate regions of low mappability (LM) or indels in homopolymeric tracts (HT) relevant to bedaquiline (BDQ) resistance. We use simulations to compare the performance of six tools for micro-variant calling across AF 1-50%, depth 50-700x, and DR, LM and HT regions. We use the best-performing tool to call micro-variants in 8,942 *Mtb* isolates with BDQ minimum inhibitory concentration (MIC) data.
Results: For AF ≥ 5% and depth ≥ 200x, VarDict achieves the highest mean F1 score at 0.96 ± 0.05 (t-test P < 0.01). LoFreq has a higher F1 in DR and HT regions, but underperforms in LM regions. For HT variants at AF 1-5%, LoFreq achieves the highest F1 at 0.91 ± 0.12 (precision 1.0, recall 0.86). Using LoFreq, we characterize Rv0678 variants in our dataset which included 2.35% (n=210) BDQ-resistant isolates. We identify 55 Rv0678 micro-indels with AF 1-75%. Median AF is 11.9% in BDQ-resistant isolates vs. 5.6% in BDQ-susceptible isolates, and the proportion of micro-variant-containing isolates is higher for BDQ-resistant isolates (Table 1). In log-linear regression, we pool 171 variants that individually occur in <3 isolates into one 'rare' Rv0678 variant variable. Among the 31 common Rv0678 variants (≥3 isolates), and the pooled rare variant, variant AF is significantly associated with MIC for 6, including the rare variant category.

	BDQ-resistant (n=210)	BDQ-sensitive (n=8,732)	Significance
Isolates with one or more SNP or indel at AF ≥ 1% (number of SNPs or indels across all isolates)	7 (38)	28 (115)	OR=10 (proportion of micro-variant-containing isolates is higher for BDQ-resistant isolates), Chi squared P-value <0.0001
Median AF (IQR)	11.9% (3.7-34.4%)	5.6% (2.7-18.7%)	Wilcoxon P-value > 0.01
Isolates with insertion at longest HT in Rv0678 (nt 192-198)	4	18	OR=9 (proportion of micro-variant-indel-containing isolates is higher for BDQ-resistant isolates), Chi-squared P-value < 0.0001

Conclusions: LoFreq is the best evaluated tool for calling micro-HT-indels. Although micro-variants are significantly associated with BDQ-resistance, very low AF Rv0678 micro-variants are observed in BDQ-susceptible isolates; hence their significance for guiding treatment requires further evaluation.

TBS-EP02 Implications of pathogen heterogeneity for intervention | Part 2

TBS-EP-29 A Nanopore-based long-read sequencing panel to detect drug-resistant TB

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Background: Timely detection of drug-resistant tuberculosis (DR-TB) would improve treatment outcomes, reduce resistance amplification, and transmission. Culture-based methods are slow and need a BSL-3 facility. Molecular assays are sensitive but target a limited set of mutations, leading to false negatives and missing novel mutations in resistance-causing genes. Targeted sequencing can detect known and novel resistance mutations but is limited to high-end diagnostic labs due to expensive infrastructure demands.
Methods: We developed a targeted sequencing panel on a low-cost Nanopore sequencer, amplifying fourteen *Mycobacterium tuberculosis* (MTB) genes covering approximately 350 WHO-listed mutations that confer resistance to first and second-line anti-TB drugs. To quantify MTB genome copies in clinical specimens and establish the minimum required for sequencing, we designed an RD-9 gene-specific TaqMan probe. The H37Rv ATCC strain was used for panel validation. The sequencing limit was tested on 10^7 to 10^2 MTB copies/library. Samples were sequenced on MinION MK1c using the latest R10.4.1 chemistry. Data was analyzed with MinKNOW (release 22.08.4), Epi2ME (version 4.1.3), and an in-house variant calling pipeline.

Results: MTB-specific RD-9 qPCR could detect up to ten genome copies per reaction. MTB Nanopore panel-specific reads were observed at all dilutions analysed in replicates. All reads exceeded the minimum quality score of 7 (median=8.5). The median coverage depth in amplicons was 1,777x (IQR= 2,424-208). Total number of reads detected at 10^2 dilution was 1,364 majority of which mapped to *rpoB* hostspot. Targeted Nanopore sequencing achieved 100% concordance with Illumina whole genome sequencing data on H37Rv in variant calling. Genomic regions such as *rpoB* S441A mutation and sites outside the hotspot regions not covered by GeneXpert MTB/RIF Ultra were also sequenced with high coverage.

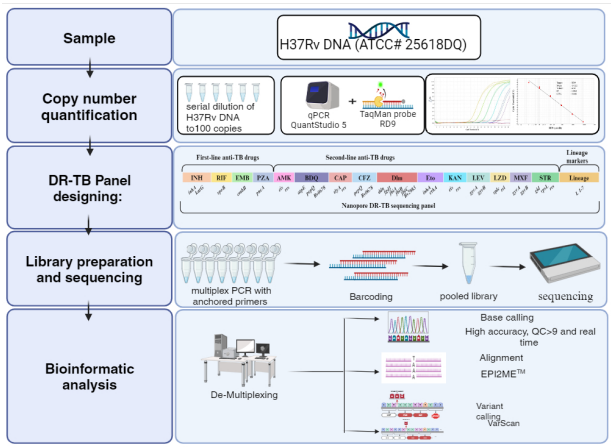

Figure : Workflow schema for copy number quantification of MTB genome in a clinical sample using RD-9 TaqMan assay designed in-house. The figure also shows stepwise process of development and validation of targeted Nanopore sequencing for and detection of drug resistance in MTB

Conclusions: Targeted Nanopore sequencing would allow culture-free detection of drug resistance, and novel mutations in MTB, enabling evidence-based treatment plans and studying transmission and evolution of resistance.

TBS-EP-31 CD4⁺ T cell profiles during TB/HIV co-infection and their associations with TB treatment response and cavitary disease

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CD4⁺ T cell responses play a key role in the pathogenesis of TB and HIV. Utilizing peripheral blood mononuclear cells from the Improving retreatment Success (IMPRESS) trial we evaluated CD4⁺ T cell phenotypes during active TB in patients with recurrent TB with and without HIV co-infection and assessed their associations with TB treatment response and cavitary disease using Cox proportional hazards and logistic regression models, respectively.

Flow cytometry was used to characterize total CD4⁺ T cell percentage, CD4+ T cell activation as well as CD25 and β-integrin expression in individuals with active TB (n=25), TB/HIV co-infection (n=50) and healthy controls, (n=11).

Percent total CD4⁺ T cells was significantly lower in TB/HIV compared to TB and healthy control groups ($p<0.0001$) with the % of activated $CD38^{+}HLA\text{-}DR^{+}$ $CD4^{+}$ T cells significantly higher among TB/HIV compared to the TB and healthy control groups ($p<0.0001$).

Percent $CD25^{+}CD4^{+}$ T cells were higher among TB individuals in comparison to TB/HIV and healthy controls ($p<0.0001$). CD4⁺ T cells associated with increased risk (OR 1.044, 95% CI 1.006 – 0.023, p=0.023) while T cell activation was associated with decreased risk (OR 0.910, 95% CI 0.839 – 0.988, p=0.025) of lung cavitation. Integrin α4β7 expressing cells ($\beta7^{Hi}$ $CD45RA^{-}$ $CD4^{+}$ T cells) were increased in TB/HIV compared to TB group (p=0.007) and associated with longer time to TB negative culture conversion in co-infected individuals (aHR 0.929, 95% CI 0.866 – 0.997, p=0.041).

The observed HIV-related changes in CD4⁺ T cell phenotypes during TB/HIV co-infection may play an important role in TB disease pathogenesis.

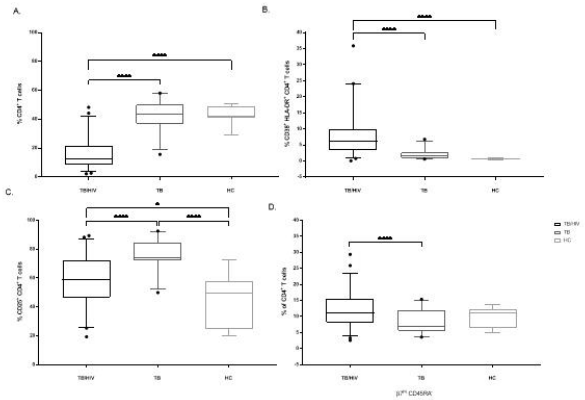

Figure 1. Differences in percentages of (A) Total CD4⁺ T cells, (B) CD38⁺ HLA-DR⁺ on CD4⁺ T cells (C) CD25⁺CD4⁺ T cells (D) β7^{Hi} CD45RA⁻ between study groups (TB/HIV, TB, and HC)

TBS-EP-32 First report of whole-genome analysis of an extensively drug-resistant M. tuberculosis clinical isolate with bedaquiline, linezolid and clofazimine resistance from Uganda

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Background: Uganda remains one of the countries with the highest burden of TB/HIV. Drug-resistant TB remains a substantial challenge to TB control globally and requires new strategic effective control approaches. Drug resistance usually develops due to inadequate management of TB patients including improper treatment regimens and failure to complete the treatment course which may be due to an unstable supply or a lack of access to treatment, as well as patient noncompliance.
Methods: Two sputa samples were collected from Xpert MTB/RIF® assay-diagnosed multi-drug resistant tuberculosis (MDR-TB) patient at Lira regional referral hospital in northern Uganda between 2020 and 2021 for comprehensive routine mycobacterial species identification and drug susceptibility testing using culture-based methods. Detection of drug resistance-conferring genes was subsequently performed using whole-genome sequencing with Illumina MiSeq platform at the TB Supranational Reference Laboratory in Uganda.
Results: In both isolates, extensively drug-resistant TB (XDR-TB) was identified including resistance to Isoniazid (katG p.Ser315Thr), Rifampicin (rpoB p.Ser450Leu), Moxifloxacin (gyrA p.Asp94Gly), Bedaquiline (Rv0678 Glu49fs), Clofazimine (Rv0678 Glu49fs), Linezolid (rplC Cys154Arg), and Ethionamide (ethA c.477del). Further analysis of these two high quality genomes revealed that this 32 years-old patient was infected with the Latin American Mediterranean TB strain (LAM).

Drug	Resistance profile	Gene Mutation	WHO-Mutation Catalogue Grading
Rifampicin	Resistant	*rpoB* p.Ser450Leu	Associated with Resistance
Isoniazid	Resistant	*katG* p.Ser315Thr	Associated with Resistance
Fluroquinolones	Resistant	*gyrA* p.Asp94Gly	Associated with Resistance
Bedaquiline	Resistant	*Rv0678* p.Glu49fs	Associated with Resistance
Clofazimine	Resistant	*Rv0678* p.Glu49fs	Associated with Resistance
Linezolid	Resistant	*rplC* p.Cys154Arg	Associated with Resistance

Conclusions: This is the first identification of extensively drug-resistant Mycobacterium tuberculosis clinical isolates with bedaquiline, linezolid and clofazimine resistance from Uganda. These acquired resistances were because of non-adherence as seen in the patient's clinical history.
Our study also strongly highlights the importance of combating DR-TB in Africa through implementing next generation sequencing that can test resistance to all drugs while providing a faster turnaround time. This can facilitate timely clinical decisions in managing MDR-TB patients with non-adherence or lost to follow-up.

TBS-EP-33 Pre-analytical sampling and processing of tongue swabs for *Mycobacterium tuberculosis complex (Mtbc)* impacts diagnostic yield

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Background: Oral swabs are an alternative diagnostic sample to detect *Mycobacterium tuberculosis* complex (Mtbc). Previous studies have processed samples remotely in overseas or reference laboratories which may limit implementation. We aimed to optimise pre-analytical sampling methods at point of collection in Blantyre, Malawi.

We compared self- and healthworker-taken tongue swabs, analysed using Xpert Ultra and RT-PCR, in adults with Mtbc and compared results by cryopreservation method.
Method: Participants (adults aged ≥18 years newly diagnosed with sputum Xpert confirmed pulmonary TB) were randomly allocated to undergo self- or healthworker tongue swab first. Two swabs were taken (using COPAN FLOQswab in Primestore MTM media 1.5 ml) then tested for Mtbc by Xpert Ultra after storage at either room temperature or -80°C and by RT-PCR, after one or two freeze-thaw cycles.
Results: In total 100 tongue swabs were taken (50 self-taken, 50 healthworker-taken) with an overall sensitivity of 36% on Xpert Ultra and 43% on RT-PCR compared to Xpert in sputum. Samples that underwent two freeze-thaw cycles prior to RT-PCR had a significantly higher sensitivity 17/28 (60.7%) compared to one freeze-thaw cycle 26/72 (36.1%) on RT-PCR (p=0.04), there was no difference by freeze thaw cycle on Xpert Ultra (9/28, 32.1% v 27/72, 37.5%, p=0.90). There was no difference in sensitivity between self-taken and healthworker-taken swabs.

Total n	Processed by Xpert Ultra: 100	Processed by RT-PCR: 100	One freeze thaw cycle: 72	Two freeze-thaw cycles: 28		Self taken Xpert Ultra: 50	Self taken RT-PCR : 50	Hea-thworker taken Xpert Ultra: 50	Healthwor-ker taken RT-PCR: 50
Total positive, n (%)	36 (36)	43 (43)				18 (36)	19 (38)	18 (36)	24 (48)
Results agree: (GXP v PCR) n (%)	77 (77)	77 (77)	59 (81.9)	18 (64.3)	Results agree: HW v SELF	38 (76)	41 (82)	38 (76)	41 (82)
Results disagree: GXP negative/ PCR positive, n (%)	15 (15)	15 (15)	6 (8.3)	9 (32.1)	Results disagree: HW negative/ SELF positive	6 (50)	2 (22.2)	6 (50)	2 (22.2)
Results disagree: GXP positive/ PCR negative n (%)	8 (8)	8 (8)	7 (9.7)	1 (3.5)	Results disagree: HW positive/ SELF negative	6 (50)	7 (77.8)	6 (50)	7 (77.8)

Table 1: Detection of Mtbc on tongue swabs.

Conclusion: When analysing tongue swabs for Mtbc additional freeze-thaw cycles may cause increased lysis leading to mycobacterial DNA release and an increase in sensitivity on RT-PCR. When swabs are transported for analysis incorporating freeze-thaw cycles, as opposed to processing at room temperature at point of collection, this may increase sensitivity. When designing further evaluations this needs to be accounted for as additional feasible and affordable lysis steps may need to be added to protocols at point of collection.

TBS-EP-34 Leveraging digital health technology for real-time disease surveillance through diagnostic connectivity in Uganda: A case of Kampala District

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Background: Disease surveillance surveys are an important part of any country's efforts to monitor and control various diseases. Disease surveillance surveys in Africa particularly involve multi-sectorial collaboration between various stakeholders, including the Ministry of Health, academic institutions, international organizations, research institutions, and development partners. The study aims to improve real-time disease surveillance in Kampala District, Uganda, by integrating diagnostic data into a centralized health information system. It aims to enhance public health outcomes through early detection, targeted interventions, and efficient resource allocation.
Methods: This was a cross-sectional study that sought to employ automated data pick-up methods from the selected diagnostic sites in Kampala, where the digital health solution was deployed in Uganda. This was intended to facilitate data analysis and result synthesis to answer the research questions of the study.
Results: Limited infrastructure and internet connectivity in rural Africa may hinder the widespread adoption of digital health solutions for real-time disease surveillance. Data security and privacy are additional factors to take into account because using digital health platforms requires strong data security and privacy safeguards to safeguard sensitive health data. Finally, equity and accessibility are important factors to take into account when implementing digital health, particularly in environments with low resources.
Conclusion: Implementing digital health for real-time disease surveillance in countries with a high burden of diseases has the potential to transform public health practices. Through leveraging digital health in Uganda, these proposed solutions have the potential to address the existing healthcare challenges, improve access to quality care, strengthen health systems, and ultimately contribute to better health outcomes and equitable healthcare delivery throughout the country.

TBS-EP-35 A scoping review on molecular diagnostic testing for isoniazid-resistant TB: Current status and gaps

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Background: The paucity of diagnostic testing options for isoniazid-resistant (INH-R) conflicts with it being the most common form of drug-resistant tuberculosis. The roll-out of molecular drug-susceptibility tests (mDST), based on the detection of *M.tuberculosis* genetic material, has significantly reduced time required to diagnose drug-resistance. We conducted a scoping review to evaluate evidence for accuracy and operational characteristics of mDST for the determination of resistance to isoniazid in tuberculosis.

Methods: We searched Medline, Embase, Web of Science, Global Index Medicus WHO, three study registries, and three Chinese databases for articles published between 2000 and May 2024. The search terms combined "mDST", "INH-R", "tuberculosis". Study selection and data extraction were performed by two independent reviewers using Covidence.

Results: After deduplication (n=3,207) and screening (n=5,473), 270 records were selected. Commercially-available mDST for INH-R were grouped into line probe assays ([LPA]: GenoType MTBDRplus v1&v2, AID TB Resistance LPA, Genoscholar NTM+MDRTBII, FluoroType MTBDR), nucleic acid amplification tests ([NAAT]: Xpert MTB/XDR, Anyplex II MTB/MDR, RealTime MTB RIF/INH, BD Max MDR-TB, Cobas MTB-RIF/INH), DNA microarrays (TruArrayMDR-TB, TB-Test/TB-Biochip, VereMTB, GeneChip MDR), whole-genome sequencing (WGS) and targeted next-generation sequencing (tNGS) (Illumina, Oxford Nanopore, Thermo Fisher, Pacific Biosciences platforms).

Additional mDST are undergoing evaluation. Most studies reported diagnostic accuracy, while few evaluated sample types, target users, time-to-result, sample throughput, target population, and costs.

Compared to phenotypic DST, sensitivity of mDST for INH-R was highest with WGS (90–100%), followed by tNGS (67–100%), microarrays (67–100%), NAATs (80–99%), and LPAs (50–100%). tNGS achieved the highest specificity (97–100%), followed by NAATs (87–100%), microarrays (81–100%), LPAs (79–100%), and WGS (67–100%).

Conclusion: Some mDSTs nearly met the minimum targets outlined in the WHO's Target Product Profile for next-generation DST at peripheral centres. This review can guide the selection of mDST across various settings.

TBS-EP-36 Understanding TB transmission dynamics in urban and rural Nepal using genomics, to optimally target interventions (TARGET TB)

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The high-density populations of South Asia harbour 40% of the global TB burden and rapid urbanisation facilitates TB spread. Migration of people within and between TB endemic countries, has potential to change the dynamics of TB population transmission in different settings. Whole genome sequencing (WGS) of *Mycobacterium tuberculosis (Mtb)* can identify strains with increased transmission, virulence and drug resistance.

We aim to understand TB transmission in urban and rural Nepal by characterizing *Mtb* pathogen genomic diversity, population structure, transmission dynamics and drug resistance.

A total of 1604 consecutive patients diagnosed with TB by sputum smear microscopy and/or GeneXpert were recruited to our study from April 2021 to March 2023. Patients were recruited from 3 study districts in Nepal; Kathmandu (N=428), Banke (N=958) and Pyuthan (N=218) districts, with varying populations densities, and rates of migration. Of the 1604 sputum samples collected 1146 *Mtb* isolates grew and DNA was extracted. DNA samples (N=1000) underwent quality control for WGS.

An initial subset of sequenced genomes was analysed. Approximately half of the sequenced isolates were lineage 3, with lineage 1, 2, 4 making up the remaining half. TB profiler was used to predict high confidence drug resistance mutations and low levels of isoniazid, streptomycin and rifampicin resistance was determined (approximately 7.3%, 7.5% and 2.8% respectively).

We present analysis of genomic diversity (ie. circulating lineages, sub-lineages, clones), the burden of the identified lineages and their transfer within Nepal and between countries. This identifies strains with enhanced transmissibility and tracks the frequency, emergence and spread of drug resistance mutations.

This study is the first to investigate transmission and drug resistance at high-level resolution using WGS in this setting. We reveal insights into heterogeneity of transmission and emerging drug resistance that may have implications for TB control efforts in different regions of Nepal.

TBS-EP-37 Drug resistance and genotypic profiling of M. tuberculosis strains in Uganda

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Background: Molecular epidemiological data plays a central role in assessing TB management policy outcomes in countries that have made strides in controlling TB. IS6110 restriction fragment-length polymorphism (IS6110-RFLP), mycobacterial interspersed repetitive unit–variable-number tandem repeat (MIRU–VNTR) analyses, and whole genome sequencing (WGS) are key tools for investigating the transmission or reactivation of active TB. Although phenotypic drug susceptibility testing (DST) remains the „gold standard" for diagnosing drug-resistant (DR) mycobacterium infections, these molecular tools have proven superior in determining prevalent strains and susceptibility status.
This underscores the need to employ advanced molecular techniques at the Uganda National TB Reference Laboratory (NTRL) to characterize MTB clusters and improve patient-centered treatment quality and outcomes.
Methods: In this cross-sectional study, 72 *Mycobacterium tuberculosis* strains were initially run on the phenotypic culture assay at the NTRL and then sub-cultured at the Korean Institute of Tuberculosis. From the 64 culture strains selected for genotyping techniques, ten representative strains were analyzed on the Illumina sequencing platform to obtain in silico spoligotyping and MIRU-VNTR data. IS6110-RFLP analysis revealed 8 clusters, indicating possible dominant strains among the affected population. WGS provided additional insights into drug resistance status, information not captured by the phenotypic DST.
Results: Despite the limited sample size, the data highlighted a high clustering rate, suggesting active transmission and indicating geographical variation. This emphasizes the need for targeted intervention strategies to areas with high transmission risks.
Conclusion: Molecular typing techniques at the NTRL/SRL have proven instrumental in establishing the prevalence and genetic diversity of Mycobacterium tuberculosis strains, along with identifying dominant strains. Urgent prioritization should be given to areas with high transmission risks to align with the ENDTB Strategy and optimize TB management.

TBS-EP-38 Classification of unsequenced M. tuberculosis strains in a high-burden setting using a pairwise logistic regression approach

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Background: In virtually all studies of *M. tuberculosis* transmission, a sizable fraction of individuals with notified tuberculosis cannot be included, either because they do not have culture-positive disease or because molecular typing resources are limited. A recent study (Susvitasari K et al., Microbial Genomics 2023) introduced a regression-based approach for inferring the membership of untyped tuberculosis cases into whole genome sequencing (WGS) defined transmission clusters based on easily observed host demographic data.
Approach: We apply a pairwise logistic regression (PLR) model to clinical and spatial data from the Republic of Moldova to predict cluster membership. We randomly select subsets of sequenced isolates to train and test models for prediction using all data that have no missingness in predictor variables (age, gender, homelessness, history of incarceration, urban residence, and *regiune)*. We repeat this approach using different genomic distance thresholds for defining transmission clusters.
Results: With a relatively small genomic distance threshold for defining a transmission cluster (maximum patristic distance equivalent to ~ 40 SNPs), we found that the PLR model can only predict the true cluster membership for each case with a mean accuracy of 9%.
Adoption of a larger genomic distance threshold for defining a transmission cluster (~ 80 SNPs) results in a smaller number of clusters (each of which have more members) and produces modest improvements in predictive performance.
Conclusion: The PLR approach does not allow for robust cluster membership prediction for unsequenced *M. tuberculosis* strains in Moldova based on the covariates we were able to include these models. The large number of co-circulating strains in this type of epidemiological setting makes cluster prediction a more difficult challenge than in settings where a smaller number of strains are circulating among distinct population subgroups.

TBS-EP-40 Analysis of M. tuberculosis genomes from TB Portals database identifies genomic variants associated with efflux pumps involved in bedaquiline resistance

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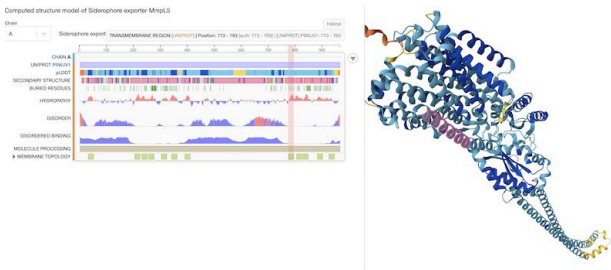
Efflux pumps in Mycobacterium tuberculosis (M. tb) are increasingly recognized for their role in conferring drug resistance, especially to second- and third-line antibiotics. These membrane proteins actively transport a variety of substrates, including antibiotics, out of the bacterial cell, thereby reducing intracellular drug concentrations to sub-lethal levels.

This mechanism facilitates the survival of M. tuberculosis under antibiotic pressure, contributing to the emergence of multidrug-resistant (MDR) and extensively drug-resistant (XDR) tuberculosis. Recent studies have identified several efflux pump genes that are overexpressed in drug-resistant strains.

Progress in AI-based 3D structures prediction allows to analyze entire proteomes of pathogens, including efflux pumps in M.tb. Mapping the genomic variability onto structures of proteins, overexpressed in drug-resistant strains, may suggest resistance mechanisms and identify promising targets for novel tuberculosis drugs.

The TB Portals Program, an international initiative involving 19 countries, has made significant contributions to the genomic analysis of M. tuberculosis. The program has sequenced over 6,500 genomes from more than 6,000 patients, particularly from regions with high DR-TB burden. TB Portals database includes detailed information on resistance profiles and clinical treatments, facilitating metadata-guided GWAS analyses.



In this study, we compared the genomic sequences of drug-sensitive strains with those of MDR and XDR strains, focusing on eight known efflux pumps overexpressed in the presence of Bedaquiline. Mutations in two genes Rv0676c (p.Thr794Ile, p.Asp767Asn) and Rv1634 (p.Gly198Arg) were most significantly associated with drug-resistant strains. All identified SNPs were mapped onto corresponding AlphaFold protein models for further analysis.

Another interesting mutation was identified in the intergenic region between genes Rv1818c and Rv1819c, within an inverted repeat potentially involved in gene regulation.

TBS-EP-41 Enhanced extrapulmonary TB diagnosis in body fluids using nanoplate digital PCR

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Background: Extrapulmonary tuberculosis (EPTB) accounts for 15-20% of all TB cases in India, posing significant diagnostic and therapeutic challenges due to a high proportion of smear- and culture-negative cases. Traditional diagnostic tests are often time-consuming and have low sensitivity. Digital PCR (dPCR), a novel third-generation technology, provides excellent performance in the absolute quantification of low levels of nucleic acid and demonstrates resistance to inhibitors.

Methods: A total of 133 clinically suspected body fluid samples (Ascitic, Pericardiac, Synovial, CSF, Peritoneal fluid etc) were included in this study. EPTB diagnosis was performed through culture and analysed for smear microscopy, Adenosine Deaminase (ADA) test and GeneXpert. DNA was extracted from these samples using the QIAamp DNA extraction kit (© QIAGEN) and quantified using nanoplate based QIAcuity dPCR System (© QIAGEN), targeting the IS6110 gene for MTB, with the ERV3 sequence as an internal control[1].

Results: In this study of 133 clinically suspected cases, comprising 56 females and 77 males with mean ages of 42.11 and 48.16 years respectively, all samples were analysed in duplicates. Each sample exhibited ≥ 25,000 valid partitions. Control samples (NTC, NC, and PC) were run in duplicate to establish the initial cutoff and threshold for both genes. Based on these criteria, 33 samples were positive, while 100 were negative. Out of 33 positives, four samples were GeneXpert positive, one was culture positive, and seven were ADA positive.

All negative samples were confirmed negative by GeneXpert, culture, and ADA tests. The least concentration of target gene quantified was 31.92 cp/mL, whereas few samples with target gene quantified 80 cp/mL were found positive with Xpert-RIFUltra.

Conclusion: EPTB body fluids are paucibacillary, potentially leading to missed diagnoses with Xpert-RIFUltra. However, digital PCR can enhance diagnosis by detecting even low quantities of DNA in body fluid samples.

TBS-EP-43 Improved treatment outcomes for people with multi-drug-resistant TB without prior anti-TB treatment: A nine-year cohort study in Shanghai

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Objective: This retrospective cohort study aimed to examine the clinical features and treatment effectiveness among newly diagnosed patients with multidrug-resistant or rifampicin-resistant tuberculosis (MDR/RR-TB). The goal was to furnish crucial insights into this distinct patient cohort and suggest potential refinements to current treatment approaches.
Methods: This nine-year cohort study was conducted in Shanghai, comprising a cohort of 668 patients diagnosed with MDR/RR-TB, all of whom were included in the final analysis. The study compared demographic and clinical characteristics between newly diagnosed and retreatment MDR-TB groups. Various parameters such as treatment outcomes, sputum culture conversion rates, radiological changes, adverse reactions, and relapse rates were evaluated. Both univariate and multivariate analyses were conducted to identify factors influencing treatment outcome.
Results: The study encompassed 668 patients, comprising 300 newly diagnosed and 368 retreatment MDR/RR-TB cases. Notably, newly diagnosed patients exhibited a higher treatment success rate compared to retreatment patients (82.33% vs. 66.03%, p<0.001). Additionally, newly diagnosed patients demonstrated a superior sputum culture conversion rate and more pronounced radiological improvement compared to retreatment patients. Conversely, adverse reactions were more prevalent among retreatment patients. Factors contributing to treatment success encompassed newly diagnosed status, younger age, and a smaller extent of lung lesions.

MDR-TB of treatment outcomes	Newly diagnosed MDR(n = 300)		Re-treated MDR(n =368)		P value
	No.	%	No.	%	<0.001
Cured	126		179	48.64	
completed treatment	121	40.33	64	17.39	
Failed treatment	18	6	54	14.67	
Death	19	6.33	33	8.97	
Lost to follow-up	16	5.33	38	10.33	
Treatment success (Cured +completed treatment)	247	82.33	243	66.03	

Table1: Summary of Treatment Outcomes for Newly Diagnosed and Retreatment MDR-TB.

Conclusion: Newly diagnosed MDR/RR-TB cases have shown significantly better treatment outcomes compared to retreatment cases, underscoring the pressing need for reevaluation and optimization of management approaches. Urgent, targeted interventions are essential to tackle the rising transmission of MDR/RR-TB. These interventions are pivotal in reversing the concerning trend of MDR-TB transmission and effectively addressing this substantial public health concern.
Keywords: MDR/RR-TB, treatment outcomes, clinical characteristics, drug resistance.

TBS-EP-44 Whole-genome sequence data and TB transmission: Understanding transmission paths

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Improving TB control may require understanding transmission and its variability across pathogen and host heterogeneity. Whole-genome sequence (WGS) data is well-placed to help achieve this high-resolution characterization of transmission. However, in transmission clusters, and in scenarios where a new strain is spreading rapidly, there may be many isolates that are extremely closely related.
This complicates interpretation of WGS data because (1) there may be insufficient genetic variation to robustly define a phylogenetic tree, and such trees are a key tool in understanding the emergence and spread of resistance (among other things) and (2) there are too many closely-related pairs to infer that direct transmission events occurred among individuals with very closely-related TB isolates.
We introduce and apply a Bayesian method for simultaneous construction of phylogenetic trees and transmission networks using WGS data from TB isolates. The method uses a transmission process that accounts for latency, and a separate hazard for sampling. It allows for unknown individuals with active TB who are "ancestral to the sample" (i.e. are in transmission chains that ultimately gave rise to a sampled individual case). Finally, it accounts for the fact that individuals may harbour diverse TB infections. We adopt a flexible statistical approach that can account for pathogen variability in the hazard of transmission. We analyze clusters of transmission from the Republic of Moldova, where the recent emergence of a Ural lineage MDR strain has been documented, and from Malawi, where there is limited drug resistance but where HIV impacts TB. We compare our inferred phylogenetic trees, dynamics of unsampled cases, and transmission dynamics to those characterized by previous methods. We also compare to simplified approaches that we design for settings in which too few sequences are available for reconstructing transmission networks.

TBS-EP-45 Navigating dual mycobacterial infections in a kidney transplant recipient: A case of therapeutic adaptation and management challenges

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Background: The prevalence of Mycobacterium tuberculosis (MTB) and non-tuberculous mycobacteria (NTM) infections among kidney transplant recipients is significant due to their immunocompromised state. This case report describes a 42-year-old female with a 12-year history of kidney transplantation who developed acute appendicitis and subsequent dual mycobacterial infections. The therapeutic challenges and rationale for modifying her treatment regimen are discussed.

Case Presentation: The patient presented with severe lower right abdominal pain 9 months ago. Ultrasonography confirmed acute appendicitis, and she underwent an appendectomy. Histopathological examination revealed Mycobacterium fortuitum in the appendiceal tissue. Concurrently, a chronic wound on her leg was identified as infected with Mycobacterium tuberculosis. She was initially treated with the standard four-drug fixed-dose combination (4FDC) therapy.

Two weeks post-initiation of 4FDC, the patient experienced severe nausea and vomiting, along with a significant drop in tacrolimus levels. The treatment regimen was modified to include isoniazid, ethambutol, clindamycin, and moxifloxacin, while her other medications were continued. Following this modification, both clinical symptoms and the leg wound improved, and tacrolimus levels stabilized.

Discussion: The co-infection of MTB and NTM poses a significant therapeutic challenge, especially in immunocompromised patients such as those with kidney transplants. The initial use of 4FDC led to adverse gastrointestinal effects and disrupted tacrolimus levels, necessitating a regimen change. The modified regimen not only alleviated the adverse effects but also led to clinical improvement and stabilization of tacrolimus levels.

Conclusion: This case underscores the need for tailored tuberculosis treatment approaches in patients with comorbidities, particularly those on immunosuppressive therapy. Screening for latent tuberculosis infection is crucial in transplant recipients to prevent severe complications. Further research is needed to establish optimal treatment protocols for managing mycobacterial infections in this vulnerable population.

TBS-EP03 Fundamental advances in understanding pathogenesis | Part 1

TBS-EP-51 Immunogenicity of H56:IC31 vaccination for prevention of TB recurrence in HIV-negative adults successfully treated for drug-susceptible pulmonary TB

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Individuals with tuberculosis (TB) are at high risk of recurrent disease following successful treatment. A vaccine that can protect against recurrent TB would significantly contribute to control of the TB epidemic.

We conducted a randomized, double-blind, placebo-controlled phase 2b trial of H56:IC31 at 5 sites in South Africa, and 1 in Tanzania. HIV-negative adults aged 18-59 years who were treated for drug-susceptible TB were randomly assigned (1:1) to receive 2 doses of either H56:IC31 or placebo, 56 days apart.

A total of 831 participants were enrolled. The first 100 participants randomized at one site in South Africa and one in Tanzania were included in a vaccine immunogenicity sub-study: 50 participants per site. The primary immunogenicity outcome was antigen-specific T cell responses that expressed any combination of IFN-g, TNF, IL-2 and/or IL-17, measured at Day 0 or 14 days after the 2nd vaccination (Day 70) in each study arm by whole blood intracellular cytokine staining assay.

H56:IC31 vaccination induced significant increases in antigen-specific CD4 T cells expressing any combination of IFN-g, TNF, IL-2 and/or IL-17, CD4 T cells co-expressing IL-2 and TNF, and polyfunctional IFN-g^{+}IL-2^{+}TNF^{+} CD4 T cells, measured at Day 70. The fold change in H56-specific CD4 T cell responses, computed between Day 0 and 70 was significantly higher (fold change 3.8, q25 - q75 2.4 - 7.8) in H56:IC31 recipients than in the placebo arm. Frequencies of antigen-specific CD8 T cells were not modulated by vaccination.

We also assessed cytokine co-expressing subsets using COMPASS, confirming significantly higher responses at Day 70 relative to Day 0 in H56:IC31 recipients for IFN-g^{+}IL-2^{+}TNF^{+}, IFN-g^{+}TNF^{+}, IL-2^{+}TNF^{+}, IFN-g-only, IL-2 only, and TNF-only expressing CD4 T cells, relative to the placebo group. No differences between the sites were observed.

Taken together, H56:IC31 was immunogenic in patients who were successfully treated for drug-susceptible TB.

TBS-EP-53 M. tuberculosis-specific CFP-10/ESAT-6 CD4 and CD8 T cell non-IFN-γ responses are common in young Kenyan children despite low reported TB exposure

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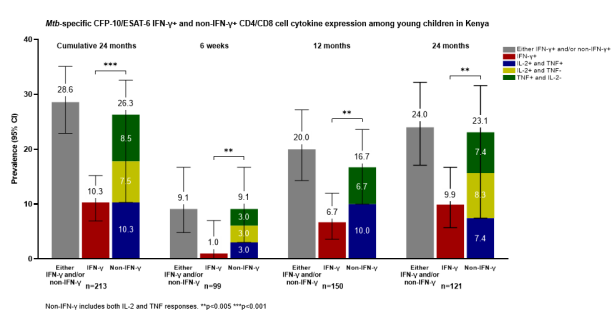
Background: *M. tuberculosis* (Mtb)-specific T cells producing non-IFN-γ cytokines may identify young children at risk for TB exposure, including HIV-exposed uninfected (HEU) and HIV-unexposed (HUU) children, who may be missed by IFN-γ release assays (IGRAs) due to potentially reduced early life IFN-γ production capacity.
Methods: PBMCs from children in Western Kenya with and without maternal HIV exposure collected at 6 weeks, 12 and 24 months of age were incubated overnight with Mtb-specific CFP-10/ESAT-6 peptide pool, and staphylococcus enterotoxin B (SEB, positive control). CD4 and CD8 T cell expression of IFN-γ, IL-2, and TNF were measured by flow cytometry. Probability of cytokine responses was estimated using Bayesian hierarchical mixture model approach (MIMOSA).
Results: Among 213 children, 28.6% had CFP-10/ESAT-6 CD4 and/or CD8 responses up to 24 months of age, which was similar regardless of HIV exposure (HEU 24.3% vs. HUU 16.1%, p=0.16). No children with positive CFP-10/ESAT-6 responses had a known TB exposure. More children exhibited non-IFN-γ+ CD4/CD8 (IL-2+ and/or TNF+) than IFN-γ+ responses (26.3% vs. 10.3%, p<0.001) (**Figure**), including 18.3% identified by non-IFN-γ+ responses alone (non-IFN-γ+ only 18.3% vs. IFN-γ+ only 2.4%, p <0.001). CFP-10/ESAT-6 cytokine responses in children were not associated with maternal IGRA positivity (overall 34.7%) or among HIV-exposed children, maternal ART (100%) or any prior maternal isoniazid preventive therapy (71.2%).
While children at 6 weeks of age were more likely to have non-IFN-γ+ CD4/CD8 responses to SEB than IFN-γ+ (96.3% vs. 77.8%, p=0.004), 100% of children had both IFN-γ+ and non-IFN-γ+ responses to SEB by 24 months of age.



Conclusion: Mtb-specific CD4/CD8 responses were common among young Kenyan children up to 24 months of age with and without HIV-exposure, despite rare known TB exposure. Non-IFN-γ+ cell cytokine expression identified more children with Mtb-specific responses than IFN-γ+ who would be potentially missed by commercially available IGRAs.

TBS-EP-54 Cerebrospinal fluid proteins and mortality of people with TB meningitis using unsupervised network analysis

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Introduction: Tuberculous meningitis (TBM) has high rates of mortality and neurological morbidity of despite corticosteroid therapy. This warrants better understanding of the immunopathology of this disease, to guide future therapy.
Methods: Pre-treatment cerebrospinal fluid (CSF) from HIV-uninfected adults with TBM from Indonesia (n=201, 40% female, 26% day-60 mortality) were used for a targeted discovery approach, measuring nearly 1,500 proteins with a proximity extension assay.
Proteins were clustered unsupervised by weighted correlation network analysis in a set of modules, annotated through over-representation analysis into biological networks.
Each model was summarised by the first component from principal component analysis. These module summary scores were then assessed for their associations with various clinical variables and, using Cox regression, for their relation to the primary outcome, 60-day mortality.

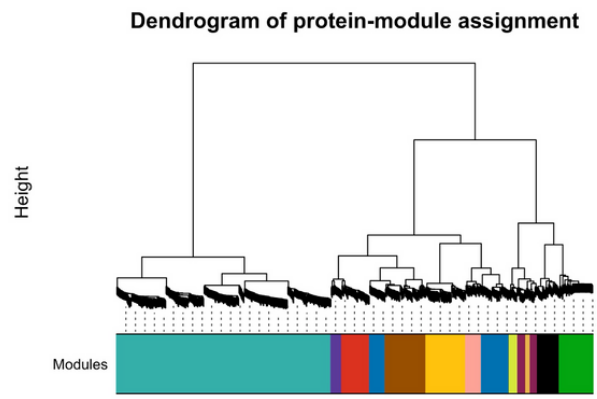

Figure: A diagram of a protein-module assignment.

Results: In the CSF, 1072 proteins were detectable, the majority higher in TBM patients than non-infectious controls. Twelve modules were found of which eleven had high within-module correlations. Using overrepresentation analysis five of the modules could be annotated. Two models, of which the first principal component showed a very high correlation (r>0.8) to CSF protein, were found to relate to cytokine-cytokine receptor interaction and coagulation respectively. Two other models were associated with day-60 mortality. These modules consisted of 97 proteins in total, one of which showed a sex-specific interaction with mortality. The association of these modules to outcome will be validated in 219 Vietnamese TBM patients after deblinding of the LAST-ACT trial (NCT03100786) in which they participate.
Discussion: The module analysis showed the powerful use of weighted correlation network analysis to reduce dimensionality in a biological meaningful way. Moreover, the modules provide insights in pathways that may play a role in TBM mortality. Next steps include exploring the use of information on functional interaction between proteins to strengthen the results obtained from WGCNA analysis.

TBS-EP-55 Utility of Xpert® MTB/RIF assay on formalin-fixed paraffin-embedded (FFPE) tissues in the diagnosis of extrapulmonary TB

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Background: In 2022, 10.6 million people worldwide are predicted to have contracted tuberculosis. The paucibacillary nature of extrapulmonary tuberculosis makes laboratory confirmation of this illness difficult (EPTB). The gold standard for tuberculosis laboratory diagnosis, the classic method of detecting Mycobacterium tuberculosis involves culture isolation and is required for confirmation of diagnosis.
But in cases where formalin-fixed biopsy materials are inappropriate for Mycobacterial culture, histological examination is used to make the diagnosis.
Aim: Using histological characteristics from hematoxylin and eosin staining as the gold standard, the study objectives were to show off the potential usefulness of Xpert MTB/RIF and evaluate its efficacy in comparison to Ziehl-Neelsen (ZN) staining for the diagnosis of Mycobacterium tuberculosis from FFPE tissues.
Methods: he study included 103 randomly chosen FFPE tissues that showed tuberculosis-related histological characteristics. Xpert® MTB/RIF assay was performed on all tissue specimens following deparaffinization and lysis. Proportions of cases that each test positively detected served as the outcome measures.
Results: About 33 FFPE samples (32% of the total) tested positive for gene Xpert out of 103 samples. The majority of the tissue samples that tested positive were lymphatic tissue (78.8%), which was followed by renal tissue (9%). All were sensitive to rifampicin. ZN stain, however, identified acid fast bacilli (AFB bacilli) in 8 (7.8%) of the samples. In this investigation, the yield rose more than three times when gene xpert was used instead of ZN stain alone.
Conclusion: Genexpert can be used on FFPE samples suspected of tuberculosis to achieve a high positivity detection rate, which may not be possible if only subjected to ZN stain alone.

TBS-EP-56 Increased innate immune and neutrophil blood transcriptomic signatures associate with poor outcome in HIV-1 TB meningitis

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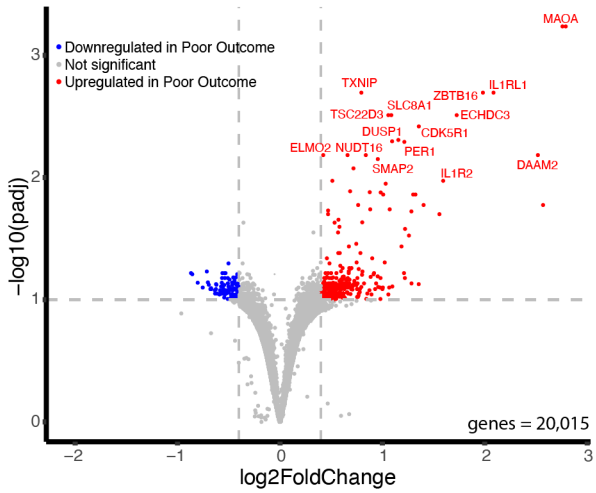
Tuberculous meningitis (TBM) causes death in up to 50% of people living with HIV, and a third of survivors suffer persistent neurological disability. Mortality and morbidity are contributed to by immune dysregulation, and adjunctive anti-inflammatory therapies are required to modulate this response to improve outcome. Developing such therapies relies on improved understanding of the host immune response during TBM.
To investigate this response, we performed RNA sequencing on 125 blood samples at diagnosis and at three timepoints during treatment from 42 adult TBM patients living with HIV in Cape Town.
A large proportion of differentially abundant genes (referred to as DEG) that decreased over time mapped to B cells, reflecting polyclonal activation associated with disseminated HIV-TB. The top DEG across timepoints were *TLR10*, *ADAMTS2*, *CD177* and *MZB1*; levels of which also decreased over time.

Disability or death at day 56 was characterised by increased baseline expression of genes associated with innate immunity, neutrophils, cytokines (TNF, IL-1, IL-6, IFN-γ), and toll-like receptor signalling in functional enrichment analysis. The top DEG separating poor versus good outcome were *ZBTB16*, *IL1R1*, *MAOA and ECHDC3,* which relate to inflammasome assembly, IL-33 signalling, neurotransmitter breakdown, and T cell inhibition, respectively (Figure).



Data-driven weighted gene co-expression network analysis (WCGNA) revealed modules associated with good (MEblack) and poor (MEyellow) outcomes. Genes within these modules corroborated findings from enrichment analysis in patients with poor outcome, additionally associating improved outcome at day 56 with upregulated CD8 T cell signalling.

These data reveal distinct associations for the innate response in the induction, and a switch from B to T cell in the broad function of the adaptive systemic immune response in resolution, relating to disability and death in HIV-TBM. Further analyses of the cerebrospinal fluid transcriptome of TBM patients are ongoing to investigate whether these findings also characterise the disease compartment.

TBS-EP-57 Integrating clinical trial data to validate the efficacy and safety profile of Cy-Tb, a new TB skin test

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Tuberculosis (TB) presents a public health burden with 229,000 people falling ill in the WHO European region in 2022. This is expected to rise with ongoing geopolitical crises. Cy-Tb (also known as C-Tb) is a skin test consisting of two *Mycobacterium tuberculosis* (Mtb) specific recombinant proteins, rdESAT-6 and rCFP-10. Seven clinical trials were conducted in Europe and South Africa to assess Cy-Tb's safety and efficacy.

A post hoc analysis of the pooled data assessed the diagnostic performance of Cy-Tb in comparison to purified protein derivative RT 23 SSI (PPD) and QuantiFERON®-TB Gold In-Tube Test (QFT).

Sensitivity of Cy-Tb (78.3%; 95% confidence interval [CI]: [74.0-82.5]) was higher than QFT (68.5% [64.3-72.6]) and similar to PPD (85.4% [81.8-89.1]) as estimated in a microbiologically confirmed TB positive population. Specificity of Cy-Tb (92.8% [90.2-95.5]) was similar to QFT (89.5% [86.3-92.6]) and PPD (90.7% [87.5-93.9]) in a population with no TB.

In a population in close contact with TB patients, paired analysis of Cy-Tb versus PPD (43% versus 44.3%) and Cy-Tb versus QFT (43.8% versus 42.1%) revealed analogous positivity rates. Cy-Tb's impact on diagnostic thinking aligns with PPD and QFT both in low and high prevalence contexts.

Moreover, Cy-Tb is advantageous over PPD and QFT in terms of technical performance: it circumvents blood draws, employs a single cut-off and does not require complex laboratory infrastructure.

The safety profile of Cy-Tb is based on data from 2,960 subjects (32 days to 76 years old) in the 7 clinical trials and was similar to PPD.

With its beneficial characteristics, Cy-Tb is a safe test to diagnose Mtb infection, including disease, across different age groups, making it a potentially pivotal part of TB control programs.

TBS-EP-58 Exploitation of ALOX5 signalling pathway improves therapeutic treatment of TB induced lung damage

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Tuberculosis remains one of the major global health challenges with those previously exposed presenting persisting pulmonary complications. Therefore, improved control measures are still required to prevent or reduce TB induced lung damage in affected individuals.
Strategies (HDTs) that exploit target host factors, have been suggested to improve on current treatments against TB. Recently, proteomic data from a recent study by Marakalala (2016) has suggested a potential role for proteins which metabolizes the arachidonic acids during TB disease progression.
We, therefore, sort to demonstrate the potential role of one of these host factors (ALOX5) in contributing to TB-induced immunopathology. Using immune-histopathological assays, we have shown the macrophage driven ALOX5 pathway to associate with severe pulmonary immunopathology during the onset of the disease. Furthermore, using both *in vitro* and *in vivo* assays, our data demonstrated that ALOX5 signaling contributes to TB-induced granulomatous inflammation.
Pharmaceutical interception of the signaling pathway resulted in reduced granuloma lesions during the infection. Lastly, the resolution of TB-induced lesions further contributed to increased bactericidal activity. Taken together, our data suggest a key role for ALOX5 pathway which can be targeted for the development of therapeutic strategy to prevent exacerbated TB-induced lung damage.

TBS-EP-59 Dysfunctional effector memory CD8 T cells in the bronchoalveolar compartment of people with uncontrolled HIV in the setting of latent TB infection

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Background: HIV increases susceptibility to tuberculosis (TB) and other respiratory pathogens, yet the underlying immunological mechanisms are not fully understood. This study aimed to utilize transcriptomics and flow cytometry to evaluate the effects of HIV on host immunity against respiratory pathogens, including TB, at the site of TB exposure (lung mucosa).
Methods: The study included 37 pairs of bronchoalveolar lavage (BAL) and peripheral blood samples from non-smoking and otherwise healthy adults from KwaZulu-Natal, South Africa with (n=14, antiretroviral naïve) and without HIV (n=23), all with confirmed „latent TB infection" (QuantiFERON positive) but no active or prior of TB.
A subset (n=10 HIV-negative and 10 HIV-positive) underwent compartment-specific bulk transcriptomics analysis, focusing on differentially expressed genes (DEGs) and the expression of validated transcriptional modules that reflect the relative frequency of immune cell subsets. Bioinformatic analyses were complemented by flow cytometric assessment of T cells, quantifying surface expression of regulatory proteins and intracellular cytokine production.
Results: Transcriptional profiling revealed compartment-specific enrichment of immunological transcripts. In the blood of people living with HIV, there was an increase in DEGs associated with cell proliferation and type I and type II interferon cytokine activity. Conversely, BAL samples showed elevated expression of CD8 T cell-associated genes, and specific transcriptional modules confirmed an increased frequency of effector memory CD8 T-cells in BAL of HIV seropositive individuals.
Functional studies revealed reduced induction of CD8 T-cell-derived IL-17A, a protective cytokine early in TB infection, in both compartments in individuals with HIV, associated with elevated expression of T-cell regulatory molecules.

Conclusions: Our data suggest that dysfunctional CD8 T-cell responses in uncontrolled HIV may contribute to impaired respiratory immunity to pathogens, including TB. This dysfunction could be modulated by host-directed therapies targeting CD8 T cell effector functions.

TBS-EP-60 Blood and urine early treatment response biomarkers in HIV-associated TB: A prospective cohort study

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Introduction: Treatment response biomarkers are needed in the clinical care of patients hospitalized with HIV-associated tuberculosis who are at high risk of early mortality. We describe the reduction in the bacillary load during early treatment using semi-quantitative measures of *Mycobacterium tuberculosis* in blood and urine.
Method: We collected serial blood and urine samples pre-treatment, day 1, 3, 7 and 14 in consenting adult patients with HIV testing urine Alere lipoarabinomannan (LAM) positive and admitted to Mitchells Plain Hospital, Cape Town. We quantified *Mycobacterium tuberculosis* using urine Alere LAM, urine and blood GeneXpert MTB/RIF Ultra (Cepheid, Sunnyvale, USA)-Xpert Ultra; and mycobacterial blood culture after blood lysis and wash to remove antibiotic carry-over. Survival analysis and mixed-effects modeling were used to determine time to *Mycobacterium tuberculosis* clearance and to give the predicted probability of a positive test at the different timepoints, respectively.
Results: 16 participants median age 39 years (IQR 36-43), CD4 count 27 cells/mm^3 (IQR 8-83) and predominantly male (68%) were included. Five (31%) participants died within the first week of hospitalization. At day 14, urine LAM, urine Xpert Ultra and blood Xpert Ultra remained positive in 83% (44-99), 86% (49-99) and 75% (41-93) of participants, respectively **figure 1**. There were no positive mycobacterial blood cultures at day 14. A mixed-effects model predicted a decline in ordinal values of urine Xpert Ultra (cycle threshold), blood Xpert Ultra (cycle threshold) and blood culture (time-to-positivity) in response to anti-tuberculosis treatment. Conversely, urine LAM grade intensity increased over the 14 days.

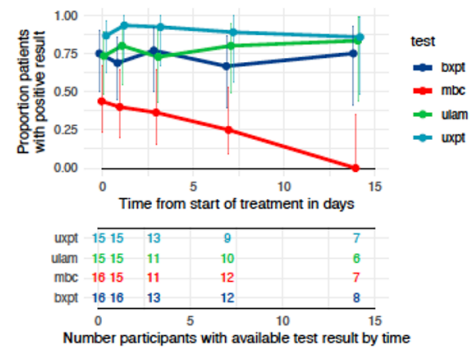

Figure 1: Kaplan-Meier curves showing proportion of patients positive by measures of *Mycobacterium tuberculosis* with 95% confidence interval at 5 timepoints. bxpt – blood Xpert Ultra, mbc– mycobacterial culture, ulam – urine LAM, uxpt – urine Xpert Ultra.

Conclusion: *Mycobacterium tuberculosis* DNA is detectable in urine and blood in decreasing quantity up to 14 days of standard treatment in patients with HIV-associated tuberculosis. Urine Alere LAM shows an increasing grade intensity during this period. Further research in larger groups and extended periods are needed to assess clinical outcomes.

TBS-EP-61 Granuloma Like Structure, a new model for evaluating the efficacy of anti-TB drugs as an alternative to macrophage monolayers

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Tuberculosis (TB) still represents one of the worst scourges for humanity. Even if important steps towards its control have been made in recent years, the emergence of multidrug-resistant strains of *Mycobacterium tuberculosis* (*Mtb*) jeopardize this success. Consequently, the development of new effective anti-mycobacterial drugs represents an important goal for global health. In this scenario, the development of experimental models that allow new drug candidates to be evaluated more effectively is urgently needed.
Macrophage monolayers are often used to evaluate anti-mycobacterial drug's efficacy. However, during infection *Mtb* resides in granulomas, which represent the hallmark of TB infection. In the granulomas *Mtb* becomes drug tolerant, probably due to impaired drug penetration and reduced growth rates in this environment. To date, the study of drug efficacy in *in vitro* granulomas has been

challenging and there is a lack of models reporting both growth dynamics and drug penetration.
We present initial developments of an integrated *in silico* and *in vitro* approach to create a novel Granuloma-Like Structure (GLS) model for anti-tuberculosis drug testing (Figure 1).

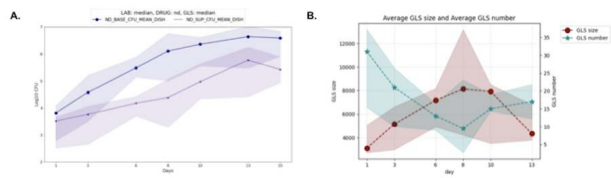

Figure 1. (A) *Inter-laboratory GLS variability.* Aggregate data of CFU count from three laboratories are shown for the no-drug condition. We report viable counts (CFU) both in the base and in the supernatant of the GLS. **(B)** *GLS number vs GLS size.* An inverse relationship is observed. GLS size peaks at days 6-8 quantitatively suggesting day 7 as the optimal drug addition time point.

Monolayers and GLS used for each experiment derive from PBMCs of the same donor and each experiment is repeated with PBMSs from at least 3 donors. Assays can last up to 2 weeks allowing drug evaluation up to 7 days. Output data includes: (i) longitudinal viable counts after drug's exposure and (ii) drug's kinetics of intracellular penetration, coupled to a semi-automated *in silico* model to analyze GLS formation, establishing relationships between size and number.
Our study forms the foundations for the development and calibration of a novel agent-based model to complement other experimental outcomes, thereby facilitating the assessment of drug efficacy under different physiologically relevant scenarios.
This project receives funding from the Innovative Medicines Initiative 2 Joint Undertaking (JU) under grant agreement No 853989.

TBS-EP-62 Unravelling the pathogenesis of post-TB lung function impairment through serum proteomics

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The underlying pathology of post-tuberculosis lung disease (PTLD) still remains elusive, hindering the development of novel treatments. One major challenge is the severe impact of tuberculosis (TB) on the immune system, obscuring the subtle mechanisms leading to lung impairment. Furthermore, the same immune mechanisms used to combat TB might contribute to long-term lung damage.
To address this, we studied changes in serum protein expression from diagnosis to the end of treatment to disentangle these mechanisms in the TB Sequel cohort.
We conducted targeted proteomic analyses using the Olink Target 96 Inflammation and Organ Damage Kits on serum samples from 70 Tanzanian participants at TB diagnosis and at the end of treatment, along with 31 additional participants from Mozambique at diagnosis. Lung function impairment was categorized using spirometry, specifically FEV1, FVC, and FEV1/FVC.
Our results identified 23 out of 184 measured proteins significantly differentially regulated (FC >1, $p<0.05$) over the treatment course. These were mainly inflammatory proteins, involving key pathways in cytokine and interleukin signalling, IFN-gamma signalling, and signal transduction (via MAP kinase, JAK-STAT, and receptor tyrosine kinases). Unsupervised classification using Bayesian and Random Forest algorithms identified 3 or 22 proteins that could distinguish TB disease from cure with 92% sensitivity and specificity of 94% or 100%, respectively.
Although differential protein expression in participants with lung function impairment post-treatment was subtle, significant differences were observed. At baseline, key pathways involved chemokine and G-protein coupled receptor (GPCR) binding and signal transduction mainly via receptor tyrosine kinases, and GPCRs. At six months, interleukin signalling (notably IL-10 and IL-12), MAPK signalling, and chemokine and GPCR binding were predominant. No classifier was identified.

In conclusion, our findings provide insights into the complex immune response dynamics in PTLD. Further analysis might highlight potential biomarkers and therapeutic targets for managing long-term lung impairment in TB patients.

TBS-EP-63 Single-cell immunometabolic profiling of peripheral blood from people with M. tuberculosis and M. abscessus

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Background: *Mycobacterium tuberculosis* (MTB) and *Mycobacterium abscess* (MAB) are the most common pathogenic mycobacteria, and the incidence of lung infections caused by these pathogens is increasing. The pathogenesis and progression of mycobacterium are closely related to the metabolic state of host immune cells, and yet detailed disease-associated alterations in the immune-metabolic landscape remain to be revealed.
Methods: A total of 9 healthy donors, 11 patients with MAB lung infection and 9 patients with MTB lung infection were included in the present study. Multi-dimensional data of immune cell metabolism were obtained using CyTOF (cytometry by time of flight), a technique that allows simultaneous measurement of multiple markers in single cells.
Results: PBMC were classified as CD4+ T, CD8+ T, DNT (CD3+CD4-CD8-double negative T cells), NK (natural killer), B, DC (dendritic cells), M-MDSC (monocytic myeloid derived suppressor cells), G-MDSC (granulocytic myeloid derived suppressor cells) and monocytes. PFKFB3 (Phosphofructokinase 3) and GAPDH (3-phosphoglyceraldehyde dehydrogenase), key enzymes of glycolysis, were significantly decreased in CD4+ T, CD8+ T, DNT, NK and B in both the MAB and MTB groups than in the healthy group ($P<0.05$). CPT1A (Carnitine palmitoyltransferase 1), a key enzyme in fatty acid oxidation, was also significantly decreased in CD4+ T, CD8+ T, DNT, NK, and B in that MAB and MTB groups than in the healthy group ($P<0.05$).
Moreover, the rate-limiting enzyme of the tricarboxylic acid cycle, IDH1 (isocitrate dehydrogenase), was significantly decreased in CD4+ T, CD8+ T, DNT, NK, B, DC, M-MDSC, and G-MDSC in both MAB and MTB groups compared to the healthy group and was significantly lower in the MTB group compared to the MAB group ($P<0.05$).
Conclusion: Rate-limiting enzymes of glycolysis, fatty acid oxidation and tricarboxylic acid cycle are significantly decreased in peripheral blood immune cells, especially non-myeloid cells, in MTB and that MAB-infected individuals.

TBS-EP-64 Age-related impairment in host-response and compensatory mechanisms in HIV-associated M. tuberculosis sepsis

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Older patients with HIV-associated tuberculosis have poor outcomes similar to those with bacterial sepsis. Mortality in HIV-TB is associated with higher disseminated bacillary load and inflammatory host response. Age is associated with mortality independent of these variables. We hypothesised that age-related impairments in compensatory mechanisms associated with HIV-TB might explain this finding.
This study assessed physiological host-responses in a cohort of inpatient adults (³18 years) with HIV-TB by extended microbiological reference standard in Khayelitsha Hospital, Cape Town. We used regression modelling to assess if multivariable associations in observed data were consistent with specific causal hypotheses. These hypotheses were derived from clinical understandings of physiological systems thought to be important in host response to infection.
534 patients had HIV-TB were included. The median age was 36 years (IQR 31-44), median CD4 56 count cells/mm³ (IQR 20-115) and predominantly female (52%). Age was associated with mortality (OR 1.6 per 10-year increase CI 1.3-1.9, $p<0.001$), but not with bacillary load or lactate. Temperature had a negative correlation with age ($R = -0.14$, $p = 0.002$) and a positive correlation with bacillary load ($R = 0.19$, $p=0.004$). Older patients had lower temperature for a given bacillary load ($p=0.02$ for interaction). In addition, lower temperature was strongly associated with mortality after adjusting for bacillary load (figure 1).
Age was independently and positively associated with pCO2 after adjusting for bicarbonate and renal function, suggesting that for a given level of metabolic acidosis, older patients have less respiratory compensation.

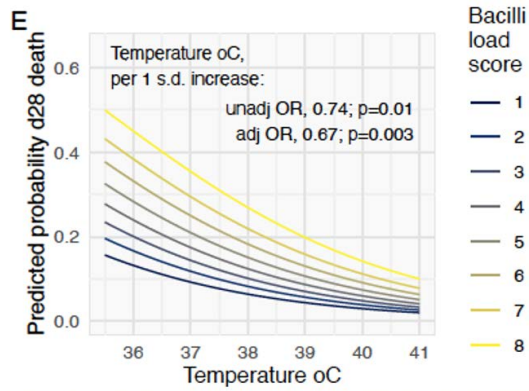

Figure 1: Predicted probability of day 28 mortality (y-axis) by temperature (x-axis) adjusting for bacillary load. unadj OR – unadjusted odds ratio, adj OR – adjusted odds ratio.

Conclusion: We report mechanisms of how age maybe associated with decompensated physiological responses to severe HIV-TB: (1) inappropriately blunted fever response to bacillary load; (2) impaired respiratory compensation for metabolic acidosis. Such mechanisms may explain the association of age with mortality in severe HIV-TB. Older patients might require different supportive and host directed therapies and monitoring strategies.

TBS-EP-65 The altered differential genome-wide DNA methylation profile of peripheral blood mononuclear cells in pulmonary TB

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Introduction: In the context of infectious diseases, emerging evidence suggests that epigenetic alterations, particularly DNA methylation changes in host genes, play a pivotal role in modulating immune responses. This study aimed to investigate the role of DNA methylation in the progression of pulmonary tuberculosis (PTB) by assessing differential genome-wide methylation profiles of peripheral blood mononuclear cells (PBMCs) of pulmonary TB patients.
Methods: Whole-genome bisulfite sequencing was employed to analyze DNA methylation patterns in PBMCs obtained from PTB patients, healthy controls, and diseased controls (n=4 per group). Bisulfite conversion, library preparation, and sequencing were performed, followed by differential methylation analysis. Gene set enrichment analysis identified differentially methylated regions (DMRs), which were subsequently validated using Sanger sequencing. Further in sillico gene expression analysis was used to investigate the mRNA expression of validated DMRs.
Results: Comparative analysis revealed significant differential methylation between TB patients and both healthy controls (Hypermethylated=2203; Hypomethylated=2466) and diseased controls (Hypermethylated=1756; Hypomethylated=1886). Gene enrichment analysis highlighted DMRs associated with immune responses, particularly T cell functioning and T cell-mediated immune processes. Notably, eight DMRs (TAF8, FZD5, HLA-DRB, MIR483, PVRIG, SH2B2, ZAP70, TNFRSF13C) were consistently identified across comparisons. Validation of selected eight DMRs confirmed their differential methylation patterns across study groups and in sillico gene expression analysis revealed downregulation of the respective genes at mRNA level.
Conclusion: The altered DNA methylation profile of PBMCs in PTB patients, suggests aberrant methylation in regions is crucial for regulating genes expression of T cell immune responses related genes during active disease onset. These findings contribute to understanding the epigenetic mechanisms underlying TB pathogenesis and may offer insights for developing targeted therapeutic interventions.

TBS-EP-66 Optimal processing of tongue swab samples for M. tuberculosis detection by the Xpert MTB/RIF Ultra assay

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Tongue swabs (TS) hold promise as simple alternatives to sputum for molecular detection of pulmonary tuberculosis (TB); however, TS-based diagnostic performance has been inconsistent, perhaps due to differences in sample processing methodologies. Several studies have reported low sensitivity when TS were processed with Xpert Sample Reagent (SR) using the existing sputum based Xpert MTB/RIF Ultra (Ultra) protocol.
However, unpublished studies that replaced SR with heat inactivation in TE buffer, to improve the Mtb detection sensitivity, report over-pressurization errors in Ultra cartridge. We assessed the performance of the Xpert MTB/RIF Ultra assay with methods that utilize SR buffer diluted at various concentrations in Tris-EDTA-Tween (TET) using contrived TS samples. TS were collected from TB negative volunteers, placed in 700 ul of buffer spiked with 0 to 336 colony forming units (CFU) of *Mycobacterium tuberculosis* strain H37Rv mc^{2}6230 and subjected to five processing methods for 10 min.
For method 1 – 4, processed samples were then added to 1.5 ml TET and tested with Ultra. Swabs processed in TET using the heat-based protocol had the highest LOD (77.6 CFU; 95% CI 51.2 -104.0). TS processed with 1:1 SR to TET had the lowest LOD (per 700 ul of buffer) at 22.7 CFU (14.2 - 31.2) CFU, followed by 2:1 SR to TET at 30.3 (19.9 - 40.7) CFU and neat SR at 30.9 (21.5 - 40.3) CFU.

Swabs processed with method 5 in TET and then added to 1.5 ml of 1:3 SR to TET had an intermediate LOD of 57.1 (42.4 - 71.7) CFU. No over pressurization-errors were observed.
Comparable performance occurred with PBS as an SR diluent. Our diluted SR-based TS processing approach improved the performance of Xpert Ultra testing, without needing additional equipment for heating. Clinical studies are needed to confirm the potential of this approach in diagnosing pulmonary TB.

TBS-EP-67 Systemic MMP-8 RNA expression upregulated in children with TB meningitis and associated with infarcts and hydrocephalus

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Background: Disease in tuberculous meningitis (TBM) is driven by the host-inflammatory response to *M. tuberculosis*. Little is known about the link between systemic inflammation and intracranial pathology. We explored the relationship between systemic inflammatory mediators and brain imaging features of TBM.
Methods: This was an exploratory study. Children were prospectively enrolled between Feb 2021 and Aug 2023. TBM cases comprised of children enrolled in SURE (ISRCTN40829906). Baseline brain MRI were taken from 30 children of whom 19 had whole blood RNA sequences available. Gene expression counts of a 10-gene panel were extracted: matrix metalloproteinases (MMP-8, MMP-9, TIMP-1), pro-inflammatory cytokines (IL-10, IL-1b, TNF-a, IFN-g), growth factors (VEGF), and neuromarkers (S100B and ENO2). Reported MRI features included hydrocephalus, basal meningeal enhancement, infarcts and tuberculomas.
Results: Twenty-one of thirty (70%) children with TBM had grade 1 disease. Twenty-six (87%) had abnormal MRI scans. The most common abnormality was cerebral infarcts (19 [63%]) followed by hydrocephalus (18 [60%]), tuberculoma (9 [30%]), and meningeal enhancement (8 [27%]). MMP-8 expression was upregulated in children with hydrocephalus (9.38 [8.88, 10.24]) compared to those without (6.58 [5.72, 7.89]), infarcts (9.39 [8.47, 10.16]) compared to those without (7.22 [5.93, 7.81]) and basal meningeal enhancement (10.24 [9.61, 10.83]) compared to those without (8.59 [6.90, 9.49]). Blood neutrophil count was elevated in children with abnormal MRI (abnormal MRI 6.67 x10^3/ul [4.45, 9.25] vs. normal MRI 4.97 x10^3/ul [4.19, 5.02]). MMP-8 and IL-1b expression were moderately correlated with blood neutrophil count (spearman's correlation co-efficient of r = 0.49; p=0.031 and r = 0.47; p=0.043 respectively.
Conclusion: MMP-8, known to be neutrophil-derived and belonging to a group of protelytic enzymes which breakdown extracellular matrix, is associated with abnormal neuroradiological features of TBM in children. This implicates MMP-8 in the pathogenesis of TBM and requires further investigation.

TBS-EP-68 Efficacy of energy-dense nutritional supplement in improving treatment outcomes in malnourished adults with drug-sensitive pulmonary TB: An open-label randomised controlled trial in India

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Introduction: Undernutrition increases the risk of adverse outcomes among patients with pulmonary tuberculosis. However, the evidence on role of nutritional supplementation in improving the treatment outcomes is limited.
Methods: An open-label two-arm randomized controlled trial was conducted in Ballabgarh block in north India to assess the efficacy of energy dense nutritional supplement (EDNS) to improve the cure rate amongst newly diagnosed malnourished (BMI <18.5 kg/m^2) adult patients with sputum positive drug sensitive pulmonary tuberculosis as compared to controls. Patients in the intervention arm received two sachets of EDNS daily, each sachet providing 500 Kcal of energy and other nutrients.
Patients in both arms received standard dietary advice. Intervention was provided till the completion of treatment or patients achieving a BMI level of 21 kg/m^2, whichever was early. Sputum examination for acid-fast bacilli was done fortnightly till the end of treatment to assess cure. Height and weight measurement was done on monthly interval till six months after the completion of treatment. Nutritional markers were assessed at baseline, month 2 and month 6 of intervention.
Results: A total of 329 patients were randomized; 167 in the intervention arm and 162 in the control arm. There was a significantly higher weight gain (4.6±4.1 Kg vs 3.9±3.4 Kg, p=0.02) at six months in intervention arm as compared to control arm, which was maintained six months post treatment. Cure rate at 6 months was 91.9% in intervention group and 88.9% in control group (p=0.12). After adjusting for the confounders, the odds of cure was 1.6 times (CI-0.7-3.7, p value-0.32) in the in-

tervention group as compared to control group. Changes in nutritional markers were not statistically significant, except for Vitamin A.
Conclusion: Nutritional supplementation in the form of EDNS increased the weight and improved cure rate; increase in cure rate was not statistically significant.

TBS-EP-69 Intracellular and secreted cytokine profile of a TB and TB/HIV co-infected cohort in Kenya

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Background: Complexities associated with TB/HIV co-infections, including in those virally suppressed with anti-retroviral therapy (ART), present challenges to reduce both infections. Patterns of cytokines produced by T helper (Th) lymphocytes likely play a central role in susceptibility, relapse and reinfection to TB.
The purpose of this study was to understand how HIV and ART status in TB patients affects recovery of Th cell effector function and cytokine profile during TB treatment.
Methodology: TB and TB/HIV co-infected participants were recruited and blood samples taken at the start of and on completion of TB treatment from 6 groups; TB-HIV-, TB-HIV+ART+, TB-HIV+ART-, TB+HIV-, TB+HIV+ART+ and TB+HIV+ART-. Intracellular staining (ICS) of PBMCs and Cytokine Bead Array (CBA) was used to assess 12 Th cell-derived cytokines isolated from QuantiFERON tubes supernatants. A total of 380 samples were analyzed.
Results: CBA shows differences in the activation of plasma cytokines including IL-9 (mitogen p=0.002), IL-10 (mitogen p=0.001), IFN-γ (Nil p=0.01, TB1 p=0.034, mitogen p=0.001), IL-17A (Nil p=0.01, TB1 p=0.02, mitogen p=001) and IL-22 (Nil p=0.001, TB1 p=0.01, mitogen p=001) among the groups. ICS shows IL-10 is increased in the TB+HIV+ group (p-value=0.001). The *Mtb*-specific Th17 populations identified through ICS, in contrast, are increased in both TB and TB/HIV co-infected groups compared to healthy controls and HIV-only infected groups despite ART.
Conclusion: Results identify defects in effector cytokines produced by Th cells that may persist after ART and contribute to poorer TB treatment outcomes in subjects with HIV. By contributing to an increase in T-lymphocyte activation already found in HIV patients, TB disease can have an impact on viral replication. Functional cytokine status of Th cell populations, including Th17 and Th22 cells, may differ at time of TB drug treatment. To understand these complexities, the profile of immune activation markers in TB patients needs to be continuously explored.

TBS-EP-70 Infection and disease caused by M. tuberculosis are associated with systemic depletion of long chain fatty acids in humans and primates

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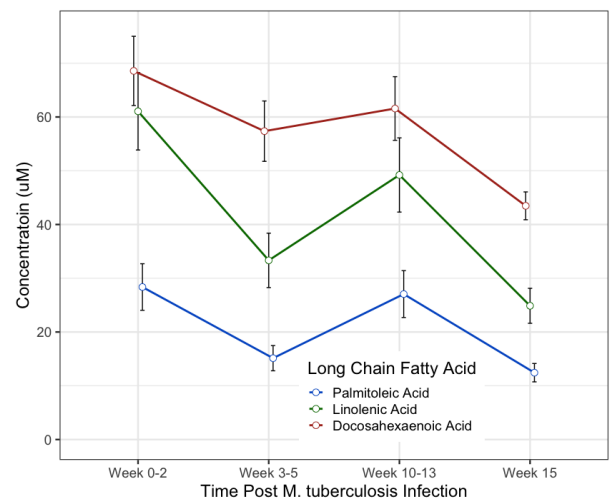
Background: The mechanisms underlying the bidirectional relationship between tuberculosis (TB) and malnutrition remain largely unexplored. We sought to determine the metabolic changes associated with *Mycobacterium tuberculosis* (Mtb) infection and disease progression in non-human primates (NHPs) and observational human cohorts.
Methods: We performed high-resolution metabolic and lipid profiling on plasma samples from rhesus macaques infected with Mtb (n=17): 12 animals received 30-50 CFU H37Rv, 6 of which also received a PD1 inhibitor; 5 other animals received 120-150 CFU H37Rv. Serial plasma samples were analyzed at the time of infection and up to 15 weeks post infection.
Observed metabolic changes were validated in a cohort of TB household contacts (HHCs) with latent TB infection (LTBI; n=81) as well as participants with TB disease (n=82) enrolled in Ethiopia.
Results: For all NHPs studied, the greatest metabolic changes were observed 15 weeks post-infection, regardless of Mtb burden.
Metabolic changes were characterized by declines in all species of long chain fatty acids (LCFAs) including linoleic acid, linolenic acid, homolinoleic acid, oleic acid, docosapentaenoic acid, docosahexaenoic acid, and palmitoleic acid (p<0.01 for all; *Figure 1*).



Concentrations of nearly all short and medium chain fatty acids were either stable or increased. Human HHCs with LTBI also experienced significant declines in plasma concentrations of nearly all species of LCFAs 6 months after exposure including linolenic acid, homolinoleic acid, oleic acid, docosapentaenoic acid, docosahexaenoic acid, and palmitoleic acid ($p<0.01$ for all). In participants with TB disease, plasma LCFA concentrations were further decreased versus those with LTBI, but gradually normalized in the 12 months after treatment initiation (baseline vs month 12; $p<0.05$ for all).

Conclusions: Infection and disease caused by Mtb leads to systemic depletion of LCFAs. Understanding whether this response primarily benefits host or pathogen may reveal new host-directed therapies and nutritional interventions to improve TB treatment outcomes.

TBS-EP04 Fundamental advances in understanding pathogenesis | Part 2

TBS-EP-71 Screening and evaluation of immunomodulatory compounds as host-directed therapy to potentiate antimycobacterial immunity

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Tuberculosis (TB), caused by Mycobacterium tuberculosis (MTB), remains a critical global health challenge, particularly due to drug resistance, high mortality rates, and poor treatment adherence. Host-directed therapies (HDTs) offer a novel approach to improving TB treatment outcomes by enhancing host immune defenses, controlling inflammation, and reducing mortality. This study aimed to assess the potential of immunomodulatory compounds, particularly those targeting Toll-like receptors (TLRs) 7/8, as adjunctive HDTs for TB. High-throughput screening of the effects of immunomodulatory compounds on THP-1 monocyte-derived macrophages (MDMs) infected with luminescent MTB strain, H37Rv Lux, was performed. Effects on inflammation were quantified via ELISA measuring pro-inflammatory cytokine levels, while luminometry gauged drug impact on bacterial clearance.

Promising compounds underwent further scrutiny using an *in vitro* 3D cell culture model mimicking TB granulomas, analysing effects on inflammation via ELISA, antimycobacterial effects using luminometry, and cytotoxicity via the Lactate dehydrogenase assay. Morphological changes were assessed using confocal microscopy. H&E and immunofluorescently labelled slides which were imaged using confocal microscopy to validate drug targets' associated with TB-induced inflammation and granuloma formation in diseased lung tissue.

The study identified TLR7/8 as potential targets, revealing that their activation heightened inflammation, improved bacterial clearance, and enhanced PBMC survival during MTB infection. This underscores the role of TLR7/8-mediated signaling in augmenting inflammatory responses during TB. Activation of TLR7/8 signaling via immunomodulatory compounds holds promise for enhancing MTB clearance.

Using IF stain on lung tissue from TB diseased participants, we observed that Multinucleated giant cells and alveolar macrophages contribute to TLR7/8-mediated signalling, potentially amplifying effector functions and aiding in MTB clearance.

In conclusion, TLR7/8 agonists represent potential adjuvant HDTs for TB treatment. Their ability to modulate inflammatory responses and enhance antimycobacterial activity suggests they could improve treatment outcomes and mitigate TB-related morbidity and mortality by addressing the challenges associated with current treatment regimens.

TBS-EP-72 Validation of host protein signatures dually associated with TB pathogenesis in blood and lung

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Tuberculosis is a curable infectious disease yet remains a major health problem globally. Therefore, there is a need of new biomarkers, tests that will serve as more accurate diagnostics to help in early detection of the *Mtb* and stratify the latently infected (LTBI) and active TB. Using a combination of Mas-spectrometry, and multiplex quantitative real-time PCR (qRT-PCR), 7 protein candidates including MNDA, MYOF, NCF1, NCF2, KCDT12, CD64 and GBP5 were shortlisted based on their increased abundance/expression in blood of active TB participants compared to healthy and LTB infected participants. The candidate proteins were hypothesized to be potential signatures of tuberculosis disease risk.

The work aims to validate the host protein signatures dually associated with TB pathogenesis in blood and lung. Using western blot and qPCR, the expression of MYOF

and NCF2 were significantly increased in blood of active TB participants when compared to healthy and LTBi participants. Further proteomic validation in lung tissue using immunohistochemistry and immunofluorescence, demonstrated an increased expression of NCF2 around the border of the caseum in TB induced granulomas.
Interestingly, neutrophils showed to be intact in the cellular region of the lung tissue releasing NCF2, however around the boarder of the caseum there was an abundance of NCF2 released by neutrophils that have undergone NETosis. Taken together, we hypothesize that NETosis may contribute to increased tissue damage during TB resulting in increased NCF2 expression. The presence of NCF2 is therefore a potential signature of the disease progression.

TBS-EP-73 Novel subunit TB vaccine delivered by flagellin elicit protective humoral and cellular immunological responses in vivo

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Despite years of mass vaccination with Bacillus Calmette-Guérin (BCG), Tuberculosis (TB) is still regarded as the one of the deadliest infectious diseases. Consequently, novel, effective vaccines are required to reach end the global TB epidemic by 2035 goals. Protein subunit vaccines, which have the desired characteristics of a vaccine, such as specificity, safety, and ease of production, are among the most promising approaches due to their ability to induce protective immune response.
This study aimed to investigate the designed novel subunit TB vaccine's ability to elicit protective immunological response when fused with *Salmonella Typhimurium* flagellin (FliC) as a delivery platform. Flagellin has an effective adjuvant activity to enhance antigenic immunogenicity and promote the induction of protective local and systemic immune responses when simultaneously delivered with an antigen. Nine HLA-E restricted *Mycobacterium tuberculosis* (*Mtb)* protein peptide sequence construct were fused with *S. typhimurium* flagellin (FliC) to make self-adjuvant novel TB vaccine (Star_MTBV).
Immunological responses to candidate TB vaccine in subcutaneously vaccinated BALB/c mice was analysed by ELISA and flow cytometry. Star_MTBV-FliC elicited significantly higher antigen-specific immunoglobulin G (IgG) in mice serum, indicating enhancement of humoral antibody response.
Furthermore, the vaccine candidate showed to elicit strong cellular immune responses, as evidenced by the T-cells producing key cytokines such as IFNγ and TNFα. These findings highlight the potential effectiveness of our flagellin-adjuvanted subunit TB vaccine as a promising candidate for further development and evaluation in preclinical and clinical studies.

TBS-EP-74 Tissue-specific immunophenotyping in a TB mice model reveals different immune responses in lung parenchyma and vasculature

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Aim: To perform immunophenotyping in the lung parenchyma and vasculature and investigate the response against *Mycobacterium tuberculosis* (*Mtb*) depending on the organ and tissue of origin of the cells in a chronic TB mice model.
Methods: Female (n=13) and male (n=13) C57Bl/6 mice were infected by aerosolization (Inhalation Exposure System, Glas-Col) with *Mtb* H37Rv and sacrificed at 6 weeks post-infection. Mice were intravenously administered with anti-CD45 antibody before euthanasia to distinguish extravascular from intravascular fractions of the lung. Blood and lungs were extracted, and cells were obtained after erythrocyte lysis and Percoll density gradient centrifugation, respectively. Cells were stimulated overnight with PMA/Ionomycin, ESAT-6/CFP-10 (*Mtb*-specific), or PPD (mycobacteria-specific) and stained for surface and intracellular antigens with 33 antibodies related to local and central memory in T, B and NKs cells. Samples were acquired using Cytek Aurora.
Results: We will focus for this abstract on inflammatory and memory markers on major cell subsets. For both specific-stimuli, $CD4^+$ and $CD8^+$ T-cells expressed significantly higher levels of IL-17 and lower levels of IL-22 in blood than in the lung. Within the $CD4^+$ T-cells of the lung, there was a prevalence of pro-inflammatory cytokines IFN-γ and TNF, and a reduction of PD-1 in the vasculature region of the lung compared to its parenchymatic counterpart ($p<0.05$). Tissue-resident memory T-cells ($CD69^+CD101^+/CD103^+$[$p<0.05$], $KLRG1^-$[$p<0.01$]) were enriched in the parenchyma for both CD4 and CD8 lymphocytes. This tissue had also lower levels of NK cells ($CD3^-NKp46^+$), with a predominantly immature phenotype ($CD27^+CD11b^{low}$;$p<0.05$), and a higher proportion of B cells with a regulatory phenotype ($CD3^-B220^+CD1d^+IL\text{-}10^+$;$p<0.01$), when compared to blood-originated immune cells.

Conclusions: Immune cells from lung parenchyma display specific tissue-residency and anti-inflammatory phenotypes in comparison to lung and peripheral vasculature, which express more canonical pro-inflammatory cytokines. The role of these populations will be further clarified by non-supervised multiparametric analyses.

TBS-EP-75 Role and mechanism of IL-36γ in promoting M1 macrophage differentiation in the anti-TB immune response through the IκBζ pathway

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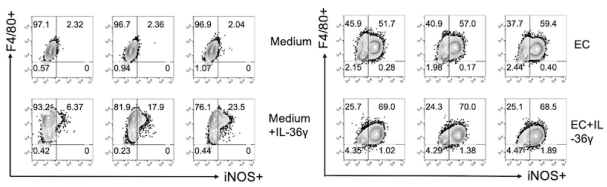
Methods: The bone marrow-derived macrophages (BMDM) were separated from C57BL/6J mice and cultured to a mature state and then stimulated with Mycobacterium tuberculosis antigen and IL-36γ. Levels of surface markers and intracellular specific molecules in both M1 and M2 macrophages [inducible nitric oxide synthase (iNOS), arginase 1 (Arg-1), CD86 and CD206] were detected by flow cytometry and RNA-seq. RNA-seq combined with three machine learning methods, including Least Absolute Shrinkage and Selection Operator (LASSO), Random Forest (RF), and Support Vector Machine (SVM), were used to screen for a number of key pathway genes, we found that the IκBζ gene, which may be associated with the promotion of M1 polarization by IL-36γ. To prove our speculation, IL-36RKO, and NFKBIZ flox/flox Lyz2Cre mice were used for experiments.

Results: Results showed that there were significant differences in the level of macrophage polarization toward M1 under different Mycobacterium tuberculosis antigen stimulation.

Furthermore, IL-36γ, with Mycobacterium tuberculosis antigen, promoted the polarization of BMDM toward M1 indicating that IL-36γ provokes the effect on antigen 85 complex a(Ag85a) protein-stimulated macrophages. The mean percentage of F4/80+iNOS+ macrophages stimulated was 56.0% when stimulated by early secreted antigenic target 6(ESAT-6) and culture filtrate protein 10(CFP-10).

Interestingly, the percentage elevated to 69.2% with the combined stimulation of ESAT-6, CFP-10, and IL-36γ. Similarly, the mean percentage of F4/80+iNOS+ macrophages increased from 19.9% to 53.8% when stimulate by Ag85a protein without and with IL-36γ.



Conclusions: Overall, the study provides preliminary evidence that IL-36γ, a member of the IL-1 cytokine family, increases the maturation level of BMDM and promotes their polarization toward M1 when stimulated with Mycobacterium tuberculosis antigens.

In addition, it was found that the IκBζ gene may play an important role in macrophage polarization and is associated with inflammation.

TBS-EP-76 Single cell RNA-Seq of PBMC reveals that PLHIV with history of TB have distinct immune cell subsets

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TB causes 1 in 3 deaths of people living with HIV (PLHIV), as well as conferring increased risk of post-cure all-cause mortality. To assess for persistent immunologic changes after TB cure in PLHIV, we completed Cellular Indexing of Transcriptomes and Epitopes by Sequencing (CITE-Seq) to identify immune cell subsets in peripheral blood which may contribute to persistent and detrimental immune activation.

We completed a nested-case control study of participants in a study on recurrent TB at GHESKIO. PBMC were isolated by gradient separation at GHESKIO prior to freezing and transfer to New York. Thawed, live cells were negatively selected using magnetic beads before labeling of cell surface immune lineage markers (TotalSeq™-B, BioLegend). Labeled live cells were fixed before sequencing with Chromium Single Cell Gene Expression Flex (10X Genomics), a hybridization-based platform for scRNA-Seq of fixed cells. After QC and batch correction, cells were clustered and projected onto the Azimuth PBMC reference with cell type annotation using HumanPrimaryCellAtlasData. We used a pseudobulk approach to differential expression analysis using edgeR quasi-likelihood F tests.

We generated CITE-Seq data from an average of 6247 analyzable cells per sample from 6 PLHIV with matched to 3 without a history of active pulmonary TB. There were more than 50 differentially expressed genes with FDR < 0.05 in each of the following populations: dendritic (DC), natural killer, naïve CD8, CD4, naïve CD4, naïve B, and mature B cells. For example, DC had 68 diferentially expressed genes in PLHIV with history of TB with overrepresentation of the GO pathways: response to hydrogen peroxide, oxidative stress, and reactive oxygen species.

We found that even years after TB cure, PLHIV with history of TB had persistent differences in gene expression at the immune cell subset level. These findings have informed current hypothesis-driven investigations of dendritic cell subsets in TB-HIV coinfection.

TBS-EP-77 Breathing new insights: Exploring the lung microbiota in pulmonary TB

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Background: The lung microbiota has not been comprehensively characterised in pulmonary tuberculosis (TB). We hypothesise that, in people with TB, the site-of-disease lung microbiota is distinct from that of non-involved contralateral tissue.
Methods: To address this, bronchoscopy was performed in people with a positive Xpert MTB/RIF result (n=17; ≤7 days of TB treatment) and healthy volunteers (n=11) as a comparator. Bronchoalveolar lavage and protected specimen brushings were performed in an uninvolved lung lobe, followed by an involved lung lobe (latter applies to people with TB only), as determined by imaging.
The microbiome was characterised in specimens from the upper respiratory tract (URT; oropharyngeal swab, nasopharyngeal swab, oral wash, supraglottic fluid) and lower respiratory tract (LRT; bronchoalveolar lavage fluid, protected specimen brushings). Sputum was additionally collected.
Results: In people with TB, alpha-diversity in the LRT was lower than that of the URT (p<0.001) and sputum (p=0.002). Beta-diversity differed between the LRT and URT (p=0.001) and the LRT and sputum (0.002), where the LRT was *Mycobacterium tuberculosis* (*Mtb*)-, *Moraxella ovis*- and *Methylobacterium mesophilicum*-enriched versus the URT and *M. mesophilicum*-, *Staphylococcus lugdunensis*- and *Mtb*-enriched versus sputum.
Although uninvolved and involved lung lobes has similar alpha- and beta-diversity, involved lobes were *Moraxella ovis*-enriched and *Treponema amylovorum*-depleted. The uninvolved lobes of people with TB and healthy volunteers did not differ in alpha- and beta-diversity, however, people with TB were *Mycoplasma zalophi*, *Erwina oleae*, *Erythromicrobium ramosum*-enriched. The involved lung lobes of people with TB had, versus the uninvolved lobes of healthy volunteers, reduced alpha-diversity (p=0.046) and *Mtb*, *M. zalophi*, and *E. ramosum* enrichment.
Conclusion: The microbiota in the lower airways of people with TB is less diverse than the upper airways and sputum. Site-of-disease lung lobes are Mtb-enriched and oral anaerobe-depleted compared to uninvolved lobes, as well as less diverse and Mtb-enriched versus healthy lung lobes.

TBS-EP-78 The clinical significance of plasma sCD25 as valuable biomarker for progression and prognosis of TB

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Background: sCD25 is an important immune molecule for T cell regulation. Tracking the detection of plasma sCD25 plays an important role in the evaluation of immune function, progression, and prognosis of tuberculosis (TB) patients.
This study analyzed the association of plasma sCD25 levels with clinical, laboratory, CT imaging characteristics, and clinical outcome of TB patients.
Methods: The levels of sCD25 in plasma were detected by ELISA. According to the cut-off threshold of plasma sCD25 levels, the patients were divided into a low-value group (Group TB1) and a high-value group (Group TB2). The association of plasma sCD25 levels with clinical, laboratory, and CT imaging characteristics of TB patients, as well as their TB treatment outcome were analyzed.
Results: The levels of plasma sCD25 of TB patients were higher than that of the healthy control. Among the 303 TB patients, the levels were increased in Group TB2, and there was a progressive reduction after anti-TB treatment.
Furthermore, patients in Group TB2 showed higher positive rates in sputum smear (52.0% vs. 34.3%; $P = 0.003$), sputum culture (69.7% vs. 56.9%; $P = 0.032$), Xpert MTB/RIF (66.3% vs. 51.2%; $P = 0.013$) and TB-DNA (51.5% vs. 31.2%; $P = 0.001$) than those in Group TB1.
Group TB2 had higher incidence in cough (78.8% vs. 62.3%; $P = 0.004$), expectoration (64.4% vs. 45.1%; $P = 0.001$), concomitant extrapulmonary TB (14.1% vs. 5.9%; $P = 0.016$), cavities (47.9% vs. 34.0%; $P = 0.022$), and unfavorable outcomes after anti-TB treatment.
Conclusion: The clinical, laboratory and radiological manifestations of TB patients with high plasma sCD25 levels indicate that the disease is more severe. Tracking plasma sCD25 detection of TB patients has evident clinical significance. It is noteworthy that when the plasma sCD25 levels are significantly elevated, patients should be cautious of the TB progression and disease severity.

TBS-EP-79 Efficacy of Diaskintest in diagnosis of TB infection in not at-risk children

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In Russia, since 2009, the Diaskintest has been used for systematic tuberculosis (TB) screening of children and adolescents allowing for timely provision of preventive treatment to persons with latent TB infection. As a result, TB incidence among children decreased by 38.4%-42.9% over the period of 2015-2021.

Objective of the study: To determine specificity of the Diaskintest in children who are not at-risk of TB in the areas with low incidence of the disease.

Materials and methods. A multicenter cohort retrospective study included 43 children from 5-15 years of age. Inclusion criteria: absence of clinical signs of any disease and immunodeficiency; presence of BCG vaccination; positive Mantoux test (MT) and negative Diaskintest; available lung CT scan results.

Results: The average age of children was 7.0 (95% CI6.0-11.0) years. The time between CT and Diaskintest was 22.8 (95% CI17.8-27.8) days. Two age groups of children were conditionally distinguished: aged 5-7 and 8-14. The MT confirmed the presence of TI in 8–14-year-old children. In 68% of 5–7-year-old children, positive MT over time allowed to assume the presence of TI.

The share of matching negative results of Diaskintest and the MT with 2 TE was 50% - a random value, while based on CT all children had no TB lung abnormalities identified.

The obtained results show that the MT is not highly effective in TB diagnosis at the background of BCG vaccination. The lack of correlation between Diaskintest and the MT is confirmed by the Fisher LSD (p=1,000)

The negative Diaskintest results and the absence of specific CT findings were in direct correlation-the share of matching results was 100%.

Conclusion: The Diaskintest is an effective method of TB screening in children, with a high probability of TB absence in mycobacterium infected children with negative test results.

Key words: children, tuberculosis infection, Diaskintest

TBS-EP-80 The impact of COVID-19 and its effects on the individual manifestations of systemic inflammation in people with pulmonary TB

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Due to their pre-existing pro-inflammatory status, the immunopathogenesis of COVID-19 effects in patients with pulmonary TB is deserving of special attention. The aimof this study was to analyze the impact of COVID-19 and its effects on systemic inflammation in pulmonary TB patients.

Two main groups were identified: patients with pulmonary TB who had previously suffered from COVID-19 3 months prior (Group 1) and those who did not experience any symptoms of post-COVID (Group 2). The comparison group included patients with TB who had not been affected by COVID-19 (Group 3).

The control group comprised healthy blood donors. Plasma concentrations of interleukin IL-6, IL-10, tumor necrosis factor alpha, D-dimers, troponin-I, cortisol, and endothelin-1 were measured in patients using enzyme immunoassays.

Among the symptoms of the post-COVID syndrome, tachycardia, arthralgia, and chronic fatigue were most commonly noted in the examined patients. These findings are consistent with general population data.

According to all empirical indicators, except for IL-10 levels, the groups of TB patients were comparable to each other ($p > 0.05$ Mann-Whitney test) and statistically differed significantly from the control group. An increase in cytokine production indicates a non-critical systemic inflammatory response.

Patients in all three groups had a high prevalence of hypothalamic-pituitary-adrenal axis dysfunction (cortisol levels > 690 nmol/L):500 ng/ml (36.4%, 7.7%, 14.3%). Despite the tendency for an increase in the frequency of these events in the following order: TB without COVID-19 -TB+COVID-19 68.2%, 46.2%, and 57.1% in groups 1, 2, and 3, respectively.

Another prominent phenomenon was systemic microthrombosis, as indicated by D-dimer levels above -TB+COVID-19+symptoms of post-COVID syndrome, there were no significant differences between the three groups of patients.

Conclusion: The frequency and severity of systemic inflammatory phenomena in patients with pulmonary TB does not depend on COVID-19 or the presence of the post-COVID syndrome.

TBS-EP-81 The effect of interferon- γ on the efficacy of treatment of people with multi-drug-resistant TB

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Interferon-γ (INF- γ) is the most important cytokine acting on the T-cell link of immunity. The absence or lack of INF-γ in tuberculosis patients leads to the progression of a specific process.

The purpose of the study: to evaluate the effectiveness of treatment of MDR-TB patients using chemotherapy in combination with recombinant interferon-γ (rINF-γ).

Materials and methods: The study included 84 patients. The inclusion criteria were a diagnosis of smear-positive pulmonary tuberculosis, at least RR/MDR TB, HIV-negative. 42 patients of the study group received injectable INF-γ at a dose of 500,000 IU daily for 90 days additionally.

The groups were comparable in gender and spectrum of mycobacterium resistance (p> 0.05). In the study group MDR was detected in 29 (69%) patients, pre-XDR – 6 (14.2%), XDR – 7 (16.7%). In the control group MDR was detected in 25 (59.5%), pre – XDR - 9 (21.4%), XDR – 8 (19.1%).

Results: in the study group smear microscopy was negative in 35 (83.3%) patients after 14 days of treatment, after 1 month - in 38 (90.5%). In the control group smear microscopy was negative in 26 (61.9%) patients after 14 days of treatment and in 31 (73.8%) after 1 month of treatment (p <0.05).

Intoxication syndrome in the study group persisted in 19 (45.2%) patients, in the control group - in 26 (61.9%) (p <0.05) by 1 month of treatment. Positive X–ray dynamics was observed in the study group in 88.1% of patients after 2 months of treatment, in the control group - in 64.3% (p <0.05). No serious adverse events were reported in the study group.

Conclusions: the use of INF-γ in MDR-TB patients during chemotherapy helps to reduce the timing of mycobacterium release and regression of specific changes in lungs. It can help shorten the treatment time for drug-resistance tuberculosis.

TBS-EP-82 Targeting lung inflammation for TB HDT development

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Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (Mtb) remains a major global health problem. To eradicate TB, there is a dire need for better therapies. Granulomas are the hallmark of TB associated lung pathological damage. In their solid form, granulomas can contain and restrict the pathogen to the center. However granulomas can undergo necrosis leading to caseation and formation of cavities, which aid bacterial spread.

Understanding drivers of granuloma caseation and cavitation may accelerate discovery of host-directed therapies (HDTs) to reduce tissue destruction during TB progression. Here we identify and evaluate multiple inflammatory pathways as potential therapeutic targets for TB. We show that neutrophil associated cell death, NETosis, and inflammatory pathways in specific subsets of macrophages associate with lung caseation and may contribute to tissue destruction.

We identify upstream mediators of NETosis and inflammatory lipids, and link them to TB pathogenesis, and finally demonstrate that these mediators can be targeted pharmaceutically to reduce lung pathological damage. Our data show that mediators of granuloma progression can be targeted for HDT development to augment current treatment strategies.

TBS-EP-83 A robust and standardised progression cascade for compounds targeting host-pathogen interactions in TB

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Over the past decade, our understanding of the host-pathogen interface in *Mycobacterium tuberculosis* (*Mtb*) infected cells and tissues has leapt forward dramatically. In addition, recent developments in phenotypic drug screening allowed us to identify compounds interfering with critical bacteria-derived virulence factors or those who function as immunomodulators of infected host cells.

However, strategies for standardized characterization of these compounds and identification of their respective targets are lacking, which limits the rapid clinical development of hit or lead compounds derived from these drug discovery campaigns.
Here, we describe the integration of a multifactorial assay platform investigating interventional aspects of host-pathogen interactions (HPI) targeting *Mtb* and its development as a robust HPI progression cascade within the ERA4TB consortium.
A streamlined flow of HPI assays was created to distinguish between compounds targeting host derived factors or compounds impairing bacterial virulence factors. Using a panel of HPI-targeting compounds with known mechanism of action, we were able to define the specificity and performance of the platform, which will help to better characterize compounds modulating HPI in future actions of the consortium.
This differentiation provides essential information required to select downstream approaches aiming at target identification.
After investigation of putative mechanisms of action, these approaches include determining the contribution of different HPI-targeting compounds to the antibacterial activity of classical anti-tubercular antibiotics in *ex vivo* combination assays.
We are exploiting a comprehensive approach combining high-content based phenotypic screening of various drug combinations by automated confocal microscopy followed by classical colony forming unit (CFU) determination of infected macrophages and neutrophils. Our comprehensive approach deciphers translational aspects of the *Mtb*-HPI interface, facilitating the rational progression of HPI hit and lead compounds.

TBS-EP-84 The likelihood of developing a systemic inflammatory response in extrapulmonary TB

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Consideration of the pathogenesis of tuberculous spondylitis from the perspective of chronic systemic inflammation will expand theoretical and methodological approaches to assessing the condition of patients.
The aim of the study was to determine the probability of developing chronic systemic inflammation in these patients in patients with tuberculous spondylitis.
Molecular markers of the following phenomena were studied in patients with tuberculous spondylitis: systemic inflammatory reaction, systemic alteration, distress reaction of the hypothalamic-pituitary-adrenal system, systemic microthrombosis, endothelial dysfunction. The phenomenon of systemic inflammatory reaction was assessed by determining interleukins IL-6, IL-10, TNFa, and endothelin I, on the basis of which an integral indicator was calculated – the level of reactivity. The criterion for the phenomenon of systemic microthrombosis was the level of D-dimers >500 ng/ml. The phenomenon of systemic alteration was noted by the presence of elevated levels of troponin I (criterion of the phenomenon: >0.2 ng/ml). The distress of the hypothalamic-pituitary-adrenal system was recorded by the level of cortisol (<100 nmol/l or >690 nmol/l). According to the original method, the probability of developing chronic systemic inflammation and low-intensity systemic inflammation was estimated.
The results of the study showed that despite a statistically significant increase in the levels of most of the studied markers in relatively healthy individuals, in most cases they did not reach the values criteria for the development of individual phenomena. The detection rate of chronic systemic inflammation in general was 8.3%, low–intensity systemic inflammation - 25%.
In patients with tuberculous spondylitis, the presence of latent proinflammatory processes (systemic inflammatory reaction, endothelial dysfunction, paracoagulation, neuroendocrine system distress, systemic alteration) was revealed. The frequency of detection of chronic systemic inflammation in less than 10% of cases makes it possible to attribute tuberculous spondylitis to diseases with a low probability of developing chronic systemic inflammation.

TBS-EP-85 Utilising AI-driven drug repurposing to understand TB pathogenesis

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Tuberculosis (TB) remains a significant contributor to global mortality resulting from infections. The growing prevalence of multidrug-resistant (MDR), extensively drug-resistant (XDR) strains and post TB lung sequels pose significant challenges despite progress in medical therapy. In order to address these problems, it is crucial to have a thorough comprehension of how diseases evolve, as well as to investigate novel approaches to treatment.
An effective strategy is drug repurposing, which entails discovering alternative applications of current treatments beyond their original indications to battle tuberculosis. Creating a specialized repository of information and a

structured representation of knowledge for tuberculosis (TB) is a crucial milestone in comprehending its mechanisms from the standpoint of repurposing drugs. This system utilizes artificial intelligence (AI) and semantic technologies to create a current and easily searchable database of TB-related information.

Therefore, it serves as a significant instrument for researchers and medical practitioners. Artificial intelligence (AI) can play a crucial role in finding medications that can alter the immunological response of the host, leading to better treatment of inflammation and tissue damage caused by infections. This not only accelerates the identification of viable medicines but also decreases the time and financial expenses commonly associated with traditional drug development approaches.

Harnessing the predictive capabilities of artificial intelligence enables the improvement of treatment strategies, tackling challenges related to medication resistance, and eventually augmenting patient results. This approach not only enhances our comprehension of the development of tuberculosis but also emphasizes potential treatments that can address the difficulties presented by MDR and XDR strains of tuberculosis, as well as the long-term lung damage caused by tuberculosis.

Utilizing AI, we may enhance treatment options, enhance patient care, and achieve substantial advancements in the worldwide fight against tuberculosis.

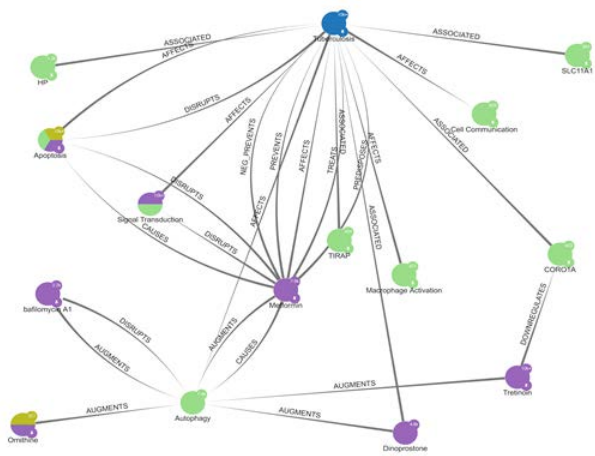

Fig1: AUTOPHAGY Plays a Crucial Role in the Elimination of Pathogens

TBS-EP-86 The approach of stem cell in TB vaccine

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Background: Despite having a high number of mortality among other infectious diseases in the world, tuberculosis remains not eliminated. High rates of drug resistance, disease recurrence, and infection spread still become a huge problem, especially in TB-endemic countries. Meanwhile, Mesenchymal Stem Cells (MSCs) are given a lot of spotlights in immunomodulatory, anti-inflammatory, and even vaccine development to robust immune responses. While the search for an effective TB vaccine is still ongoing, it might be beneficial to investigate stem cell characteristics that may become helpful in TB vaccine development.

Method: We searched several databases: Pubmed, ScienceDirect, and Google Scholar to find any articles with keywords stem cell and tuberculosis vaccines with their MeSH vocabularies and potential terms. Among 116 articles found, 11 articles were eligible for full paper screening. Six articles were proceeded into further reading.

Results: Tuberculosis granuloma is the main site of pathogenesis in early TB infection. Studies show MSCs are found in TB granuloma acting as limiting bacterial growth and inducing dormancy of TB by hypoxia and dormancy-related gene transcription (DevS/devR regulon).

However, MSCs also limit T cell response to Mtb, promote fibrin deposition via TGF-B, upregulate TNF-A and other inflammatory cytokines, and might induce unfavorable effects if administered to people with TB infection.

On the other hand, MSCs can be used as environmental vectors of ESAT-6 TB antigen for producing TB vaccines in animal models. Besides, MSCs still useful as immunomodulators in MDR/XDR-TB infection to reduce severity and enhance recovery.

Conclusion: With both sides of MSCs' roles in tuberculosis pathogenesis and treatment, further studies focusing on MSCs in creating new treatments and prevention is worth to explore.

Keywords: Stem cells, MSCs, Tuberculosis Vaccine, TB

TBS-EP-87 Features of the immune status in people with drug-resistant TB

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Introduction: In case of tuberculosis infection, complex processes of specific and non-specific reactivity occur in the patient's body. The formation of an immune imbalance causes a delayed regression of specific changes and a prolonged course of the infectious process against the background of anti-tuberculosis therapy.
The purpose of the study: to substantiate the use of adjuvants in the treatment of drug-resistant tuberculosis.
Materials and methods: The prospective study included 65 patients. The main inclusion criteria were: verified diagnosis of tuberculosis, proven MDR, pre-XDR or XDR TB, HIV negative.
Men prevailed – 56.9%, women – 43.1%. The infiltrative form of tuberculosis was in 58.5% of patients. MDR TB was determined in 75.4%, pre-XDR -20%, XDR -4.6% Lung damage in the volume of 1-2 segments was noted in 10.8%, lobe in 40.0%, 2 lobes in 10.8%, 1 lung in 21.5%, 2 lungs in 16.9%. All patients underwent determination of lymphocytes of the T-cell link.
Results: Deviations of immune status indicators from reference values were revealed in 46 (70.8%) patients. In 32.6% of patients with infiltrative tuberculosis, mainly with MDR TB, a widespread (more than 2 lobes) process in the lungs and severe intoxication syndrome, an increased content of mature CD3+ was determined.
An imbalance of T lymphocyte subpopulations in the form of a decrease in CD4+ (in 10.7%) and an increase in CD8+(34.8%) or a decrease in CD8+(21.7%) prevailed in patients with infiltrative form (in 80%). A decrease in CD4+ was observed in patients with widespread lung damage.
Conclusions: To normalize the functioning of the immune system in MDR tuberculosis patients, it is necessary to use adjuvants capable of regulating immune imbalance and increasing specific reactivity, such as interferon-gamma (IFN-γ). The clinical indication for the use of recombinant IFN-γ is a decrease in the content of CD4+ and CD8+ T lymphocytes.

TBS-EP-05 Mechanisms underlying heterogeneous disease manifestations | Part 1

TBS-EP-88 The accuracy of a three-gene host response signature to classify TB severity in children

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Background: Children with non-severe TB are eligible for shorter treatment regimens, but new tools are needed to guide disease classification. We evaluated the role of the blood-based Cepheid 3-gene Xpert Host Response (HR) cartridge to stratify TB disease severity in children.
Methods: We included children under 15 years with microbiologically confirmed or unconfirmed TB in Uganda and The Gambia. Disease severity was defined according to WHO guidelines. Less than 1 mL of blood was collected and Xpert-HR was used to measure the cycle threshold for each gene and calculate an HR TB score with the equation of (GBP5-DUSP3)/2 – TBP. We performed receiver operating curve (ROC) analysis to calculate the area under the curve (AUC) and determine the accuracy to classify severe disease at cut-off values closest to 90% sensitivity to minimize undertreatment.
Results: Of 116 children included, the median age was 4 years (IQR 1-7), 21 (18.1%) had Confirmed TB and 31 (26.7%) had severe TB per WHO criteria. The median HR TB score was significantly lower in the severe group versus the non-severe group (-1.5 versus -1.0, p = 0.02). In the confirmed TB group, Xpert HR achieved an AUC of 0.73 (95% CI 0.46-0.99) to detect severe TB, with a specificity of 62.5% (95% CI 24.5-91.5) at 84.6% sensitivity (95% CI 54.6-98.1). However, when including the unconfirmed TB group, the AUC reduced to 0.64 (95% CI 0.52-0.75) with a specificity of 24.7% (95% CI 16.0-35.3) at 90.3% sensitivity (Table). This corresponded to 42.2% overall concordance with WHO criteria (Table), with 39.1% concordance with CXR classification of severe TB.
Conclusions: Xpert-HR had low specificity to detect severe TB in children and could lead to overtreatment. There was improvement when used with confirmed TB cases only, but child-specific TB gene signatures may be needed to increase accuracy.

	Severe TB[a]	Non-Severe TB	Total
Xpert HR Positive[b]	28 (90.3%)	64 (67.4%)	92
Xpert HR Negative[b]	3 (9.7%)	21 (24.7%)	24
Total	31	85	116

1. Defined by WHO guidelines.
2. Defined as a HR TB Score of -0.45 or lower for severe TB.

Table. Comparison of Xpert HR and WHO guidelines for classifying severe versus non-severe TB in children.

TBS-EP-89 Identification of genetic variants associated with post-TB lung disease

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Patients recovering from Tuberculosis (TB) may suffer from post-TB lung disease (PTLD) characterised by spirometric and radiological abnormalities, as well as respiratory impairments. Although the literature on PTLD is expanding, its genetics remains largely unexplored. This study, as part of the TB-Sequel study (https://www.tbsequel.org/), utilised genome-wide association studies (GWAS) to identify genetic variants associated with lung function in TB patients for the first time.

Lung function was assessed via spirometry, specifically, forced expired volume in 1 second (FEV_1), forced vital capacity (FVC) and FEV_1/FVC ratio. We performed GWAS based on lung function measures at the end of TB treatment (cross-sectional GWAS) and the change in lung function over the first year from the start of the TB treatment (longitudinal GWAS) in patients diagnosed with TB from four African countries (Gambia, Mozambique, Tanzania, and South Africa). 765 individuals were included in the cross-sectional GWAS and 976 individuals in the longitudinal GWAS. Genome-wide significant single nucleotide polymorphisms (SNPs) (p-value < 5E-8) were assigned to putative causal genes using *in silico* methods. The prioritised genes were further investigated using publicly available single-cell RNA-sequencing data from inflamed human TB lungs.

As the first GWAS examining post-TB lung function, we identified three SNPs associated with lower FEV_1, higher FVC at the treatment end and decreasing FVC over time, respectively. The putative genes prioritised - *LAMA2*, *FHIT* and *CARMIL1* - are involved in lung remodelling, repression of Wnt/-catenin signalling (activated in alveolar type 2 (AT2) cells during lung injury), and inflammatory signalling, respectively. The expression of these genes in relevant cell types within TB-affected lung tissue can be confirmed using a publicly available single-cell dataset. The SNPs identified may affect post-TB lung function by impacting lung tissue repair or the extent of immune response to *Mycobacterium tuberculosis*.

TBS-EP-90 Transcriptomic changes associated with lung function impairment after successful TB treatment

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Approximately half of tuberculosis (TB) patients have lung function impairment post-treatment, but the reasons why some patients sustain long-term lung function impairment remain unclear. The strong concurrent immune activation during TB complicates the study of this process.

As a substudy of the TB Sequel cohort, RNA sequencing was performed on samples from 322 patients to examine transcriptomic changes related to lung function outcome post treatment. Patients with bacteriologically confirmed pulmonary TB were stratified into two groups (good/

poor) based on FEV1 and FVC measured after treatment. Data from presentation, month 2, and month 6 (end-of-treatment) was analyzed to understand longitudinal differences between patients with varying lung function outcomes.

Our findings suggest that the immune modulation by M. tuberculosis may differ between patients with good and poor lung function outcomes throughout the entire course of the disease. After adjusting for timepoints, those with post-treatment lung impairment showed downregulation of neutrophil-related genes, altered Th1/Th2 cell differentiation pathway, changes in B and T cell signaling, and leukocyte transendothelial migration. Significant changes were observed in pathways up- and downstream of interferon (JAK/STAT, RAP1, mTOR) and pathways sensing M. tuberculosis antigens (NOD-, Toll-like, and c-lectin). Oxidative stress has been proposed as a mechanism of lung damage in tuberculosis and was represented in our analysis as enrichment of HIF-1 and apelin pathways. Differences in cell turnover were also noted, as well as pathways linked to diabetes, such as insulin resistance and type 2 diabetes. An unexpected finding was the significant downregulation of prolactin (PRL) signaling in the poor-outcome group. Changes in PRL were previously reported in TB and the gene was proposed as a marker for COPD.

This study provides insights into possible processes leading to greater lung damage in some individuals, opening new avenues for developing host-directed therapies to limit damage and reduce long-term TB complications.

TBS-EP-91 A multi-country evaluation of the diagnostic performance of Molbio Truenat MTB Ultima, a novel tongue swab molecular test for TB

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Background: TB is most often diagnosed using microbiological or molecular testing of sputum samples. In contrast to sputum, which can be difficult to obtain and is associated with production of infectious aerosols, tongue swabs are easy to collect from people of all ages and can be tested using low-cost, point-of-care molecular platforms. Here, we report the first evaluation of Truenat MTB Ultima, a commercial tongue swab molecular test developed specifically for TB diagnosis.

Methods: We consecutively enrolled people with presumptive TB at health centers in India, Uganda, and Vietnam from February-May 2024. We scraped the tongue dorsum for up 15-30 seconds using Copan FLOQswabs prior to sputum collection for smear microscopy and Xpert MTB/RIF Ultra (Xpert Ultra).

Swabs were collected into a tube containing proprietary buffer, lysed for 90 seconds using the automated Molbio Truelyse device and 6 uL of the crude lysate was added to the MTB Ultima chip for testing using Molbio's portable Truelab PCR platform. We assessed the diagnostic accuracy of tongue swab MTB Ultima in reference to sputum Xpert Ultra results.

Results: Among 645 enrolled participants (median age 47, IQR 34-67.5, 45.3% female, 12.1% PLHIV, 24.2% with diabetes, 12.6% Xpert Ultra-positive), 281 were from India, 200 from Uganda, 164 from Vietnam. We excluded 19 participants with trace results on sputum Xpert Ultra. MTB Ultima had higher sensitivity than sputum smear microscopy (79.7% vs. 54.3%, difference 25.4%, 95% CI 10.5-30.3, $p<0.01$), and high specificity (98.4%, 95% CI 96.9-99.3) (Table 1).

MTB Ultima detected 100%, 86.7%, 64.0% and 54.5% of people with sputum Xpert Ultra high, medium, low and very low semi-quantitative results, respectively.

	Sensitivity (n/N) (%, 95% CI)	Specificity (n/N) (%, 95% CI)
Overall	63/79 (79.7%, 69.2-88.0)	547/556 (98.4%, 96.9-99.3)
Country		
India	18/24 (75.0%, 53.3-90.2)	245/253 (96.8%, 93.9-98.6)
	32/38 (84.2%, 68.7-94.0)	158/158 (100%, 97.7-100)
Uganda	13/17 (76.5%, 50.1-93.2)	144/145 (99.3%, 96.2-100)
Vietnam		
Female	18/23 (78.3%, 56.3-92.5)	265/267 (99.3%, 97.3-99.9)
PLHIV	6/8 (75.0%, 34.9-96.8)	68/68 (100.0%, 94.7-100)
PLWD	23/24 (95.8%, 78.9-99.9)	128/131 (97.7%, 93.5-99.5)
Semi-quantitative Xpert grade		
High	28/28 (100%, 87.7-100)	-
Medium	13/15 (86.7%, 59.5-98.3)	-
Low	16/25 (64.0%, 42.5-82.0)	-
Very Low	6/11 (54.5%, 23.4-83.3)	-

Table 1. Diagnostic accuracy of Truenat MTB Ultima tongue swab test in reference to sputum Xpert Ultra results.

Discussion: MTB Ultima demonstrates promise as a point-of-care tongue swab molecular testing platform that can replace sputum smear microscopy at lower-level health facilities where sputum-based molecular testing is not feasible.

TBS-EP-92 Immunometabolic correlates of protection against M. tuberculosis infection among TB household contacts

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Some individuals, even when heavily exposed to an infectious tuberculosis patient, do not develop evidence of an antigen-specific T-cell response as measured with an interferon-gamma release assay (IGRA). We examined immune and metabolic correlates of this protection against *Mtb* infection. In 1347 heavily exposed Indonesian household contacts, we excluded active tuberculosis, estimated exposure to the index patient, and performed IGRAs, which were repeated after 3 months for those who tested negative. We correlated innate immune cell phenotypes, ex-vivo cytokine production, inflammatory protein profiles in IGRA supernatants, circulating metabolites, and *Mtb*-specific antibodies with IGRA conversion.

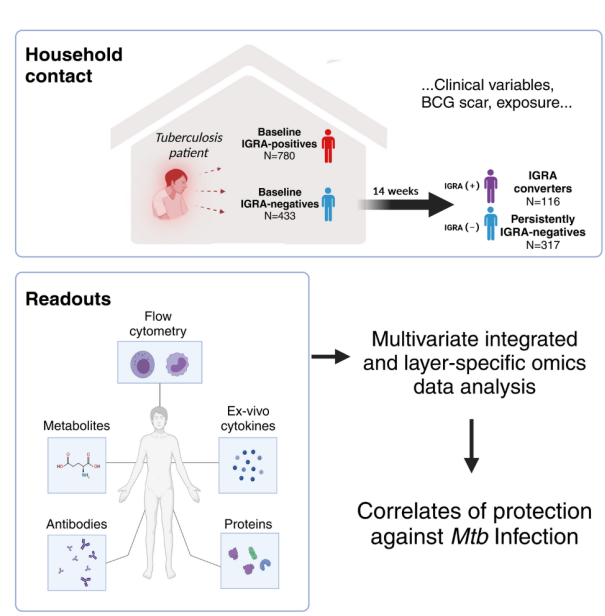
Using strict IGRA cutoffs, 237 households were classified as persistently IGRA-negative at 3 months, and 51 as IGRA converters. IGRA conversion after 3 months was associated with higher exposure to the index patient, exposure to *Mtb* Beijing strains (RR 1.84 [95% CI;1.12-3.01]) and with the absence of a BCG scar (RR 0.35 [95%CI;0.21-0.58]).

Among contacts with a persistently negative IGRA, various innate immune cell populations showed stronger reduction at 3 months, and baseline heterologous production of proinflammatory cytokines and inflammatory proteins in IGRA mitogen tubes was higher. Neither circulating concentrations of *Mtb*-specific antibodies nor antibody activity were significantly associated with IGRA status at baseline or follow-up. We also identified metabolic pathways associated with IGRA conversion based on circulating metabolites at baseline.

These include: tryptophan metabolism; glycine, serine and threonine metabolism; glycerophospholipid metabolism; and arachidonic acid metabolism. Also, metabolites that were more abundant in persistently IGRA-negative individuals correlated with heterologous cytokine production.

Our findings suggest that a more efficient host innate immune response, rather than a humoral response, mediates early clearance of *Mtb*. The protective effect of BCG vaccination against *Mtb* infection may be linked to innate immune priming or 'trained immunity'.

Our findings also suggest that certain metabolic interventions could protect tuberculosis contacts from *Mtb* infection.



TBS-EP-93 Exploring in vivo expressed mycobacterial proteins in the gastric lavage samples of paediatrics pulmonary TB as biomarkers for the development of immunoassay

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Background: Diagnosing pediatric pulmonary TB (PTB) poses challenges, as 85% of cases are smear-negative and 60-70% are culture-negative. Although sputum is a potential sample for diagnosing pulmonary TB, as infants and young children tend to swallow sputum, so gastric lavage is a valuable alternative for biomarker discovery.
Objective: Identification of *in vivo* expressed mycobacterial proteins in the gastric lavage samples of paediatric pulmonary tuberculosis patients for the development of a rapid antigen detection assay for pediatric TB.
Methods: In this study, 200 pediatric PTB suspects were enrolled. Gastric lavage samples from culture-positive pediatric pulmonary TB patients (n=8) and non-tuberculosis controls (n=8) were processed for mass spectrometry via data-independent acquisition (DIA) and data were analyzed for the identification of specific mycobacterial proteins. The selected mycobacterial protein was cloned and expressed to produce recombinant protein. Antibody was generated against the purified recombinant protein in rabbit for the development of an ELISA-based mycobacterial antigen detection assay for the diagnosis of pediatric TB using gastric lavage samples.
Results: A total of 683 mycobacterial proteins were identified in gastric lavage samples by DIA among which 98 were specifically identified in TB samples. One mycobacterial protein which showed exclusive or predominant detection in TB samples was selected for the development of immunoassay in the gastric lavage samples of 10 pediatric subjects from each Confirmed PTB, Probable PTB and Non-tuberculosis group. ROC curve was generated for the combined group of 'Confirmed PTB' and 'Probable PTB' vs. 'Non-TB' disease group and a cut-off value was derived to provide a sensitivity of >90%.
The cut-off selected from the development cohort was subsequently applied in blinded samples from the validation cohort consisting of 150 pediatric PTB suspects. The positive and negative results were decoded and compared with CRS.
Conclusion: Immunoassay-based test suggested the potential for diagnosing pediatric PTB.

TBS-EP-94 Assessing the activation profile of M. tuberculosis-specific T cells as a surrogate marker for in vivo disease activity in TB household contacts

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Background: Phenotypic profiling of *Mycobacterium tuberculosis* (Mtb)-specific T cells has shown promise in diagnosis, prognosis and treatment monitoring of Tuberculosis (TB). We therefore studied T-cell activation profiles of household contacts (HHC) of adults with microbiologically confirmed TB in selected urban sites of Tanzania, Mozambique and Zimbabwe within the ERASE-TB study using the flow cytometry-based T-cell activation marker-Tuberculosis (TAM-TB) assay.
Methodology: TAM-TB assays were performed for 265 HHC at the time of TB diagnosis of the household member. Whole blood was stimulated *in vitro* with Mtb antigens (ESAT6/CFP10 and Mtb125 peptide pools), followed by intracellular interferon-gamma and T-cell marker (CD38 and CD27) staining.
Results: Analysis of baseline TAM-TB results across sites show ESAT6/CFP10-specific T-cell responses in 138/265 (52%) HHC, which is in line with the TB endemic setting of ERASE-TB. Response rates against Mtb125, a peptide pool optimized for extensive covering of HLA class II molecules, increased to 172/263 (65%). Only 54/231(23%) HHC exhibited a $CD38^{high}$ Mtb-specific CD4+ T-cell profile at the time of Mtb exposure which serves as a surrogate biomarker of an ongoing immune response against Mtb. Of note, three out of five HHCs diagnosed with incident TB during follow-up visits and one of two HHCs diagnosed with symptomatic TB at the baseline visit also showed an activated T-cell profile.
Conclusions: Our results show an increased T-cell response rate against the HLA class II optimized Mtb125 compared to the ESAT6/CFP10 peptide pool. We further demonstrate the applicability of monitoring the Mtb-specific T-cell activation by TAM-TB as a surrogate biomarker of active TB disease to identify persons at risk of developing TB. Longitudinal clinical and TAM-TB follow-up of HHC in ERASE-TB will reveal T-cell activation and disease progression trajectories.

TBS-EP-96 Diagnostic accuracy of chest X-ray and sputum screening among household contacts of people with multi-drug-resistant TB in Vietnam

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Background: The optimal screening algorithm for tuberculosis (TB) disease in high burden settings is uncertain. We aimed to determine TB co-prevalence, and diagnostic accuracy of CXR and universal sputum screening with nucleic-acid amplification tests (GeneXpert MTB/RIF, GXP) among household contacts of patients with MDR-TB (VQUIN trial, ACTRN12616000215426).

Methods: We conducted a cross-sectional study in 10 provinces of Vietnam. Consenting individuals (any age) underwent TB symptom screening, clinical examination, CXR and produced sputum for GXP. Those testing positive on ≥one test produced two additional sputum specimens for acid-fast bacilli smear and liquid culture.

We defined co-prevalent TB as microbiologically-confirmed or clinically diagnosed TB disease within 90 days from enrolment.

Using a positive sputum culture for *M. tuberculosis* as reference, we estimated diagnostic accuracy of:

i. GXP alone,
ii. Typical symptoms or signs alone,
iii. CXR alone, and;
iv. Combinations thereof.

Results: Among 4104 household contacts, 3949 people commenced screening. CXR and valid sputum specimens were available for 2250 individuals. Median age was 40 years (IQR 27, 53) and 38% were male. Eighty-one individuals (4%) had diabetes and 11 (0.5%) had HIV. CXRs were normal in 1912 (85%) including 1666 with no clinical symptoms/signs. Co-prevalent TB was 61/3949 (1540 per 100,000), including 38 with culture confirmation. GXP alone was 0% sensitive, and 100% specific; any typical symptom/ sign alone was 50% sensitive and 87% specific; CXR consistent with pulmonary TB alone was 89% sensitive and 92% specific. CXR with typical symptoms/ signs and a positive GXP yielded the highest sensitivity (92%) and specificity (100%) *(Table 1)*.

Conclusions: TB prevalence among household contacts of MDR-TB patients was high. Symptom screening alone had low sensitivity. Adding GXP to screen asymptomatic individuals with a normal CXR did not increase case detection. CXR and GXP may perform differently in high HIV prevalence settings.

Screening test		Total N=2250	TB culture negative N=2212	TB culture positive N=38	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Normal CXR (n=1912)	No clinical symptoms or signs, GXP negative	1663	1662	1	(base)	(base)	(base)	(base)
	No clinical symptoms or signs, GXP positive	3	3	0	0	99.8% (99.4%, 99.9%)	0	99.9% (99.6%, 100.0%)
	Any TB symptom/ sign, any duration, GXP negative	241	240	1	50.0% (5.9%, 94.1%)	87.4% (85.8%, 88.8%)	0.4% (0.1%, 2.9%)	99.9% (99.6%, 100.0%)
	Any TB symptom/ sign, any duration, GXP positive	3	3	0	0	99.8% (99.4%, 99.9%)	0	99.9% (99.6%, 100.0%)
CXR c/w pulmonary TB (n=231)	No clinical symptoms or signs, GXP negative	145	137	8	88.9% (50.0%, 98.5%)	92.4% (91.1%, 93.5%)	5.5% (2.8%, 10.6%)	99.9% (99.6%, 100.0%)
	No clinical symptoms or signs, GXP positive	9	4	5	83.3% (36.8%, 97.7%)	99.8% (99.4%, 99.9%)	55.6% (25.1%, 82.3%)	99.9% (99.6%, 100.0%)
	Any TB symptom/ sign, any duration, GXP negative	60	53	7	87.5% (46.2%, 98.3%)	96.9% (96.0%, 97.6%)	11.7% (5.7%, 22.5%)	99.9% (99.6%, 100.0%)
	Any TB symptom/ sign, any duration, GXP positive	14	2	12	92.3% (60.9%, 98.9%)	99.9% (99.5%, 100.0%)	85.7% (57.3%, 96.4%)	99.9% (99.6%, 100.0%)
CXR abnormal, not c/w pulmonary TB (n=107)	Any TB symptom/ sign, any duration, GXP positive	1	0	1	50.0% (5.9%, 94.1%)	100.0% (100.0%, 100.0%)	100.0% (100.0%, 100.0%)	99.9% (99.6%, 100.0%)

TBS-EP-97 Evaluation of a digital stethoscope for TB diagnosis among symptomatic individuals: A diagnostic accuracy study

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Background: New tuberculosis (TB) diagnostics are urgently needed, both for triage and confirmatory testing. For triage, diagnostics should be non-invasive, simple to administer, low-cost and rapid, with sensitivity ≥90% and specificity ≥70%. Digital stethoscopes that utilize machine-learning approaches to analyze respiratory sounds have potential for triage.
Methods: We aimed to assess the diagnostic accuracy of a commercially available digital stethoscope (AI Diagnostics, South Africa) for TB diagnosis among individuals with signs and symptoms of pulmonary TB. Adult participants are being enrolled through the FEND-TB consortium (https://www.fend-tb.org/) from South Africa, Uganda, Vietnam, and Peru. The microbiological reference standard (MRS) was defined as TB-positive on any of: liquid culture, solid culture or Xpert MTB/RIF Ultra on sputum. The wireless digital stethoscope captured and analyzed respiratory sounds from six auscultation positions on the torso of each participant. The manufacturer (blinded to MRS status) provided individual participant scores and a cut-off for positivity.
Results: Among 30 MRS-positive and 90 MRS-negative participants selected for initial evaluation, 74 were female, 42 living with HIV, 26 current smokers, and 16 previously treated for TB. All had determinable respiratory recordings. Estimates of sensitivity and specificity, adjusted for stratified sampling by country, were 87.5% (95% CI 64-96) and 53.2% (44-63), respectively (Table 1 shows estimates by participant characteristics).

Characteristics	Category	Sensitivity			Specificity		
		n	N	Estimate 95% CI (%)	n	N	Estimate 95% CI (%)
Overall		**26**	**30**	**87.5% (64.2%, 95.7%)**	**49**	**90**	**53.2% (43.7% , 63.0%)**
Country	Peru	0	1	0.0% (0.0%, 79.3%)	0	0	-
	South Africa	15	18	83.3% (60.8%, 94.2%)	41	66	62.1% (50.1%, 72.9%)
	Uganda	11	11	100.0% (74.1%, 100.0%)	8	24	33.3% (18.0%, 53.3%)
HIV Status*	Negative	17	18	94.4% (74.2%, 99.0%)	30	59	50.8% (38.4%, 63.2%)
	Positive	9	12	75.0% (46.8%, 91.1%)	19	30	63.3% (45.5%, 78.1%)
Smoking Status	No	14	18	77.8% (54.8%, 91.0%)	41	73	56.2% (44.8%, 67.0%)
	Yes, previous smoker	3	3	100.0% (43.9%, 100.0%)	0	0	-
	Yes, current occasional smoker	0	0	-	1	1	100.0% (20.7%, 100.0%)
	Yes, current daily smoker	9	9	100.0% (70.1%, 100.0%)	7	16	43.8% (23.1%, 66.8%)
Sputum Smear Status	Negative	12	14	85.7% (60.1%, 96.0%)	48	87	55.2% (44.7%, 65.2%)
	Positive	14	16	87.5% (64.0%, 96.5%)	1	3	33.3% (6.1%, 79.2%)

n= Number of results, N = Total number classified as Reference Standard Positive or Negative.
*One MRS− participant was missing HIV status.
Overall estimates account for stratified sampling and 95% confidence intervals (CI) use the stratified Wilson method of Yan and Su.
Reference: Yan X, Su XG. Stratified Wilson and Newcombe Confidence Intervals for Multiple Binomial Proportions. 2010. Statistics in Biopharmaceutical Research, 2:3, 329-335, doi: 10.1198/sbr.2009.0049

Sensitivity was lower among people living with HIV but not for AFB-negative and current smokers. The ROC AUC is estimated at 0.74. Testing took a median of 5 minutes/participant (IQR 4–6) to complete.

Conclusions: These preliminary data suggest that further investigation of this digital stethoscope as a triage test is warranted, including use in asymptomatic individuals and specific high TB risk populations. The device was simple to use and can be used offline. The initial cost of equipment is projected to be low and there are no ongoing consumable costs.

TBS-EP-98 Radiological sequelae in individuals with microbiologically-proven asymptomatic TB detected in a population-based survey in rural KwaZulu-Natal, South Africa

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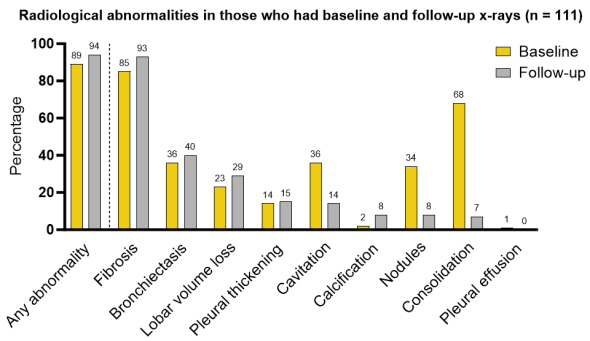
Background: Post-tuberculosis lung disease (PTLD) is a major cause of morbidity. Although approximately 50% of people diagnosed with TB in prevalence surveys have subclinical disease, little is known about their post-treatment sequelae. We assessed changes between baseline and 3-year chest x-rays in people diagnosed with TB in a population-based survey.
Methods: People newly diagnosed with microbiologically-confirmed TB (sputum positive for Mtb by GeneXpert Ultra or MGIT culture) during a community survey that included symptom-agnostic radiological screening (2018-2020) were contacted for a follow-up assessment three years later (2021-2023). This analysis was restricted to individuals with X-rays from both timepoints. X-rays were compared by a blinded radiologist for changes over time. Radiological outcomes were analyzed by baseline symptoms (WHO 4-symptom screen, including cough of any duration) and HIV status.
Results: Among 174 eligible participants, 111 (64%) had x-rays at both timepoints. 90/111 (81%) were asymptomatic at baseline and 49/111 (44%) were living with HIV. 104/111 (94%) reported starting TB treatment after diagnosis. Between baseline and 3-year follow-up, the proportion with cavities, consolidation and nodules decreased, while those with fibrosis, bronchiectasis, volume loss and calcification increased (Figure 1). 78/111 (70%) had new or worse radiological abnormalities at follow-up, with fibrosis being most common (63/111, 57%), followed by bronchiectasis (22/111, 20%) and volume loss (13/111, 12%). Chest x-ray abnormalities at 3-years did not differ by baseline symptom or HIV status.



Conclusions: Despite early detection and treatment at the subclinical phase of TB, more participants had radiological abnormalities at 3-year follow-up than at baseline. These findings suggest that even early detection and treatment may not prevent long-term radiological consequences of TB that could be features of PTLD and that further investigation into the functional correlates of these radiological findings is required.

TBS-EP-99 Transcriptomic responses associated with mortality in HIV-associated TB by longitudinal whole blood analysis

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People living with HIV (PLWH) admitted to hospital with symptoms of tuberculosis (TB) are at particularly high risk of death, with mortality rates up to 25% in African countries. Death occurs despite initiation of appropriate anti-tuberculosis treatment and antiretroviral therapy (ART). We investigated whole blood transcriptomic profiles during anti-tuberculosis treatment in a longitudinal cohort of adult patients hospitalised for TB in Malawi, with the goal of interrogating pathophysiology, identifying an early transcriptomic biosignature associated with outcome and identifying novel therapeutic targets.
Methods: The study was nested within CASTLE, a randomised trial of enhanced diagnostics for TB in PLWH, at Zomba Central Hospital, Malawi. Participants were HIV-positive adults admitted with symptoms of TB, enrolled following informed consent. Whole blood samples were collected at admission and after one and two weeks of anti-tuberculosis treatment.

Mortality was recorded at day 56. RNA was extracted and sequenced by NovaSeq 6000 (Illumina). Principal component analysis (PCA), differential gene expression analysis using edgeR and weighted correlation network analysis were used to compare gene expression and immune networks by participant vital status and over time.
Results: 56 participants were enrolled, with most taking ART (n=49, 88%) and 27/56 (48%) with an undetectable HIV viral load. TB was diagnosed in 21/56 (38%), and 18 were followed longitudinally during anti-tuberculosis treatment. Mortality occurred in 44% (8/18), at median (IQR) 15 (5.5-25) days. Significantly up- and down-regulated transcripts, comparing those who died with those who survived, were evident at all timepoints studied, with greater difference by vital status with increased time from anti-tuberculosis treatment initiation (see Figure - PCA plot showing samples by participant outcome).

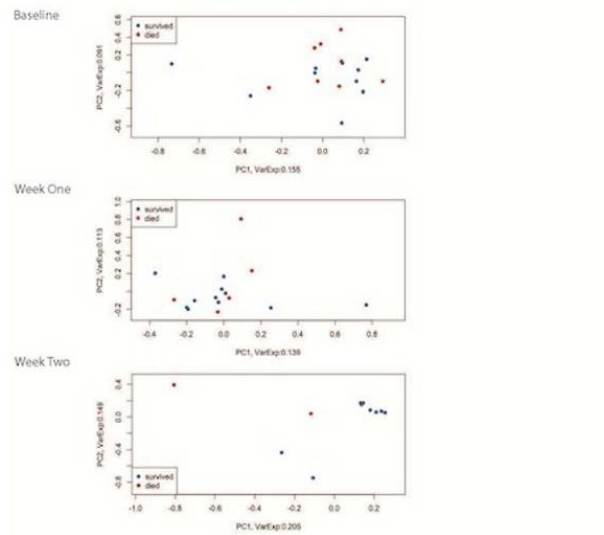

Figure – Principal component analysis of whole blood transcriptome during anti-tuberculosis treatment at enrolment (baseline) and following TB treatment initiation (week one and two). Principal component (PC) 1, representing the greatest variability in the data, is plotted on the x axis and PC2 on the y axis, demonstrating clustering of participant samples, represented by coloured dots, by similarity, with blue indicating participants who survived and red indicating participants who died.

Conclusion: Mortality from HIV-associated TB is unacceptably high, despite appropriate anti-tuberculosis treatment. Interrogation of pathological immune responses stands to elucidate key pathophysiological targets for therapeutic intervention.

TBS-EP-100 Host genetic factors related to TB susceptibility and mortality: Genome-wide association studies from Indonesia

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Background: Heritability of tuberculosis has long been recognized, and many candidate genes have been studied, but few associated variants replicate across settings. Also, very few studies have examined genetic factors across the spectrum of disease. We performed genome-wide studies in Indonesia aiming to identify genetic loci associated with susceptibility to TB infection, disease, and mortality.
Methods: As part of a long-standing research collaboration, chest X-ray negative tuberculosis (TB) household contacts (n=1097) and community controls (n=530), and patients with pulmonary TB (n=1616) and tuberculous meningitis (n=565) were DNA genotyped (Illumina genome-wide SNP arrays), **Table 1**.

	n	Symptoms	Chest X-ray	Microbiology	HIV
Community controls	530	no	normal	Negative	0.2% country prevalence
TB household controls, persistently IGRA-negative	317	No	normal	Negative (exposed to sputum+ index patients)	Negative
TB household controls, IGRA-positive	780	No	Normal	Negative (exposed to sputum+ index patients)	Negative
Pulmonary TB	1616	yes	abnormal	Sputum smear, Xpert or culture positive	2%
TB meningitis	509	yes	~50% abnormal	>50% bacteriologically confirmed	~30%

Table 1: study subjects.

To improve imputation in the absence of an Indonesian reference genome, whole genome sequencing (WGS) was performed on a subset (n=227). Genetic associations with different stages after exposure to *Mtb* were determined, with adjustment for age and other relevant host factors.
Results: We created an imputation panel using WGS of 227 individuals from West Java. In addition to identifing 1.8 million novel variants, adding Indonesian reference to the East Asian reference panel significantly improved imputation accuracy. Our GWAS on TB vs controls replicated the association of HLA-II region associated with TB disease.
We have identified two regions with genome wide significance associated with persistent IGRA-negativity among heavily exposed TB household contacts, and two regions associated with mortality after two months treatment (33%) among tuberculous meningitis patients.
Conclusion: We have replicated the global host genetic correlate for TB disease in the HLA-II region, and identified several new loci associated with resistance to TB infection, disease and mortality, based on strong selection of controls and careful clinical phenotyping.
We aim to validate genetic loci within the International Tuberculosis Human Genetics Consortium (ITHGC), and examine biological pathways with a functional immunological and multi-omics studies.

TBS-EP-101 TB relapse and reinfection among people with treatment history in Hanoi, Vietnam

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Background: Repeated episodes of tuberculosis (TB) can be caused by either relapse or reinfection even after successful treatment. We assessed the proportions of relapse and reinfection among active TB patients with a history of one or more treatments in Hanoi, Vietnam.
Methods: Retreated TB patients diagnosed with smear-positive pulmonary TB were recruited in two periods, 2012-2015 and 2017-2020. Patients who completed or were cured by a regimen for previously treated TB were followed up for 18 months. DNA samples from clinical isolates were extracted before starting retreatment and at any subsequent recurrences, and the whole genome was analyzed using Illumina sequencer for paired samples. Relapse was distinguished from reinfection using a threshold fewer than six single nucleotide variants between paired samples. Drug resistance-conferring mutations were identified using TB-Profiler version 4.3. Cox proportional hazard models were employed to investigate possible risk factors for recurrence.
Results: In total, 546 patients were recruited and retreatment was started. Multivariate analyses applied for the 2012-2015 cohort revealed an association between the presence of cavity on chest X-ray and recurrence (adjusted hazard ratio = 3.35 [95% confidence interval 1.16-9.66]) after adjustment for age, gender, body mass index, treatment history and underlying disease. Out of 69 recurrent episodes following retreatment, 36 paired samples were obtained. Among these, 10 (27.8%) were regarded as

relapse, and 26 (72.2%) were classified as reinfection, although the possible involvement of mixed infection could not be excluded. Four of the 10 isolates from relapse cases accumulated drug-resistance conferring mutations during retreatment.

Conclusions: In Hanoi, recurrence due to simple relapse was not as frequent as expected among smear-positive pulmonary TB patients with a treatment history.

Further careful analysis is needed to investigate exogenous transmission and understand the role of cavities in recurrence.

TBS-EP-102 Hyperferritinaemia associated with bacillary load and mortality in people who have been admitted with HIV-associated TB

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Introduction: Ferritin is an acute phase reactant commonly elevated with inflammation including tuberculosis-associated inflammation. Ferritin elevation results from monocyte-macrophage activation which may play a role in pathogenesis and outcome in HIV-associated tuberculosis. We hypothesized that ferritin is associated with bacillary load, tissue damage, and mortality in patients with HIV-associated tuberculosis.

Methods: We measured ferritin from stored samples of a well characterised cohort of inpatient adults (≥18 years) with HIV-associated tuberculosis diagnosed microbiologically in Khayelitsha Hospital, Cape Town. Spearman rank correlation was used to assess the relationships between ferritin and *Mycobacterium tuberculosis* load and immune biomarkers. Ordinal categories of ferritin were created for survival analysis with risk of mortality assessed by Cox-proportional hazards modelling.

Results: The analysis included 221 participants with median age 36 years (IQR 31-43), CD4 count 66 cells/mm^3 (IQR 24-133), most not on ART (65%) and predominantly female (55%, 121/221). At week 12, mortality was 19% (42/221). Median ferritin was 1554 mmol/l (IQR 705-4876) and was higher in those who died compared to survivors (2577 vs 1449, p <0.001). Ferritin correlated with markers of bacillary load, innate immune cytokines (CXCL10 R = 0.69, p <0.001; IL1Ra R = 0.63, p <0.001) and organ dysfunction and tissue damage (creatinine R = 0.3, p <0.001; d-dimer R = 0.51, p <0.001; troponin R = 0.3, p <0.001 and pro-BNP R = 0.32, p <0.001). In a Cox proportional hazards model, hyperferritinaemia was associated with higher risk of mortality (HR 1.4, CI 1.1-1.8), *figure 1*.

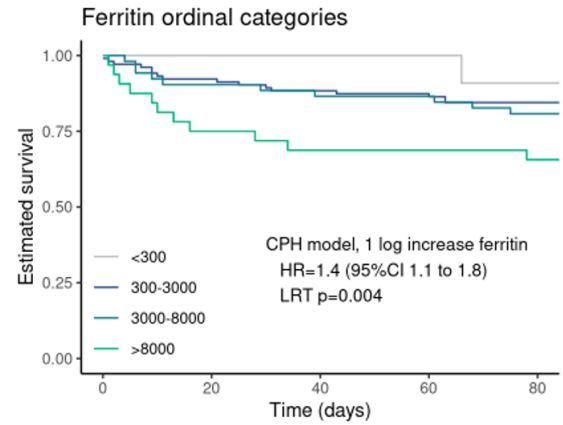

Figure 1: Kaplan-Meier plot showing survival by ferritin on an ordinal scale of four categories. Hazard ratio for one log increase in ordinal category with 95% confidence interval from a Cox Proportional Hazards model fit to data.

Conclusion: Hyperferritinaemia is associated with markers of innate immune inflammation, organ dysfunction, tissue damage and mortality in patients with HIV-associated tuberculosis. These findings suggest that hyperinflammation, along the spectrum of secondary haemophagocytic lymphohistiocytosis, plays a role in the pathogenesis and is a determinant of outcome in severe HIV-associated tuberculosis.

TBS-EP-103 Comparing TB transmission hotspots: Insights from hotspot identification from residential and activity space data among individuals with newly-diagnosed TB in South Africa

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In high-prevalence settings, halting the spread of tuberculosis (TB) rests on breaking the chain of transmission, yet it is largely unknown where transmission occurs. Understanding where transmission occurs can inform targeted screening and testing interventions.

This preliminary analysis aims to determine whether the geographical extent of transmission hotspots identified from residential-only locations differed from those identified using activity space locations.

We enrolled individuals recently diagnosed with pulmonary TB at two primary healthcare clinics in Tongaat, KwaZulu-Natal, South Africa. We conducted structured interviews to capture participants' activity space (routine spatial movements, including residences, locations, and transit hubs) within the 12 months before TB diagnosis and collected sputum for whole genome sequencing (WGS).

We selected the two largest WGS-inferred transmission networks to identify and compare transmission hotspots using distance-based mapping (DBM) using either the full activity space data for each participant or residence location alone.

To date (July 2022–May 2024), we enrolled 438 individuals with GeneXpert-positive TB, with WGS data available for 220. We identified transmission hotspots for transmission networks 8 (n=7; red) and 15 (n=9; blue), both of which consisted entirely of strains from MTB lineage 2.2.1 (Figure).

The estimated extent and location of transmission hotspots for transmission network 15 differed by geographic data input (activity space versus residential-only locations), whereas transmission hotspots for transmission network 8 were similar across both inputs.

Interestingly, transmission network 15 consisted entirely of men (100% vs. 66.7%), had a higher average monthly income (R6700 vs. R3200), and reported more locations per person (4.5 vs. 3.8) compared to transmission network 8.

Our study highlights the heterogeneity between transmission networks, beyond genomic characteristics. Transmission hotspots derived from activity space data can differ significantly from those identified using residential data, particularly for transmission networks comprised of demographic features previously reported to be associated with transmission.

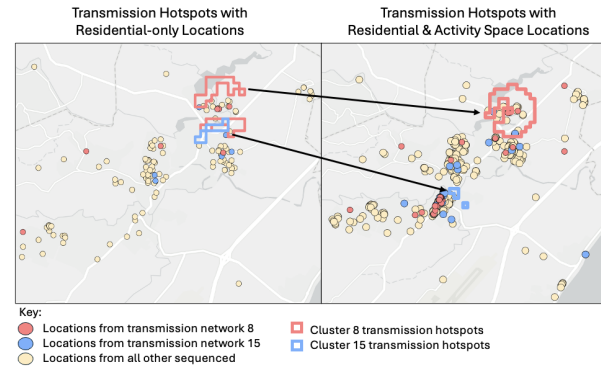

Figure: Comparison of the geographical location of transmission hotspots using DMB on residential-only locations (left) vs. activity space locations (right).

TBS-EP-104 Risk factors for fatal cases caused by TB of the central nervous system in immune reconstitution inflammatory syndrome and their prediction using logistic regression models

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The **aim** of the study was to predict the risk of death caused by tuberculosis (TB) of the central nervous system (CNS) in immune reconstitution inflammatory syndrome (IRIS) using logistic regression models.

Materials and Methods: Patients with confirmed CNS tuberculosis who started antiretroviral therapy (ART) were included in the study. A fatal case was defined according to autopsy data as death caused by CNS tuberculosis occurring within one year of observation. To analyze the risk factors of death from CNS tuberculosis in TB-associated IRIS, logistic regression models were constructed and analyzed. A multifactorial model for predicting the risk of death from neurological TB-IRIS was developed.

Results: The analysis was conducted on the examination results of 55 patients. A five-factor model revealed a significant dependence of the risk of a fatal outcome on specified factors, with an area under the ROC curve (AUC) of 0.96 (95% CI: 0.914 - 1.0), $p<0.05$. Recovery within one year was observed in 24 patients (43.6%), while 31 patients (56.4%) had a fatal outcome.

Indicator	The value of the coefficient of the model, b±mb	p
Five-factor:		
Age	-0.19±0.11	0.1
Gender	0.89±1.14	0.1
Resist	1.25±1.27	0.33
CD4+	-0.02±0.009	0.01*
RNK HIV	0.000007±0.000003	0.039*
Two-factor:		
CD4+	-0.017±0.007	0.019*
RNK HIV	0.000007±0.000008	0.01*

Table 1. Coefficients of the five-factor and two-factor logistic model for predicting the risk of a fatal case in TB-IRIS with tuberculosis damage to the CNS
** p<0.05*

Conclusions: We found that the risk of a fatal outcome in TB-associated IRIS with CNS involvement is significantly related (p<0.05) to the level of CD4+ lymphocytes per microliter of blood and the viral load level before the start of ART. The risk of a fatal outcome is higher in patients with a high initial viral load and a low level of CD4+ lymphocytes per microliter of blood.

TBS-EP-105 Activity space data reveals joint subgrouping of mobility patterns, demographic characteristics, and HIV serostatus among individuals with newly-diagnosed TB in South Africa

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Tuberculosis (TB) transmission remains a barrier to TB control. Previous research measuring individual-level activity space has yielded important insights about how individual mobility influences TB transmission. We aimed to determine the characteristics of those with similar activity space mobility (activity space clusters) and their association with recent TB transmission.
We enrolled individuals recently diagnosed with pulmonary TB at two healthcare clinics in Tongaat, KwaZulu-Natal, South Africa. We conducted interviews to capture participants' activity space (routine spatial movements, including residences, locations, and transit hubs) and collected sputum for whole genome sequencing (WGS). We grouped individuals into activity space clusters based on the similarity of their individual-level activity spaces, first calculating pairwise cosine similarity values between all pairs of individuals, and then hierarchically clustering them. Subsequently, we conducted preliminary analyses to examine associations between demographic characteristics, genomic linkages (£ 15 SNPs), and activity space clusters using ANOVA and Fisher's exact test.
From July 2022–May 2024, we enrolled 438 individuals with GeneXpert-positive TB, with WGS data available for 220 (28.8% with genomic linkages). Among 174 participants who shared at least one common location with another participant, we identified eight activity space clusters that differed by employment status (p-value=0.069), educational attainment (p-value=0.045), and HIV status (p-value=0.001) but not by genomic linkages. However, some clusters showed no within-cluster variation (activity space cluster 6: 100% less than grade 12 education, activity space cluster 7: 100% HIV negative, activity space cluster 8: 100% employed), indicating that individuals with similar traits are more likely to share the same activity spaces (Figure).

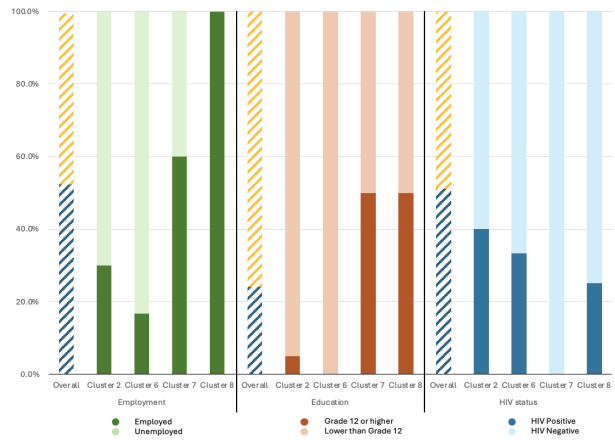

Figure: Comparison of activity space clusters by significant demographic and clinical characteristics

Our study highlights the heterogeneity of mobility patterns and shows that people with certain characteristics tend to frequent similar locations. These findings, incorporated with advanced transmission inference methods, are crucial for gaining insights into individuals, groups, and locations where targeted control efforts may be effective.

TBS-EP-106 Connecting TB bioarchives to enhance global collaboration and answer fundamental research questions on a large scale

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Tuberculosis (TB) is a leading cause of death for which an effective vaccine is urgently required. Progress in vaccine development has been hampered by fundamental gaps in our understanding of the immune response that an effective vaccine needs to induce. As part of ongoing efforts to address this, research groups worldwide have conducted numerous field-lab studies in which biological samples (e.g., blood, sputum, and urine) are collected from tuberculosis cases and contacts/healthy controls to identify correlates of protection.

Global collaboration around these samples has the potential to enable fundamental research questions to be asked on a large scale and to provide breakthroughs in our understanding of the requirements for an effective TB vaccine.

However, these studies have tended to not be connected to each other and there has been no attempt to create an inventory of their archived samples and metadata, or to explore the feasibility of global collaboration at scale. To address this, we have performed a systematic review to identify relevant studies with samples that may be available for use by the global TB research community.

We searched MEDLINE, Embase, Web of Science, CENTRAL and clinicaltrials.gov without language restrictions for tuberculosis observational studies and vaccine trials published between January 2014 and January 2024. The ten-year timeframe was chosen as this is the maximum time that we anticipate samples being stored. From this systematic review we identified 206 relevant studies across 34 different countries.

Future work will engage with principal investigators and key stakeholders to develop a Terms of Reference and prepare for an online database for the use of available samples. This study has potential to provide the TB research community with an opportunity to solve fundamental research questions on a scale that has so far not been possible.

TBS-EP-06 Mechanisms underlying heterogeneous disease manifestations | Part 2

TBS-EP-107 Impact of nutritional intervention on cytokine profile of malnourished latent TB individuals in presence and absence of parasitic infection

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Background: Malnutrition is a comorbidity and determinant of TB. Nutritional support reduces disease incidence. The immunological underpinnings of how nutritional support reduced TB disease incidence is unknown. In this study we analysed the cytokine levels to understand the immune mechanisms.

Methods: A total of 74 IGRA-positive individuals ages 18-55 years were evaluated. The malnourished without parasite (n=19), malnourished with parasite(n=18), well-nourished without parasite(n=18) and well-nourished with parasite (n=19). Malnourished participants [n=37] received six months of nutritional intervention of 2600 kcal comprising 81.9g protein, 78.8g fat and multivitamin supplements. Helminth-positive individuals [n=37] were treated with anti-helminthic drugs. The cytokine levels were measured from supernatants of the IGRA test using a 17-plex Biorad kit. A student t-test was performed on cytokine levels between malnourished and well-nourished groups with and without parasites, followed by a paired T-test for the malnourished group before and after intervention.

Results: In malnourished without helminth infection, Th2 (IL-4, IL-5 and IL-10) cytokines were higher. Th-1 cytokine IL-2 was higher in the well-nourished group. In the helminth-infected group, the malnourished showed increased levels of Th-2 cytokines (IL-4, IL-5, IL-10, and IL-13), and IL-12p, IL-17, and MCP-1.

Post-nutritional intervention, in malnourished without helminth infection, the pro-inflammatory (IL-1β, IL-6, IL-12p, IFN-γ) cytokines were reduced, and the anti-inflammatory cytokine (G-CSF) was increased. In malnourished with helminth infection, Th-2 cytokines (IL-5) and Th-1 cytokine (IL-2) were decreased post-intervention and anti-helminthic treatment. MCP, a pro-inflammatory cytokine, was found to be increased.

Conclusion: Nutritional supplementation reduces the pro-inflammatory cytokines (IL-1β, IL-6, IL-12p, IFN-γ) in the malnourished helminth-negative group. After the nutritional and anti-helminth treatment intervention, malnourished individuals with helminth infection

showed reduced anti-inflammatory cytokine IL-5 and increased levels of pro-inflammatory cytokines (IL-2 and MCP). The increased levels of pro-inflammatory cytokines in pre-intervention samples indicates pro-active immune-reaction against exposure to M.tb in the latent TB samples.

TBS-EP-108 Impact of diagnostic machine errors on the timely diagnosis of persons affected with drug-resistant and drug-susceptible TB

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Background: The timely diagnosis of tuberculosis (TB), including drug-resistant and drug-susceptible forms, is crucial for effective patient management and treatment. However, diagnostic machine errors can lead to delays in obtaining accurate results, potentially impacting clinical decision-making and patient outcomes.
Methods: This retrospective study analysed data from TB diagnostic facilities across Uganda, where an internet-dependent diagnostic connectivity solution was implemented. Field activity reports were reviewed, focusing on instances of diagnostic machine errors and their impact on the timely reporting of TB test results.
Data were collected on the types of errors encountered, their frequency, and the associated delays in obtaining results.
Results: Various diagnostic machine errors were identified, including compatibility issues with the connectivity solution, software malfunctions, and hardware failures. These errors resulted in delayed or incomplete data transmission, leading to significant delays in reporting TB test results to healthcare providers. The impact was particularly pronounced in remote areas with limited internet connectivity, further exacerbating the challenges in timely diagnosis. Consequently, delays in initiating appropriate treatment regimens for persons affected with drug-resistant and drug-susceptible TB were observed.
Conclusion: Diagnostic machine errors can have a considerable impact on the timely diagnosis of TB, including drug-resistant and drug-susceptible forms.
Addressing these errors through regular maintenance, software updates, and robust internet connectivity is crucial to ensure prompt reporting of test results and initiation of appropriate treatment.
Efforts to mitigate diagnostic machine errors should be prioritized to improve patient outcomes and enhance TB control efforts in Uganda.

TBS-EP-109 Challenges in TB diagnosis and treatment delays for deaf individuals in Kampala District: A qualitative study

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Background: Tuberculosis (TB) remains a critical health issue in Uganda, particularly in urban areas like Kampala. The deaf community often faces additional barriers in accessing timely and effective healthcare due to communication challenges. This study investigated the diagnostic and treatment delays experienced by deaf individuals in Kampala district.
Methods: A qualitative study was conducted with a purposive sample of 10 consenting volunteer deaf individuals diagnosed with TB. Participants were recruited from disability community centers and healthcare facilities in Kampala. Data were collected through in-depth interviews, focusing on their experiences with TB diagnosis and treatment. Thematic analysis was used to identify key themes and patterns related to delays in the healthcare process.
Results: The analysis revealed several common themes:
1. All participants reported significant delays in diagnosis due to communication difficulties with healthcare providers. The absence of sign language interpreters and inadequate use of visual aids contributed to misunderstandings and misdiagnoses.
2. Many participants faced stigma within the healthcare system and their communities, deterring them from seeking timely medical attention. This stigma was often compounded by their deafness and TB status.
3. Most participants indicated a lack of awareness among healthcare workers about the specific needs of deaf patients. This included poor understanding of sign language and the unique challenges faced by deaf individuals.
4. Due to delayed diagnosis, participants often started treatment late, adversely affecting their health outcomes. Some reported experiencing deteriorating health conditions before receiving appropriate TB care.
Conclusion: The study highlights critical gaps in the healthcare system for the deaf community in Kampala, particularly concerning TB diagnosis and treatment. Addressing healthcare gaps for deaf persons affected by TB in Kampala requires sign language interpreters, provider training, and anti-stigma policies.
Further research is needed to develop and evaluate interventions aimed at reducing healthcare disparities for the deaf community.

TBS-EP-110 Exploring challenges and opportunities in TB sample collection instructions for deaf volunteers in Kampala

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Background: Accessing healthcare services for tuberculosis (TB) sample collection poses formidable challenges for deaf individuals in Kampala, exacerbating existing healthcare disparities.
This study delves into the experiences of four consenting deaf volunteers, shedding light on the barriers they encounter in understanding TB sample collection instructions and the potential for innovative solutions to address these challenges.
Methods: Qualitative analysis was conducted, drawing on the narratives of four consenting deaf volunteers in Kampala. Semi-structured interviews were employed to explore their experiences with TB sample collection instructions. Through thematic analysis, the study sought to determine communication barriers, access to sign language interpreters, and the feasibility of sign language enabled technology (SLET) demonstrations as a potential solution.
Results: The analysis unveiled significant challenges faced by the deaf volunteers, including communication barriers, limited access to sign language interpreters, and a lack of deaf-friendly healthcare services.
However, amidst these challenges, opportunities for innovation emerged. SLET demonstrations were identified as a promising solution to enhance comprehension and empower deaf individuals in understanding TB sample collection instructions. Participants expressed enthusiasm for SLET as a means to bridge communication gaps and improve healthcare access.
Conclusions: The findings underscore the urgent need for innovative solutions to address communication barriers faced by deaf individuals in accessing healthcare services, particularly for TB sample collection. Integration of SLET demonstrations into healthcare facilities presents a tangible opportunity to enhance understanding and empower deaf patients. This can foster inclusive practices, ensuring equitable access to TB diagnosis and treatment for the deaf community in Kampala.
This study advocates for the implementation of SLET demonstrations as a step towards building a more inclusive and accessible healthcare system, ultimately improving health outcomes for all.

TBS-EP-111 TREC as a personalised TB predictor in preschool children

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Background: Scientists around the Globe are making deliberate attempts to develop the new methods for predicting and diagnosing tuberculosis, but these measures are not enough to end its epidemic. The purpose of the study was to evaluate the excisional rings of the T-cell receptor (TREC) and K-deletion element of B-cells (KREC) in infants and preschool children at high risk of tuberculosis as a promising prognostic marker for tuberculosis infection activity.
Method: The observation group consisted of 87 children aged 1 to 7 y/o, of which 13 (14.9%) aged 1 to 3 y/o and 74 aged 4 to 7 y/o; 53 (60.9%) boys/34 (39.1%) girls. The three groups were formed: G1 (n=27) with an established diagnosis of tuberculosis (TB), G2 (n=34) with TB infection diagnosis made based on the results of tuberculin diagnosis and without signs of a local specific process, and [control] G3 (n=26) without signs of TB infection according to the results of specific skin tests and without signs of TB, i.e., conditionally healthy.
Results: The reference values of TREC and KREC were established for children of early and preschool ages when extracting DNA from a dry blood spot. When assessing tuberculosis infection in children of early and preschool ages, statistically significant criteria were determined, such as: anti-tuberculosis therapy ($F=42.001$; $p<0.001$), positive or negative reaction to the recombinant tuberculosis allergen during an intradermal test ($F=39.394$; $p<0.001$), high blood TREC level ($F=12.707$; $p<0.001$), tuberculin reaction ($F=10.625$; $p<0.001$), and KREC level ($F=3.182$; $p=0.039$).
Conclusions: High level of TREC can be considered as a marker for the activity or a personalized predictor for the risk of progression of TB infection in children of early and preschool ages with high risk of TB.
Keywords: children, tuberculosis infection, specific immune response, anti-tuberculosis therapy, DNA circle, TREC, KREC, immunodiagnostics.

TBS-EP-112 Effect of diabetes on presentation and treatment outcomes among adults with sputum positive pulmonary TB: A prospective cohort study in Haryana, India

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Background: This prospective cohort study was done to compare the clinical, microbiological, and radiological presentation, and treatment outcomes between adult patients with tuberculosis who had diabetes as compared to those without diabetes.

Methodology: All consecutive adult patients (age ≥ 18yrs) with microbiologically confirmed drug- sensitive pulmonary tuberculosis who were put on treatment in two tuberculosis units in Ballabgarh block in Haryana, India between November 2019, and January 2021 were enrolled. Patients were diagnosed as having diabetes if their HbA1C was >6.5%, or fasting blood sugar ≥ 126 mg/dl. Presence and onset of symptoms was ascertained through interview and a symptom score was calculated by giving a score of 1 to following symptoms: cough, fever, chest pain, night sweats, haemoptysis, and weight loss. Chest X-rays were evaluated by an experienced radiologist. Patients were followed for six months through the period of treatment to assess treatment outcomes. Data was analysed using $\chi 2$ test or Fisher's exact test.

Variable	Total N=412 (%)	Patients with diabetes, N=73 (%)	Patients without diabetes, N=339 (%)	p-value
Body-mass index (in kg/m^2)*				
Underweight (<18.5)	273 (66.6)	28 (38.4)	245 (72.7)	<0.001
Normal (18.5 – 24.9)	127 (31.0)	40 (54.8)	87 (25.8)	
Overweight or obese (>=25)	10 (2.4)	5 (6.8)	5 (1.5)	
Grading in sputum smear				
Low (scanty or 1+)	174 (42.2)	30 (41.1)	144 (42.5)	0.828
High (2+ or 3+)	238 (57.8)	43 (58.9)	195 (57.5)	
Mean symptom score (SD)	3.6 (1.3)	3.7 (1.3)	3.6 (1.4)	0.504
Chest x-ray finding**				
Cavitation	296 (80.7)	51 (69.9)	245 (72.3)	0.726
Consolidation	201 (54.8)	31 (42.5)	170 (50.1)	0.408
Multi-lobar involvement	230 (63.0)	34 (46.6)	196 (57.8)	0.197
Outcome at the end of treatment				
Cured	347 (84.2)	58 (79.5)	289 (85.3)	0.218
Treatment completed	7 (1.7)	3 (4.1)	4 (1.2)	0.079
Treatment failure	5 (1.2)	0 (0.0)	5 (1.5)	0.296
Death	33 (8.0)	9 (12.3)	24 (7.1)	0.134
Treatment interrupted	8 (1.9)	1 (1.4)	7 (2.1)	0.696
Loss to follow up	12 (2.9)	2 (2.7)	10 (2.9)	0.923

*Data available for 73 diabetics and 337 non-diabetics
**Data available for 61 diabetics and 304 non-diabetics

Table. Initial presentation and treatment outcomes among adult patients with sputum positive pulmonary tuberculosis with or without diabetes in Ballabgarh, India.

Results: A total of 412 patients were included in the study, of which 73 (17.7%) had diabetes. The mean symptom score among those with or without diabetes was 3.7 (SD-1.3) and 3.6 (SD-1.4) respectively. There was no significant difference in the clinical presentation, radiological, and sputum smear grade at baseline between patients with or without diabetes. Patients without diabetes gained significantly higher weight (3.8 kg, SD-4.6 kg), as compared to those without diabetes (1.8 Kg, SD- 3.9 Kg). Treatment success was achieved in 83.6% of patients with diabetes and 86.4% of patients without diabetes.

A higher proportion of deaths were observed among patients with diabetes (12.3% vs. 7.1%) as compared to those without diabetes.

Conclusions: Though treatment success rate was less, and death rate was higher in patients with tuberculosis who had diabetes as compared to those who didn't have diabetes, difference was not statistically significant.

TBS-EP-113 TB severity factors: A systematic review

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Introduction: Existing tuberculosis (TB) severity scores do not consider important manifestations of disease severity (bacillary load, extent of lung involvement, disease dissemination) and most are not specifically designed for people living with HIV (PLWH). The aim of this review was to identify factors associated with TB severity described in the literature in order to propose a consensual multifactorial TB severity score for PLWH.

Methods: This systematic review was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Searches were carried out in Pubmed, Embase and Cochrane Publications from 01 June to 31 October 2021 on severe morbidity, treatment failure, sequelae and death were selected, enabling us to search for factors associated with these outcomes.

Results: 117 studies from 41 countries were included. The size of the studies population ranged from 44 to 2551058 with a median of 769 (IQR, 299- 3245). Most reported TB severity factors were:

• In PLWH: low CD4, comorbidities, opportunistic infections, ART not initiated, being bedridden, disseminated TB, age ≥60 years, anemia, LAM positive, LAM grade ≥3, low BMI, meningeal TB, diagnosis delay>4 weeks, pulmonary TB with extra pulmonary involvement, smear or culture positive.

• In HIV negative patients: comorbidities, age ≥60 years, decreased activity of daily living, dehydration, female gender, orientation disturbance.

• In studies that included both PLWH and HIV negative patients: comorbidities, HIV positive, low CD4, age ≥60 years, smear or culture positive, low BMI, extrapulmonary TB, previous TB episode, bilateral lung involvement, cavitation, miliary TB, high bacillary load, age ≥65 years,

anemia, dyspnea, fever, heart rate > 100 per minute, infiltration > 2 lobes, meningeal TB, peritoneal TB, respiratory rate > 20 per minute, SpO2< 90%, TB-specific abnormality on chest x-ray.
Conclusion: This review identified TB severity factors that could be included in a consensual multifactorial TB severity scale for PLWH.

TBS-EP-114 Computer-aided detection of chest X-ray as a surrogate marker of disease severity in pulmonary TB

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Background: Recent advances in computer-aided detection of chest X-ray (CAD CXR) based on artificial intelligence (AI) have resulted in a WHO recommendation to use CAD CXR for tuberculosis (TB) screening. Our aim was to evaluate CAD CXR as a surrogate marker of disease severity in pulmonary TB (PTB).
Method: Digitalised CXRs of patients with PTB from Sweden before and 2, 6 and 12 months after treatment were analysed using two CAD software. CXRs digitalised in jpg-format from patients with TB in Ethiopia before and 12 weeks after treatment were also analysed. Baseline CXRs in both cohorts were graded by radiologists according to a severity scale from the National Tuberculosis Association (NTA) of America. Inflammatory markers as well as clinical and microbiological data were obtained at baseline from both cohorts.
Results: CAD CXR was performed on 37 PTB-patients in the Swedish cohort with a median (IQR) abnormality score of 64.3 (30.4–78.7) from CAD4TB and 0.82 (0.39–0.91) from qXR. There was a significant correlation between the two CAD software (ρ=0.83) and with the NTA grading (ρ=0.66). CAD scores also correlated with inflammatory markers and mycobacterial load at baseline. In the Ethiopian cohort (n=82), there was a significantly increased qXR score (0.98 vs 0.82, p<0.01) compared to Swedish PTB patients as well as a correlation between qXR and the NTA classification.
Conclusion: CAD CXR is a promising surrogate marker of disease severity in PTB. Current CAD software are optimised to identify TB and need further refinement to be used as surrogate markers for disease severity and treatment monitoring.

TBS-EP-115 A role of ethno-geographic factors on the incidence of TB in the region of the South Aral Sea, Uzbekistan

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Introduction: Republic of Karakalpakstan (RK), a biggest region in north-western Uzbekistan, is widely known as part of Aral Sea disaster zone and as area with the highest incidence rates of tuberculosis (TB) in the country. Data proved TB morbidity in the RK was twice the rest of Uzbekistan even in 1950s, when the disaster did not enter in its initial stage. The manifestation of TB strongly differs even inside the RK. Ethno-geographic features of community may cause epidemiological effect on symptomatic TB incidence in this area.
Aims and methods: To study the role of the specific residency and ethnicity of a community currently living in the RK, as well as lifestyle of its ancestors, in development of symptomatic TB in this region. We performed analysis of retrospective individual level data that concerned cases of symptomatic TB, registered in 2018-2022. We compared TB incidence rates (per 100,000) and calculated relative risks (RR) of TB in community living in four regions (northern, north-western, central and southern) of RK and having ancestors with nomadic, sedentary or mixed lifestyle.
Results: The highest TB incidence rate for five years was observed among Karakalpak ethnicity with mixed lifestyle in ancestors (91.9), the lower rate - among Kazakhs with nomadic ancestors (65.8) and the lowest one – among sedentary Uzbeks (39.2). The RR of TB in Kazakhs vs. Karakalpaks was 0.717 (p<0.001) and Uzbeks vs. Karakalpaks – 0.427 (p<0.001). The TB incidence rates were highest in northern region with the highest one among Karakalpaks (98.6) and similar in other ethnicities. The RR in Uzbeks vs Karakalpaks in this region was 0.721 (p<0.031), and the RR in southern vs. northern regions was 0.308 (p<0.001).

	Incidence rates (per 100,000)			Relative risk (p-value)			Relative risk (p-value)
	Karakal.	Kazak.	Uzbek	Karakal.	Kazak.	Uzbek	
Northern	98.6	79.6	71.4	1.0	0.807 (p=0,169)	0.721 (p=0,031)	1.0
North-western	87.2	82.4	-	1.0	0.945 (p=0.767)	0.228 (p=0.106)	0.948 (p=0.564)
Central	98.8	72.4	71.0	1.0	0.732 (p=0.009)	0.72 (p=0.007)	0.944 (p=0.433)
Southern	40.7	29.1	28.6	1.0	0.707 (p=0.276)	0.693 (p=0.119)	0.308 (p<0.001)

Conclusions: The incidence rates and risk of TB in RK is significantly higher in community living in the northern region and whose ancestor had mixed lifestyle.

TBS-EP-116 The platelet count and platelet to lymphocyte ratio in children with pulmonary TB and latent TB

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Introduction: In 2022, 10.6 million people worldwide became ill with tuberculosis (TB), including 1.3 million children under 14 years of age.
There are studies showing that the platelet-to-lymphocyte ratio can serve as a marker of inflammation, diagnostic or prognostic indicator of various diseases.
The aim of the study to study the platelet count and platelet to lymphocyte ratio in children with pulmonary TB and latent TB.
Methods: The first group included 17 children with pulmonary TB, the second group - 61 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 7.1±4.9 years, in the second group - 7.3±3.9 years. The difference between the groups is not significant: Student's t-test = -0.173, $p>0.05$. In the first group there were 9 (52.9%) boys and 8 (47.1%) girls, in the second group there were 32 (52.5%) boys and 29 (47.5%) girls.
The difference between the groups is not significant: Chi-square test = 0.001; p= 0.972. The mean platelet count was higher in children with pulmonary TB compared to children with latent TB: 379.5±148.8 compared to 252.6±70.6. The difference between the groups is significant: Student's t-test = 3.4, $p<0.01$.
The platelet to lymphocyte ratio was also higher in children with TB compared to children with latent TB: 11.7±8.1 compared to 6.8±4.4. The difference between the groups is significant: Student's t-test = 2.4, $p<0.05$.
Conclusion: Platelet count and platelet to lymphocyte ratio were higher in children with pulmonary TB compared to children with latent TB. Further research is needed to determine whether these indicators can be used to predict the progression of latent TB to active TB.

TBS-EP-117 An assessment of TB diagnosis among people living with HIV with advanced disease (CD4 < 200) admitted at Homabay CTRH in 2022

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Background: Tuberculosis is the leading infectious disease killer in Kenya. In 2018, nearly half of the estimated cases were missed in Kenya. Homabay County TB HIV CO infection rate 2018 53%. Active case finding 2018 76%. TBHIV cases is significantly higher with majority having CD4 cell count <200/cmm. We did an assessment of TB diagnosis amongst HIV positive patients admitted at HBCTRH in 2022
Methodology: We reviewed records of advanced HIV patients admitted in HBCTRH between January 2022 – December 2022. Data was abstracted from Patient admission and inpatient lab registers, and sociodemographic and clinical variables were collected. Data quality assessment was done and descriptive statistics and corresponding percentages were used to summarize categorical variables. All patient records were treated with confidentiality
Results: A total of 503 advanced HIV patients were admitted in the ward in 2022. TB LAM done to 315(63%) with 127(40.3%) having positive results. Gene Expert was done to 75(14.9%) with 15(20%) positive results. TB case finding in the inpatient was 160(31.8%) with Males being 94 (58.8%). PTB cases were 80(15.9%) and EPTB 80(15.9%).Mortality amongst advanced HIV patients was at 88(17.5%) with TB accounting for 18(20.5%) of the deaths. Patients who died without a TB screening (TB LAM and Gene Expert) were 45(51%).Data quality met the 90% threshold.
Conclusions: TB is a significant cause of morbidity and mortality amongst HIV patients. TB LAM helped in cases identification amongst advanced HIV patients and gaps in TB screening lead to missed cases

TBS-EP-118 Non-tuberculous mycobacterial infections in people living with HIV

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Objectives: to study non-tuberculous mycobacteria (NTM) species have been caused in NTM disease (NTMD) in HIV patients.
Materials and methods: 115 HIV patients with NTMD were included in the study. The average age of patients was 39.2 years (from 19 to 52 years), men – 57.4% (66/115), women – 42.6% (49/115). All patients underwent laboratory (luminescent microscopy; molecular genetic examination (real-time PCR, detection of NTM DNA; cultivation in the automated BD Bactec™ MGIT™ 960 system; species identification of NTM (MALDI-TOF MS mass spectrometer, Microflex LT), drug-susceptibility testing (bacteriological Sensititre analyzer, Trek Diagnostic Systems) and instrumental examination.
Results: out of 115 patients, 83 (72.2%) had disseminated NTMD and 32 patients (27.8%) had pulmonary NTMD caused by various NTM (Table).

species	pulmonary NTMD (n-32)	pulmonary NTMD (%)	disseminated NTMD (n-83)	disseminated NTMD (%)
M.avium	27	84.4	79	95.2
M.intracellularae	0	0	2	2.4
M.chimerae	0	0	1	1.2
M.kansasii	2	6.2	0	0
M.xenopi	3	9.4	0	0
M abscessus	0	0	1	1.2

Table. NTM species, which were the cause of NTMD.

The NTM sensitivity to clarithromycin was 84.3% (97/115), to amikacin – 74.8% (86/115), to moxifloxacin – 57.4% (66/115), to linezolid – 40.0% (46/115). There was no difference in NTM drug resistance to these drugs in pulmonary and disseminated NTMD.

Conclusions: In HIV patients, mycobacterial lung damage can occur in the form of pulmonary (27.8%) and disseminated forms (72.2%).

Among disseminated NTMD, M.avium complex was the predominant etiological factor – 97.6%. Among the pulmonary NTMD, a greater variety of NTM was noted: M.avium complex was the cause of the disease in 84.4% of cases, M. xenopi – in 9.4% of cases, M. kansasii in 6.2% of cases. Sensitivity to clarithromycin and amikacin was preserved in most NTM isolates, while a high level of resistance to linezolid was recorded.

TBS-EP-119 Prevalence and risk factors of drug-resistant M. tuberculosis in rural communities of South Africa

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Background: Globally, tuberculosis (TB) is the leading cause of mortality with drug-resistant TB (DR-TB) remaining a menace to public health and health security.

The study aimed to evaluate drug-resistant *Mycobacterium tuberculosis* (DR-MTB)'s prevalence and risk factors in rural South Africa.

Methods: A cross-sectional study was conducted among outpatients in rural communities of the Vhembe district, South Africa. Thirty active TB patients were enrolled for this study in rural communities. Patient data were collected using a structured questionnaire on lifestyle behavior and socioeconomic and environmental characteristics. A total of 60 (30 blood and 30 sputum) specimens were collected. A U-rapid test was used on blood specimens to confirm HIV status.

For sputum samples, DNA was extracted using Allplex™ DNA extraction. The DNA extract was subjected to multiplex real-time PCR using the Anyplex MTB/NTM and subsequently to Allplex™ MTB/MDR/XDRe to detect MTB/NTM (Mycobacterium tuberculosis/nontuberculosis mycobacteria) and MTB/MDR-MTB/XDR-MTB (Mycobacterium tuberculosis/Multidrug-resistant Mycobacterium tuberculosis/ Extensively drug-resistant Mycobacterium tuberculosis) respectively.

Results: Among the 35 participants, 54,3% (19/35) were females. The ages of the participants ranged from 23 to 72 years. The estimated prevalence of drug-resistant MTB was 11.4% (4/35). Unemployment constituted 65.7% (23/35) of TB patients in this study. Fifty-one percent (18/35) of the patients tested positive for MTB/HIV co-infections. In addition to MTB/HIV, other co-infections included MTB/NTM (40.0%, 14/35), MDR-MTB/NTM (5,7%, 2/35), and XDR-MTB/NTM (2,9%, 1/35).

Conclusion: The study's findings underscore the urgent need for targeted strategies in addressing drug-resistant TB. The high prevalence of co-infection, particularly NTM/MTB and NTM/DR-MTB, should be a primary focus in MTB control in the Vhembe district. The significant proportion of unemployment among TB patients and the prolonged healthcare consultation period were identified as key risk factors.

Keywords: Drug-resistant *Mycobacterium tuberculosis,* Drug-resistant tuberculosis, Nontuberculous mycobacteria, Risk factors, Rural communities

TBS-EP-120 Factors associated with hospitalisation and mortality of people with pulmonary TB

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Background: Tuberculosis (TB) treatment is mainly domiciliary; however there are situations in which hospitalization become necessary. A prospective observational study was done to look into the factors associated with hospitalization and mortality.

Methodology: 188 pulmonary TB patients admitted in National institute of tuberculosis and respiratory diseases, New Delhi, were enrolled. The detail clinical history, examination and investigations were recorded and statistical analysis was done.

Results: Indications for hospitalisation were breathlessness, hypoxia, weak general condition, haemoptysis, pneumo / hydropneumothorax, adverse drug reactions, co-morbidities and initiation of treatment. 146 patients (77.7%) had BMI<18.5 kg/m^2 and 39.4% patients had respiratory failure. Dyspnoea at rest (grade-4) was present in 18.4% patients. Twenty three (12.2%) patients had poor performance status of ECOG score-4 and were totally confined to bed or chair and cannot carry out any self-care.

Most patients (95.7%) had far advanced disease on chest X ray with cavity in 117(62.2%) patients. Eleven (5.8%) patients with haemoptysis, 31 with hydropneumothorax and 11 with pneumothorax were admitted for the management. Nine (4.7%) patients were admitted to man-

age hepatitis. Four (2.1%) patients with exacerbation of COPD and one DRTB patient to start treatment regimen were hospitalised.
Conclusion: High mortality of 24.2% was observed in patients with SpO_2 <90%, 69% in patients with ECOG- 4 score and 15.6% in patients with BMI <18.5kg/m^2. Low BMI was seen in 92% deaths and severe anaemia in 16% deaths. DR TB was present in 20% deaths and history of alcohol abuse was positive in 12% deaths. Smoking history was present in 40% (n=10) deaths and mortality was high (29%) in patients with grade IV dyspnoea. Triage for hospitalisation in TB patients with dyspnoea of grade III-IV, low BMI, smoking History, hypoxia and poor ECOG score will improve the treatment outcome.

TBS-EP-121 Comparison of machine learning algorithms in epidemiological modeling and prediction of TB/multi-drug-resistant TB

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Background: Global efforts and digitized surveillance initiatives aimed at eliminating tuberculosis (TB) and multidrug-resistant tuberculosis (MDR TB) are ongoing. This study seeks to apply and compare various epidemiological modeling techniques and their hybrid algorithms to support these endeavors.
Methods: We utilized the autoregressive moving average (ARIMA) model, exponential smoothing model (ETS), neural network autoregression (NNAR), TBATS model, STLM model, and hybrid ensembles to forecast the number of TB/MDR-TB cases and incidence rates in Taiwan.
Results and Discussion: Epidemiological and demographic data covering the period from January 2005 to December 2023, including TB cases and incidence rates, underwent rigorous processing. The dataset was divided into two segments: a training dataset from 2005 to 2022 for model simulation and a test dataset from January 2023 to December 2023 for verifying the models' forecasting capabilities.
Our methodology involved data simulation modeling, followed by the assessment of performance by measuring the variance between modeled values and actual observations. The simulation models demonstrated satisfactory performance levels across all methodologies.
Further analysis identified three top-performing candidate models: STLM, E-S hybrid, and E-S-T hybrid models, which consistently outperformed individual models such as ARIMA, NNAR, and ETS, as well as their respective hybrid counterparts. For example, the STLM model exhibited root mean squared error (RMSE), mean absolute error (MAE), and mean absolute percentage error (MAPE%) values of 0.0671, 0.0523, and 0.5112, respectively. The ETS-STLM hybrid model showed values of 0.0693, 0.0540, and 0.5285, while the E-S-T model recorded values of 0.0704, 0.0548, and 0.536.
Additionally, the performance evaluation of the STLM model extended to pseudo out-of-sample forecasting, employing metrics such as RMSE, MAE, and MAPE% with values of 2.459e-06, 1.955e-06, and 5.075, respectively, indicating promising performance. These epidemiological models also provided projections to 2035 by age and gender for TB elimination.

TBS-EP-122 Linkages between social determinants, clinical TB manifestations, and treatment outcomes among people with smear-positive pulmonary TB in Almaty and Almaty oblast, Kazakhstan

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Background: Over time, TB programming addressed social determinants to improve treatment outcomes. TB specialists recorded the influence of these determinants on clinical manifestations while patients attended medical facilities.
Methodology: an analysis was conducted of medical records from 388 patients diagnosed with smear-positive pulmonary tuberculosis, with treatment outcomes documented in the National Register of TB Patients between 2018 and 2019.
Social determinants including alcohol abuse, substance use, migrant status, homelessness, and history of incarceration, alongside medical and epidemiological factors such as HIV status, diabetes mellitus, pregnancy, postpartum status, and contacts with TB and multidrug-resistant TB (MDR-TB) patients, were examined.
Results: A correlation was found between **clinical forms** and social determinants: patients with more severe social histories tended to present with more severe clinical forms of TB. Advanced TB forms (such as generalized, disseminated, caseous pneumonia, and fibrotic cavernous) were associated with a higher burden of all risk factors, averaging 1.12 per case, compared to 0.89 per case for less severe forms like infiltrative TB.
When clustering only social factors, this burden remained higher for advanced TB cases (0.79 per case) compared to non-severe forms (0.53 per case), representing a 1.5-fold increase. Patients from disadvantaged backgrounds often presented with severe conditions at medical facilities, likely due to barriers in accessing TB care and delayed physician consultations.
Treatment outcomes: 284 TB patients were cured or completed treatment, 99 had unfavorable outcomes. Notably, two or more risk factors was present in 36% of patients with unfavorable outcomes, compared to only 18% in those cured or completed treatment. The burden of social risk factors was 2.2 times higher in patients with unfavorable outcomes.

Conclusion: The study highlighted social determinants' role in shaping TB clinical forms and treatment outcomes. Integrating mitigation efforts into TB control strategies is crucial for healthcare equity and effectiveness.

TBS-EP-123 TB in children from family contacts before and during the COVID-19 pandemic

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Introduction: The COVID-19 pandemic has had an adverse impact on the detection of tuberculosis (TB) in children. There are studies about an increase in the severity of TB in children during the COVID-19 pandemic.
Objective: to study cases of pulmonary TB in children from family contacts who became ill before the pandemic (2017-2019), in comparison with children who became ill during the pandemic (2020-2022).
The first group included 40 children who fell ill with TB before the pandemic, the second group included 40 children who fell ill during the pandemic.
Methods: Clinical, bacteriological, radiological and statistical methods were used.
Results: The compared groups didn't differ in gender and age composition. The average age of children in the first group was 8.6 $\pm$ 3.3 years, in the second group - 9.9 $\pm$ 3.4 years. Student's t-test = 1.76, p>0.05, the difference is not significant. In the first group there were 27 girls (67.5%) and 13 boys (32.5%), in the second group there were 22 girls (55%) and 18 boys (45%). The difference between groups by gender is not significant: Chi-square test = 1.317; p=0.252.
TB of the intrathoracic lymph nodes was observed in 31 children (77,5%) of the first group and in 20 children (50%) of the second group. Primary TB complex was registered in 6 children of the first group (15%) and in 11 children (27,5%) of the second group. Severe forms of TB were noted in 3 children (7,5%) of the first group and 9 children (22,5%) of the second group. The difference between the groups is significant: Chi-square test = 6.843; p=0.033.
Conclusion: Severe forms of TB were more often recorded in children from family contacts who became ill with TB during the COVID-19 pandemic compared to children who became ill with TB before the pandemic.

TBS-EP-124 The role of physiotherapy in managing pulmonary cystic fibrosis secondary to pulmonary TB

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Background: Pulmonary tuberculosis can cause severe lung damage, leading to scarring and cyst formation, mimicking cystic fibrosis (CF) symptoms. These complications contribute to progressive lung damage, significantly impacting quality of life (QOL) and lifespan. Physiotherapy remains critical in enhancing respiratory function and overall well-being with this condition.
Methods: This cohort study involved six persons affected by pulmonary cystic fibrosis secondary to tuberculosis. We evaluated airway clearance techniques, respiratory muscle training, exercise programs, and self-management education. Data were collected at baseline, midway, and post-intervention, recorded in a secure datasheet.
Primary outcomes were improvements in mucus clearance, lung function, and treatment adherence, analyzed using paired t-tests. Qualitative data on patient adherence and quality of life were analyzed thematically. The study received ethical institutional approval, and informed consent was obtained.
Results: Airway clearance techniques like chest physiotherapy, postural drainage, and autogenic drainage significantly improved mucus clearance ($p < 0.05$). High-frequency chest wall oscillation enhanced mucus clearance in all persons affected by tuberculosis. Respiratory muscle training with incentive spirometry strengthened inspiratory muscles and prevented atelectasis ($p < 0.05$). Tailored exercise programs improved lung function and reduced inflammation ($p < 0.05$). Patient education on airway clearance techniques, recognizing exacerbations, and self-management skills enhanced treatment adherence and quality of life ($p < 0.05$).
Conclusion: Physiotherapy utilizing airway clearance, individualized exercise plans, education and technology can play a vital role in managing pulmonary CF secondary to tuberculosis by improving mucus clearance, lung function, treatment adherence and quality of life. There is room for developing home-based physiotherapy programs and utilizing telehealth technologies, including respiratory apps that provide real-time feedback and precise lung function assessment. These approaches will ultimately improve the overall QOL for patients with this condition.

TBS-EP-125 The monocyte-to-segmentonuclear neutrophil ratio in children with TB from families with COVID-19 and TB

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Introduction: The COVID-19 pandemic has adversely affected tuberculosis (TB) control. According to the World Health Organization's Global TB Report, 1.3 million people worldwide died from TB in 2022. However, the reduction in total TB deaths between 2015 and 2022 was only 19%, falling short of the End TB Strategy target for 2025 (75% reduction between 2015 and 2025). There are studies on the potential value of the monocyte-to-neutrophil ratio in the diagnosis of various diseases.
The aim of the study was to research the monocyte-to-segmentonuclear neutrophil ratio of peripheral blood in children with pulmonary TB from families with COVID-19 and TB.
Methods: 26 children with pulmonary TB were examined. The first group included 13 children from families with TB cases. The second group included 13 children from families with COVID-19 and TB cases. TB in children and family members was verified by bacteriological and / or radiological methods. COVID-19 in family members was verified by a positive PCR test for COVID-19 result. Peripheral blood parameters in children were studied before TB treatment. The monocyte-to-segmentonuclear neutrophil ratio of peripheral blood were calculated. Student's t test was used for comparison.
Results: Both groups didn't differ by quantity of boys and girls, by the average age. Each group included 7 boys (53,8 %) and 6 girls (46,2 %). The average age of children in both groups was the same, 9,2 ± 4,2 years.
The monocyte-to-segmentonuclear neutrophil ratio was 0,08 ± 0,03 in the first group, in the second group – 0,12 ± 0,04. The difference is significant, $p<0,05$.
Conclusion: The monocyte-to-segmentonuclear neutrophil ratio were higher in children with pulmonary TB from families with cases of COVID-19 and TB compared children from families with TB. Further research is needed to determine the predictive value of the studied ratio in children with TB.

TBS-EP-07 Pharmacological considerations for optimising new regimens

TBS-EP-126 DOLPHIN Kids: Once vs. twice daily dolutegravir with 3 months of weekly isoniazid and rifapentine (3HP) in children with HIV

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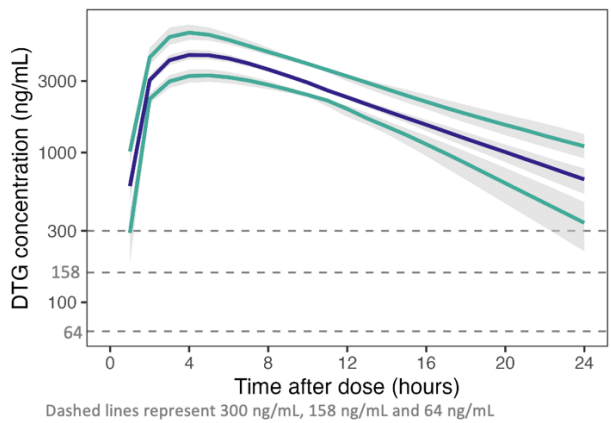
Introduction: Tuberculosis remains a leading cause of death in people with HIV. Short course tuberculosis preventive treatment is effective in children with HIV, but the appropriate dolutegravir dosing in children taking 3HP is unknown. DOLPHIN Kids is a phase I/II study aimed at characterizing the safety, tolerability, pharmacokinetics and viral load suppression of 3HP co-administered with dolutegravir-based antiretroviral therapy in children with HIV.
Methods: South African children aged 2-17 years living with HIV and weighing at least 10 kilograms were switched to dolutegravir-based antiretroviral therapy, with dolutegravir given twice daily while on 3HP and for two additional weeks after stopping 3HP. Semi-intensive pharmacokinetic sampling for dolutegravir was performed on Days 28 (prior to first HP dose) and 46 (after third HP dose) along with additional troughs on Days 44 and 48. Primary endpoints were safety and dolutegravir pharmacokinetics during 3HP/dolutegravir co-administration. Dolutegravir pharmacokinetics was evaluated using nonlinear mixed effects modelling methods. Alternative use of once-daily dolutegravir with 3HP was explored through Monte Carlo simulations.
Results: We enrolled 17 children, 11 female, median age 5 years. All observed concentrations of dolutegravir, either given once-daily without 3HP or twice-daily with 3HP, are above 158 ng/mL. Dolutegravir clearance was increased by 34% with versus without 3HP. When simulating the use of once-daily dolutegravir with concomitant administration of 3HP, the median and 95% CI of the 5th percentile of the simulated trough concentrations are: 339 ng/mL (220–466 ng/mL), assuming full adherence (figure). The combination was well-tolerated, 1 participant discontinued 3HP due to a grade 4 asymptomatic elevation in ALT.



Conclusion: Co-administration of 3HP with twice-daily dolutegravir was safe and resulted in effective dolutegravir exposures. Modeled co-administration of 3HP with once-daily dolutegravir predict effective dolutegravir exposures. DOLPHIN Kids will proceed with evaluating once-daily dolutegravir dosing with 3HP in children who are at least 10kilograms.

TBS-EP-127 Exposure analysis of ethionamide and ethionamide sulfoxide from people on TB treatment and determination of a new pharmacodynamic target using hollow fiber studies

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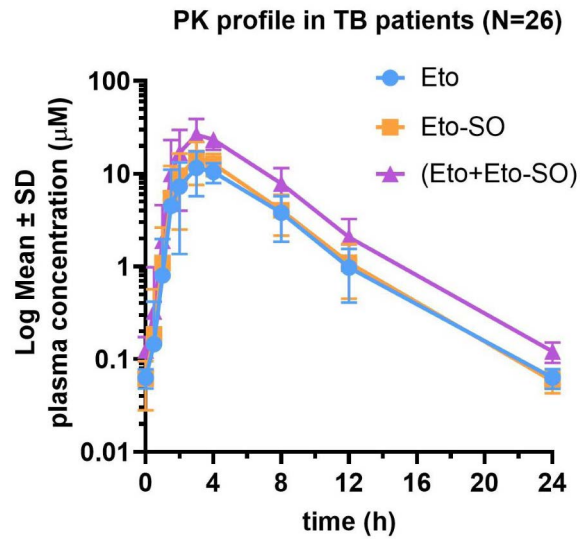
Upon administration of ethionamide (Eto), the human flavin monooxygenases partially convert Eto into Eto sulfoxide (Eto-SO), a metabolite with similar *in vitro* activity as Eto against *M. tuberculosis*. Current pharmacokinetic/pharmacodynamic (PK/PD) parameters are based solely on the exposure of Eto. Here we defined novel Eto PK/PD parameters by prospectively determining Eto and Eto-SO PK in tuberculosis (TB) patients and simulating the human exposures of Eto+Eto-SO using the Hollow Fibre Infection Model (HFIM) to estimate the Eto dose required for activity.

Adults established on TB treatment regimen received 500mg of Eto as a single dose for two days (NCT05258877). 10 blood samples/patient were collected over 24 hours. Plasma Eto and Eto-SO concentrations were measured using HPLC-MS/MS. A non-compartmental analysis was performed, and a population PK model was built to describe the combined exposures Eto+Eto-SO. Concentration-time profiles mimicking the human exposures were simulated using the HFIM for 7 days with *M. tuberculosis* H37Rv (Eto/Eto-SO MIC=1-2 mg/L). We identified the Eto dose to achieve a 1-log-kill target using exposure simulations with 1000 virtual patients.

26 adult participants aged 38±11 years (46% female; 61.5% people living with HIV) were enrolled. Eto-SO C_{max} and $AUC_{0\text{-}tau}$ were 24% and 15% higher than for Eto, and combined (Eto+Eto-SO) was 30.8 µM and 139.7 h*µM, respectively. A one-compartment model with transit compartments, first-order absorption and elimination described the data adequately. The combined Eto+Eto-SO target AUC to achieve a 1-log-kill after 7 days was 63 h*µM. The Eto dose required to achieve this in >90% of patients was 330mg/day.



Based on combined Eto+Eto-SO exposure, the Eto dose can be lowered to the well tolerated range while ensuring therapeutically early bactericidal activity. The activity of low dose Eto in combination with the recently identified Eto booster alpibectir has reinstated Eto's importance for the treatment of TB.

TBS-EP-128 NAT2 genotype in relation to isoniazid drug exposure and survival among people with tuberculous meningitis in Indonesia

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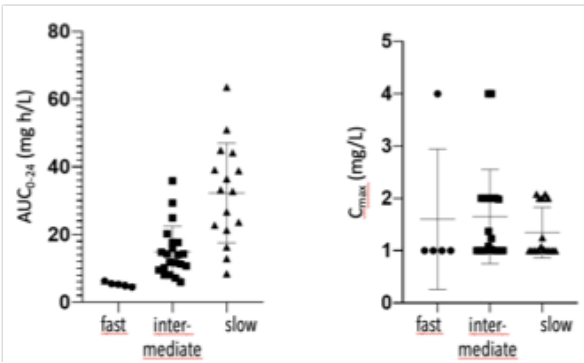
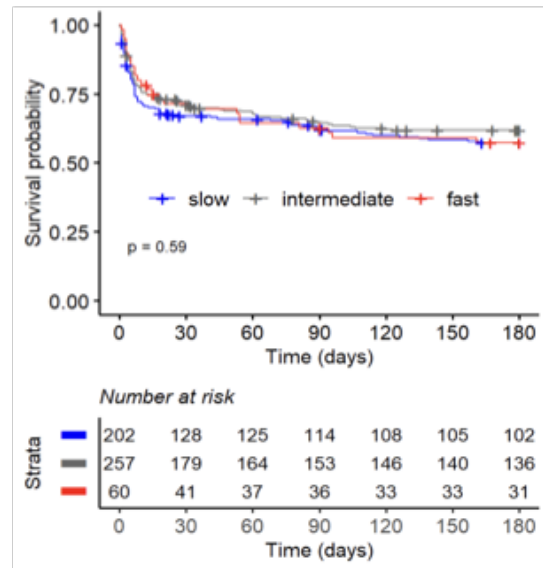
Background: Meningitis is the most severe form of extrapulmonary tuberculosis (TB), causing death and disability. Standard treatment includes isoniazid (INH) as first-line drug. INH metabolism is dependent on the genetic variation in the highly polymorphic *NAT2, i.e.* N-acetyltransferase.
We hypothesized that NAT2 genotype affects exposure to INH, which in turn affects survival of TBM, and that TBM patients who are rapid acetylators have a higher mortality.
Methods: *NAT2* genotyping was performed in 518 TBM patients in Indonesia who received standard dose 300 mg INH. We used a previously established 4 SNP model (rs1801279, rs1801280, rs1799930, rs1799931) to predict 'rapid' (reference phenotype), 'intermediate' and 'slow' acetylator status. We associated predicted *NAT2* enzyme function with pharmacokinetic parameters of INH in plasma and cerebrospinal fluid (in a subset of 42 patients) and with patient survival in the total group evaluated.
Results: Among 42 HIV-negative TBM patients with INH exposure data, the predicted *NAT2* phenotype segregated acetylator status as measured by clearance, half-life and total exposure, without showing an impact on the maximum concentration (*Fig 1A*).

Fig 1a. INH exposure according to *NAT2* predicted acetylatorstatus



From 518 patients with genotyping data (60% male, median age 29), 325 (62.7%) had bacteriologically confirmed and 193 (37.3%) clinically diagnosed ('probable') TBM. After 60 days 171 (33%) had died. Genotype based prediction of acetylator status did not predict patient survival after correction for age, sex, HIV status (*Fig 1B*).

Fig 1b. patient survival according to acetylatorstatus



Conclusion: In this setting, NAT2 acetylator status does not affect survival of TBM. Future studies should examine if a higher dose of INH might still improve patient outcome.

TBS-EP-129 Dynamic PET facilitated modeling and novel multi-drug-resistant TB antibiotic regimens for tuberculous meningitis

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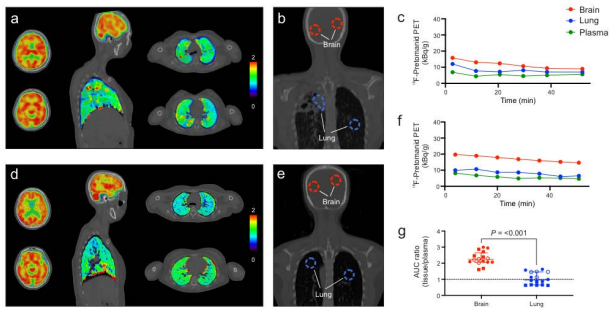
Tuberculosis (TB) remains a leading cause of death, but antibiotic treatments for tuberculous meningitis, the deadliest form of TB, are based on those developed for pulmonary TB and not optimized for brain penetration. Here, we performed first-in-human dynamic ^{18}F-pretomanid positron emission tomography (PET) studies in eight human subjects for three-dimensional, multi-compartmental *in situ* visualization of antibiotic concentration-time exposures (area under the curve – AUC), demonstrating preferential brain ($AUC_{tissue/plasma}$ 2.25) versus lung ($AUC_{tissue/plasma}$ 0.97) tissue partitioning (NCT05609552). Preferential, antibiotic-specific partitioning into brain or lung tissues of antibiotics active against MDR strains were confirmed in experimentally-infected mice and rabbits, using dynamic PET with chemically identical antibiotic radioanalogs, and postmortem mass spectrometry measurements.
PET-facilitated pharmacokinetic modeling predicted human dosing necessary to attain therapeutic brain exposures in human subjects. These data were used to design optimized, pretomanid-based regimens (PaLZ, PaSMx,

PaLMxZ, BPaLZ – Pa = pretomanid; L = linezolid; Z = pyrazinamide; S = sutezolid; Mx = moxifloxacin; B = bedaquiline) which were evaluated at human equipotent dosing in a mouse model of TB meningitis, demonstrating excellent bactericidal activity without an increase in intracerebral inflammation or markers of brain injury / metabolism. Importantly, several antibiotic regimens demonstrated discordant activities in brain and lung tissues in the same animal, correlating with the compartmentalized tissue exposures of the component antibiotics. These data provide a mechanistic basis for the compartmentalized activities of antibiotic regimens, with important implications for the development of antimicrobial regimens for meningitis and other infections in compartments with unique antibiotic penetration.



TBS-EP-130 Intensified treatment of tuberculous meningitis in children: First pharmacokinetic data from the SURE trial

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Introduction. Up to 15% of children with TB present with tuberculous meningitis (TBM), which is associated with high mortality and morbidity. The SURE trial is an international phase III randomized controlled trial of 6-month intensified TB treatment versus 12-month WHO standard TB treatment, with or without adjunctive aspirin, for children with TBM. An interim pharmacokinetic analysis was performed to verify whether dosing interventions in the trial are appropriate.
Methods. Intensive pharmacokinetic sampling was performed in the first group of children in the intervention arm of the trial, who received a double dose of isoniazid (20mg/kg), a double dose of rifampicin (30mg/kg), pyrazinamide (40mg/kg) and levofloxacin (20mg/kg). Samples were taken on day 14, early in treatment, when adequate exposure to TB drugs is most critical and stable concentrations ('steady-state') are expected. Plasma samples were analyzed using validated LC-MS/MS methods. Pharmacokinetic parameters were assessed using non-compartmental pharmacokinetic techniques.
Results. Eleven children from Vietnam were included, with an age range of 6 months to 16 years (median age: 5 years). The geometric mean total exposure (AUC0-24h) to rifampicin was 138 h.mg/L (range 34-253), four-fold higher than in children on the standard dose (SHINE trial [1]).
The AUC0-24h of isoniazid was 44 h.mg/L (range 12-97), almost three-fold higher than with the standard dose [1]. The AUC0-24h of pyrazinamide was 332 h.mg/L (range 197-516), similar to values on the standard dose of this drug. AUC0-24h to levofloxacin was 77 h.mg/L (range 48-121), at least similar to values previously observed in children.
Conclusions. Intensified treatment resulted in much higher plasma exposures to rifampicin and isoniazid and adequate exposure to pyrazinamide and levofloxacin in children with TBM. More plasma as well as CSF pharmacokinetic data will be presented. Predictors of exposure and exposure-response relationships will be assessed.
[1]. Chabala et al. Clin Infect Dis. 2022;74(10):1767-1775.

TBS-EP-135 Computational modelling of bacterial antibiotic target-binding for optimising TB treatment

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Pharmacokinetic (PK)/pharmacodynamic (PD) modelling is widely used in the optimization of dosage regimens in antimicrobial drug development. The traditional PD approaches such as Hill/Emax models correlate drug efficacy with constant drug concentrations *in vitro*. They normally neglect the fluctuations in drug levels that are typical for realistic dosing applications.
Recent advancements in developing models consider time trajectories of drug-target binding at varying doses. This has enhanced our qualitative understanding of drug effects, however, there remains a gap in translating *in vitro* data into quantitative clinical predictions. The limited validity of PD models based on *in vitro* data leads to a high demand for animal testing. However, animal trials have their limitations, and translating these results to human treatment can be challenging.
Our research aims to develop a mathematical framework to predict optimal dosing of TB treatment from *in vitro* observations. We have developed a multi-scale transla-

tional mathematical model that incorporates the reaction kinetics of drug-target binding, the population biology of bacteria, and the heterogeneity in bacterial drug susceptibility.
We validate our model with sputum CFU data from EBA trials using drugs at different dose levels (dose ranging) and dosing schedules (dose fractionation). Significantly, our model can accurately predict the bacterial population size in TB patients (Figure), utilizing solely early-phase *in vitro* data combined with phase I PK data.

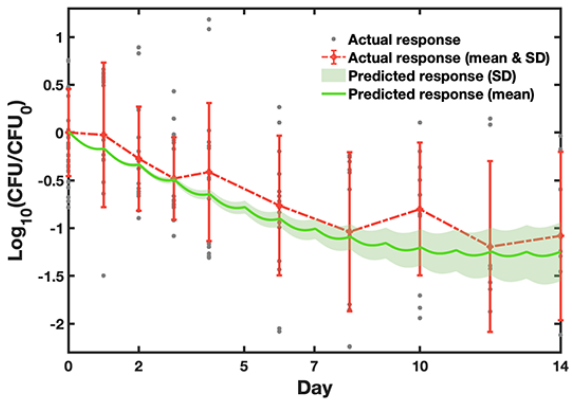

Figure. Actual and predicted drug responses of TB patients undergoing 14-day monotherapy.

We show that Hill models fail to accurately predict the decline of bacterial load in patients' sputum, while our approach does so with high accuracy (R^2=0.83). Our framework has the potential to accelerate the drug development process, assist in identifying the most promising compounds for prioritization, and potentially minimize preclinical animal testing.
Furthermore, this method will provide insights into dosing strategies for clinical trials and help in designing personalized medicine.

TBS-EP-136 Rifampicin and isoniazid dosage adjustment according to TDM and acetylator status: A single centre prospective observational study

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Individualized dosing of rifampicin and isoniazid may improve treatment outcomes. We describe how rifampicin therapeutic drug monitoring (TDM) and N-acetyltransferase 2 (NAT2) assessment could affect drug dosage in patients with tuberculosis (TB) disease/infection.

Prospective observational study enrolling consecutive subjects managed at Sacco Hospital (Italy) for TB disease/infection (July 2020-September 2023) was performed. Rifampicin TDM levels (range 8-24 mg/L) were systematically determined (mass spectrometry) after a median time of 14 days (IQR 12-21) from enrollment, at 2, 4 and 6 hours after intake. A reference area under the curve (AUC) of 67.5 mg*h/L was assumed. NAT2 acetylator status was determined (RT-PCR) at enrollment and defined as slow, intermediate or rapid.
173 subjects were enrolled and rifampicin TDM was performed in 140 patients, acetylator statuses were determined in 127 patients. 54.9% (n=95) were males, median age 45 (IQR 35-59), 76.3% (n=132) had TB disease. Median rifampicin dose administered was 9.9 mg/kg (IQR 9.1-11). In 66% (n=93) of cases rifampicin concentration was >8 mg/L: in 83.9% (n=78) the peak was obtained after 2 hours, in 12.9% (n=12) after 4 hours, in 3.2% (n=3) after 6 hours. Median AUC was 54.2 mg*h/L (IQR 39.6-78.8), in 37,1% (n=52) the AUC was >67.5 mg*h/L.
Rifampicin dosage was modified in 52.1% (n=73) cases: increased in 49.3% (n=69), reduced in 2.9% (n=4). NAT2 acetylator status was defined as rapid in 7.9% (n=10) of the patients, intermediate in 35.4% (n=45), slow in 56.7% (n=72).
Isoniazid dosage was modified in 18.9% (n=24) cases: increased to 7.5 mg/kg in 80% of rapid acetylators (n=8), reduced to 2.5 mg/kg in slow acetylators with hepatotoxicity (22.2%, n=16).
Rifampicin TDM and/or NAT2 genotyping led to modification of drug dosage in 52.6% (n=91) cases. TDM and pharmacogenetics could guide TB treatment individualization. Further studies are required to determine its effect on hard clinical outcomes.

TBS-EP-137 Prediction of poor pulmonary TB treatment outcomes using a combination of host biomarkers

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Background: There is an urgent need for biomarkers that predict tuberculosis treatment response. Despite its poor specificity and sensitivity, sputum microscopy and culture conversion eight weeks following treatment initiation remain the recommended surrogate for TB treatment response.
Methods: We conducted a nested case-control study to identify potential biomarkers to predict TB treatment response on 72 participants who completed the PredictTB

treatment-shortening clinical trial. Our cohort comprised of 18 poor treatment outcomes (16 confirmed relapses and two treatment failures) and 54 controls (cured). We used baseline clinical, microbiological, radiologic data and we measured the concentrations of 50 cytokines (at 5 timepoints) and used 4 different predictive machine-learning algorithms to identify biomarkers that predict poor TB treatment outcomes.

Results: Using baseline predictors (clinical, microbiologic, cytokines), the random forest algorithm achieved the best performance metrics with an AUC of 0.81, sensitivity of 0.76 and specificity of 0.76. Using baseline predictors and the difference between baseline cytokines and cytokines at various time points we described bio-signatures at the various timepoints. At week 4 the best performing model had an AUC of 0.84, sensitivity of 0.79, and specificity of 0.76. The week 8 best performing model had an AUC of 0.85, sensitivity of 0.91, and specificity of 0.75. The week 16 best performing model had an AUC of 0.82, sensitivity of 0.89, and specificity of 0.67 while the week 24 best performing model had an AUC of 0.83, sensitivity of 0.76, and specificity of 0.80. The week 8 model's performance metrics met the WHO minimal targets (sensitivity of ≥75%, and a specificity of ≥80%) for a TB treatment response test applied during treatment.

Conclusions: Our preliminary analysis indicate that a multi-marker bio-signature may better predict TB treatment response (cure vs relapse) compared to current measures. This work will be combined with a larger cohort.

TBS-EP-138 Effectiveness and safety of the BPaL regimen in people with pre-extensively drug-resistant TB in Ukraine

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Purpose: The aim of our study was to determine the effectiveness and safety of the BPaL treatment in patients with pre-extensively drug-resistant tuberculosis (pre-XDR-TB) in Ukraine.

Materials and Methods: We conducted a register-based cohort study using prospectively collected data from the largest central TB dispensaries in Ukraine. Our study included 19 main TB dispensaries from 19 regions across Ukraine. Data were stored in the NIAID Ukraine TB-portal database, which contains information on patient demographics, TB risk factors, and clinical and microbiological data. Patients with pre-XDR-TB treated for 6-month with BPaL (bedaquiline, pretomanid, and linezolid) during the 10 first months of 2023 were included (group 1-BPaL) as well as a control group of patients from 2022 treated with the long standard 18-20 months regimens (treatment was carried out with second-line drugs according to the drug susceptibility test (without bedaquiline and without pretomanid)) (group 2-StandTx). Treatment effectiveness was assessed based on WHO defined outcomes categorized as cured, completed, died, failure, and lost to follow-up.

Results: In total, 611 patients with pre-XDR-TB were included in the study, with 257 patients in group 1-BPaL and 354 patients in group 2-StandTx.

Overall, group 1-BPaL had better outcomes compared to group 2-StandTx. The cure rate was higher in group 1-BPaL (73.9%, n=190) compared to group 2-StandTx (47.7%, n=169) (p<0.0001).

Lost to follow-up (5%, n=13 vs 15.3%, n=54; p=0.0001) and treatment failure (4.3%, n=11 vs 10.7%, n=38; p=0.004) were both less common in group 1-BPaL compared to group 2-StandTx.

Mortality rates were also lower in group 1-BPaL (11.7%, n=30) compared to group 2-StandTx (18.4%, n=65) (p=0.024). Treatment completion rates were similar between the two groups (5.1%, n=13 vs 7.9%, n=28; p=0.1724).

Conclusions:BPaL treatment is associated with a greater treatment efficacy, safety, and adherence in patients with pre-XDR-TB in Ukraine compared with previous standard treatment regimens.

TBS-EP-139 Pharmacogenomic profiling of *N-acetyltransferase 2* in southern and western Indian TB population

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Isoniazid is majorly metabolized by the arylamine N-acetyltransferase 2 (NAT2) enzyme. Single nucleotide polymorphisms (SNPs) in the *NAT2* gene could classify an individual into three distinct phenotypes, i.e., rapid (RA), intermediate (IA), and slow acetylators (SA). *NAT2* SA achieves higher isoniazid plasma exposures and has an increased risk of developing antitubercular drug-induced liver injury (AT-DILI) relative to IA and RA.

We conducted a prospective observational study to characterize the *NAT2* SNPs, genotypes, and phenotypes among the TB patients from Southern (Kasturba Hospital [KH], Manipal, n=250) and Western (All India Institute of Medical Sciences [AIIMS], Jodhpur, n=205) India. Ge-

nomic DNA was extracted from the blood samples of TB patients. Six *NAT2* SNPs, rs1041983 (282C>T), rs1801280 (341T>C), rs1799929 (481C>T), rs1799930 (590G>A), rs1208 (803A>G) and rs1799931 (857G>A) was analyzed using predesigned TaqMan drug metabolism genotyping assays by Quant Studio™ 5 Real-Time PCR System.

The minor allelic frequency (MAF) of the *NAT2* SNPs, 282C>T, 341T>C, 481C>T, 590G>A, 803A>G and 857G>A were found to be 0.43, 0.34, 0.32, 0.37, 0.36, and 0.11 respectively in KH, Manipal, and 0.40, 0.35, 0.30, 0.33, 0.36 and 0.13 in AIIMS, Jodhpur.

The *NAT2* RA, IA, and SA were found to be 5.6%, 62.4%, and 32% of TB patients of KH, Manipal and 6.8%, 58.5%, and 34.6% of AIIMS, Jodhpur center respectively.

All the *NAT2* SNPs were in Hardy Weinberg equilibrium, except for 857G>A in both centers. Linkage disequilibrium (LD) analysis revealed strong associations (R^2>0.8) between the *NAT2* SNPs 341T>C and 481C>T that corresponds to *NAT2**5A haplotype and 341T>C and 803A>G that corresponds to *NAT2**5C haplotype in both the centers.

We observed a high proportion of TB patients with *NAT2* SA status, warranting the need for assessment of isoniazid pharmacokinetics, and AT-DILI monitoring in these patients.

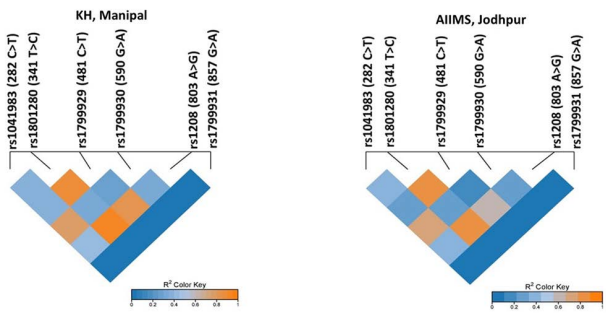

Figure 1: Linkage Disequilibrium (LD) analysis of the NAT2 SNPs of TB patients.

TBS-EP-141 A phase 1 PK trial to assess the potential for CYP3A-mediated drug-drug interactions with quabodepistat

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Background: In vitro assessments of quabodepistat (OPC-167832), an inhibitor of decaprenylphosphoryl-β-D-ribose 2′-oxidase, indicated that it is metabolized by cytochrome P450 (CYP) 3A enzyme isoforms. This phase 1 trial assessed the effects of a CYP3A inhibitor, itraconazole (Part 1), and a CYP3A inducer, carbamazepine (Part 2), on the pharmacokinetics (PK) of quabodepistat.

Design/Methods: This was a 2-part, open-label, drug-drug interaction trial with daily oral interventions administered in healthy adults. Part 1: participants received 30mg quabodepistat (Day 1) with PK assessments on Days 1-8. On Day 8, participants received 200mg itraconazole twice daily (BID) then once daily (Days 9-14). On Day 15, 30mg quabodepistat was coadministered with 200mg itraconazole; 200mg itraconazole was continued (Days 16-25). PK assessments were collected (Days 15-26). Part 2: participants received 30mg quabodepistat (Day 1) with PK assessments on Days 1-8. On Days 8-10, participants received 100mg carbamazepine BID, on Days 11-13, 200mg carbamazepine BID, and on Days 14-31, 300mg carbamazepine BID. On Day 25, 30mg quabodepistat was coadministered with 300mg carbamazepine (morning dose). PK assessments were collected (Days 25-32). Safety and tolerability of quabodepistat alone or in combination were assessed.

Results: A total of 18 participants (9 in each part) completed the study. Most participants were male (63%), ranging from 20-54 years of age with a BMI of 21.2-32.0 kg/m2. PK assessments showed that CYP3A inhibition by itraconazole increased quabodepistat exposure (Cmax and AUC) approximately 1.7- to 1.8-fold (Table 1).

	With/Without CYP3A Inhibition by Itraconazole		With/Without CYP3A Induction by Carbamazepine	
PK Parameter	Ratio of Geometric Mean	90% CI	Ratio of Geometric Mean	90% CI
C_{max}, ng/mL	1.72 (n=11)	1.41–2.11	1.07 (n=10)	0.93–1.24
Auc_t, ng·h/mL	1.82 (n=11)	1.57–2.11	0.60 (n=10)	0.51–0.71
Auc_∞, ng·h/mL	1.75 (n=9)	1.48–2.07	0.64 (n=7)	0.50–0.83

*Table 1. Geometric Mean Ratios and 90% Confidence Intervals for Quabodepistat Pharmacokinetic Parameters**

**Participants included had evaluations in both parts of the study. Auc_∞, area under the curve extrapolated to infinity; Auc_t, area under the curve limited to the end of the dosing interval; CI, confidence interval; C_{max}, maximum concentration; CYP3A, Cytochrome P450 family 3 subfamily A; PK, Pharmacokinetic.*

CYP3A induction by carbamazepine had no effect on quabodepistat Cmax, but resulted in a reduction in AUC by ~40%. No abnormal laboratory test, vital signs values, or ECG measurements were reported in either part.
Conclusions: The observed CYP3A-mediated drug-drug interactions are not considered clinically significant. Quabodepistat was well-tolerated in this trial, alone or in combination with itraconazole or carbamazepine, in healthy adult subjects.

TBS-EP-142 Expanding point of care testing for M. tuberculosis through extraction-free processing of sputum specimens

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Currently, molecular detection of *Mycobacterium tuberculosis* (MTB) from sputum involves sample liquification followed by nucleic acid extraction. Here we offer an alternative to traditional sputum processing by eliminating the need for nucleic acid extraction.
We investigated four protocols for direct to PCR processing of sputum using both traditional laboratory equipment and new, point of care (POC) instruments. For traditional laboratory processing, heat inactivation and sample lysis were done in two steps. Sputum contrived with known quantities of MTB were heated at 95°C for 10 minutes and lysed using the BioSpec Mini-Beadbeater-16 or Omni vortex bead beater attachment. For POC direct to PCR processing, heating and lysis were done in one step. Samples were sonicated using the LumiraDx Lysis Module or mechanically lysed using the ClaremontBio OmniLyse® 1X heat/bead beating device. Prior to qPCR testing, all samples were diluted with 1mL of TCEP buffer (2.5mM TCEP, 2mM EGTA). This diluted sputum lysate was tested directly using an in-house PCR assay targeting the IS6110 and IS1081 regions.
Our results indicate that all four extraction-free methods can be used to detect MTB from sputum.
The BioSpec Mini-Beadbeater-16 resulted in the highest recovery of MTB, followed by the LumiraDx Lysis Module (Mean CT = 25.8, and 26.4, respectively). To determine the clinical potential of the LumiraDx Lysis Module, a larger study was done in which we detected as low as 25 CFU/mL with a predicted limit of detection (LoD) of 100 CFU/mL. This LoD is comparable to the more costly Cepheid GeneXpert® test.
The next phase of this research is pairing this protocol with a molecular assay on a POC detection platform to enable affordable, rapid MTB testing from sputum samples. This will reduce the time to initiate treatment, reduce loss to follow-up, and expand access to MTB testing in low resource settings.

TBS-EP-143 Apramycin, reconnoitered as the new combination partner for the treatment of TB

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Mycobacterium tuberculosis (Mtb) has the capability to dodge the immune system by escaping into alternate physiological forms by forming drug tolerant populations under the immune pressure in the host. New drugs are urgently needed to treat these non-replicating persisters. In the past, aminoglycoside antibiotics have played a pivotal role in TB chemotherapy. Here, we explored the therapeutic potential of a next-generation aminoglycoside, apramycin (APR). We determined the apramycin MIC as 0.25-1 μg/ml for sensitive and multidrug-resistant Mtb (MDRTB), including amikacin resistant strains. In standard time-kill kinetic assays, the bactericidal activity of APR was similar to that of amikacin demonstrating dose-dependent killing of planktonic Mtb. However, in biofilm and macrophage intracellular killing assays, apramycin appeared significantly more potent than amikacin. Further, apramycin monotherapy was efficacious in a mouse chronic TB lung infection model (~0.92 $\log_{10}$ CFU/lung reduction). Apramycin combination therapy with the current standard of care (SoC) antibiotic combination of isoniazid (H), rifampicin (R), ethambutol (E), and pyrazinamide (Z) was found to be synergistic (HREZ=1.88 vs. HREZ-APR=2.78 $\log_{10}$CFU/lung reduction). The results indicate the potential of apramycin-based combinations for the treatment of human tuberculosis.

TBS-EP-144 Anti-TB treatment and relative impact on levels of gamma glutamyl transferase, glutathione, and gamma glutamyl transferase-to-reduced glutathione molar ratio

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Background: Tuberculosis treatment has been associated with oxidative stress and elevated gamma glutamyl transferase level, implicated in the pathogenesis of the disease. This study assessed the levels of reduced glutathione (GSH), gamma glutamyl transferase (GGT) and oxidized glutathione (GSSG) in subjects affected with M.TB, undergoing treatment at Infectious Disease Hospital.
Methods: Sixty subjects on anti-TB treatment and 30 controls were enrolled for this study. Serum GGT, GSH and GSSG were determined Spectrophotometrically. Data ob-

tained were analyzed using SPSS (version 23, IBM, USA). Variations among groups were determined by ANOVA. Associations between the parameters by Pearson's correlation. A confidence interval of 95% was set at p<0.05.
Results: The GGT, GSH, GSSG, GSH/GSSG and GGT/GSH molar ratios varied significantly among MTB subjects on intensive phase of anti-TB treatment (IPAT), M.TB on continuation phase of anti-TB treatment (CPAT) and the controls (p<0.05).
The GGT was significantly higher while GSH was significantly lower in M.TB subjects on IPAT when compared to M.TB on CPAT and controls (p< 0.05).
The GSH was significantly lower in M.TB subjects on CPAT compared to controls (p< 0.05).
The GSSG was significantly higher in M.TB on IPAT and CPAT compared to controls (p<0.05).
The GSH/GSSG molar ratio was significant lower while GGT/GSH molar ratio was significantly higher in M.TB subjects on IPAT and CPAT when compared with the controls (p<0.05).
The GGT correlated negatively with GSH and GSH/GSSG ratio in M.TB subjects on IPAT (r= -0.503, p=0.006) and (r= -0.453, p=0.016) respectively.
The GGT correlated positively with GSSG (r=0.435, p=0.021). The GGT correlated negatively with GSH/GSSG ratio in M.TB subject on CPAT (r=-0.433, p=0.021).
Conclusion: This study shows that anti-TB treatment is associated with elevated gamma glutamyl transferase and reduced GSH/GSSG ratio. Higher GGT/GSH and reduced GSH/GSSG molar ratios may be linked with poorer outcomes during anti-TB treatment.

TBS-EP-145 Development of novel, POC-appropriate sample prep devices for use with tongue swab-based assays

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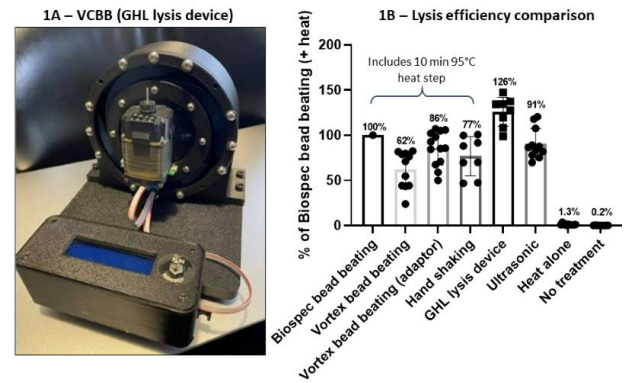
Background: As interest grows in using tongue swabs for tuberculosis (TB) diagnostics, there remains a need for low-cost, rugged, efficient methods for preparing tongue swab samples for assay introduction, especially at point-of-care. Such approaches need to render the sample biosafe, inactivate nucleases, and lyse *Mycobacterium tuberculosis* (MTB) cells. Typical lab approaches use a heat step followed by mechanical agitation (e.g. bead beating) in a separate instrument.
Here, we developed two novel, low-cost devices that combine heating and bead beating functionalities and compared their performance against alternate approaches.

Methods: We developed a device in which a voice coil motor provided the mechanical motion for bead beating (VCBB, Fig1A), and its integrated sample tube holder could simultaneously heat four tubes to 95°C. Using MTB-spiked tongue swab matrix, we investigated lysis efficiency (based on qPCR of lysate), nuclease inactivation, and biosafety relative to a standard method of 10 minutes in a 95°C heat block followed by Biospec mini-bead-beater. We then tested this system in the same manner on fresh tongue swab samples collected from study participants at two urban health centers in Kampala, Uganda. We also developed an alternate, even lower-cost device using a DC motor instead of voice coil, but currently for a single tube.
Results: We found optimal VCBB parameters of holding the sample at 75-95°C for two minutes, followed by shaking at 60Hz with 7mm displacement for four minutes with the heater off but samples remaining warm, which drastically improved lysis efficiency relative to room temperature samples. As summarized in Fig1B, our novel devices had statistically (paired t-tests) greater lysis efficiency relative to the reference method and other approaches we have tested over time.



Conclusions: Two designs for low-cost (<$100 BOM) tongue swab sample prep devices were validated and will be made freely available to interested parites.

TBS-EP-146 Identification of *NAT2* and *SLCO1B1* variants associated with anti-TB drugs in real-world data: All of Us Research Program

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Four first-line drugs for individuals with drug-susceptible Tuberculosis (TB) are recommended by the World Health Organization: isoniazid (H), rifampicin (R), ethambutol, and pyrazinamide. However, reports indicate that individuals with TB may experience adverse drug reactions that could result in anti-tuberculosis drug-induced hepatotoxicity (ATDH) contributing to treatment failure, relapse, emergence of drug resistance, and death.

Previous systemic reviews/meta-analyses and studies have examined *N*-acetyltransferase 2 (*NAT2*) and solute carrier organic anion transporter family member 1B1 (*SLCO1B1*) variants and their association with ATDH. *NAT2* variants have been associated with H related hepatotoxicity, whereas, *SLCO1B1* variants have been associated with reduced R intrinsic clearance and have conflicting reports on their association with ATDH.

More, *NAT2* variants can be categorized into slow/intermediate and fast acetylators, and in the United States' general population, there is ~50% prevalence of slow acetylators. Likewise, the minor allele frequency of *SLCO1B1* variant rs4149014 is known to be different among races (Asian 28.7%, European 0.2%, and African 4.2%). Therefore, we propose in this project to examine *NAT2* and *SLCO1B1* variants in the National Institute of Health's All of Us Research Program (AoU).

We examined 10 *NAT2* and 7 *SLCO1B1* variants and their allele frequency in AoU (*NAT2*: rs1801279 0.02, rs1041983 0.35, rs1801280 0.39, rs1799929 0.37, rs1799930 0.27, rs1208 0.60, rs1799931 0.05, rs1495741 0.71, rs4646244 0.26, rs4646267 0.17; *SLCO1B1*: rs4149014 0.03, rs2417957 0.10, rs4149063 0.12, rs2306283 0.51, rs4149056 0.12, rs4149013 0.05, and rs2291075 0.42), identifying a total of 245,044 and 192,867 individuals.

Additionally, we identified 1,656 TB cases having at least one of the *NAT2* or *SLCO1B1* variants previously mentioned with 1,373 of these cases having both *NAT2* and *SLCO1B1* variants.

Understanding *NAT2* and *SLCO1B1* variants and their association with ATDH will help inform development of personalized treatments, especially for individuals from populations with variants associated with higher ATDH risk.

TBS-EP-147 Efficacy of vitamin D supplementation in accelerating sputum conversion of bacteriologically diagnosed people with TB: A meta-analysis

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Tuberculosis (TB) is a global pandemic disease whose first-line treatment is with a combination of four antimicrobials commonly abbreviated as HRZE. However, some consider the regimen inadequate, thus conducting numerous trials to search for adjunctive therapies, including Vitamin D supplementation.

Trials so far have led to mixed results; therefore, the present study aims to consolidate data on the effects of Vitamin D supplementation on clinical outcomes, specifically rates of sputum culture conversion.

PubMed databases were searched for peer-reviewed articles published in English between the year 2013 and 2023 that deal with human subjects, designed as RCTs, utilizing Vitamin D supplementation in addition to anti-TB therapy, with a measured outcome of rate of sputum culture conversion at specific follow up intervals. The risk of bias was assessed using the Cochrane Risk of Bias (RoB) 2 tool.

Initially, 1,225 articles were found via database search, narrowed to six articles after screening and full-text reading.

Vitamin D supplementation increased the odds of culture conversion at eight weeks significantly but not at 16 weeks. Statistical heterogeneity was minimal, but the studies significantly differed about the dosing regimens of the intervention, populations included, and attrition rates.

The risk of bias was also low, but there were concerns due to high attrition rates, lack of blinding, and the addition of unplanned post-hoc analysis. Possible factors mentioned in some studies that may lead to variations in the effect of Vitamin D supplementation include Vitamin D status (sufficiency/insufficiency/deficiency), presence of drug resistance, and genetic polymorphisms; these may be explored in future studies sufficiently powered to examine such relationships.

TBS-EP-148 Treatment outcomes of people with isoniazid mono-resistant M. tuberculosis in Uganda: A retrospective cross-sectional study from 2017 to 2022

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Isoniazid-resistant tuberculosis is estimated to occur in 13.1% of new cases and 17.4% previously treated cases. Current WHO guidelines recommend treatment with Rifampicin, ethambutol, pyrazinamide, and levofloxacin for 6 months in patients with isoniazid mono-resistant TB (Hr-TB) but the effectiveness and use of other regimens in managing Hr-TB has not been established. There is a need to pay increased attention to the timely identification of Hr-TB patients to improve treatment success.

Selected isolates were tested for mutations associated with isoniazid resistance. Patient demographic data such as treatment regimen, adverse effects, and treatment start dates were obtained from treatment registers. The independent variables available (age, sex, regimen used, *M. tuberculosis* mutation genes for isoniazid specifically *InhA* and *KatG*, history of TB, HIV status, and reporting year) were assessed as possible factors in the relationship between Hr-TB and treatment success.

A total of 85 isolates were analyzed with most belonging to the category of newly diagnosed 42.3% (36/85) with 42.4% (36/85) turning culture negative at month one upon initiation of treatment. This study showed mutation in the *KatG* MUT1 region being dominant with a nucleotide change of S315T1 and with *inhA* MUT2, MUT3A, and 3B region being registered with no mutations. There were no significant age differences between the unsuccessful and successful treatment outcome groups (35.4 years and 35.86 years, p=0.078). The study found that most deaths were among people aged above 36 years 71.4% (5/7 participants).

This study revealed delayed culture conversation of beyond 2 months as a significant factor associated with unsuccessful treatment of isoniazid mono-resistant TB and this can be used as a predictor in routine patient management. The study found a higher proportion of mutations known to confer high-level isoniazid drug resistance among patients with isoniazid drug resistance but the treatment outcome across the different mutations never varied.

TBS-EP-149 Adherence to follow-up laboratory testing guidelines for TB treatment monitoring in Eastern Region, Ghana: Sensitivity analysis of three TB registries

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Background: Monitoring adherence to follow-up laboratory testing guidelines is critical in tuberculosis (TB) treatment management to assess patient response and inform adjustments to medications. However, this has received little attention by researchers. We assessed to what extent health staff adhere to follow-up laboratory testing guidelines for TB treatment monitoring.

Methods: We conducted a retrospective audit using record linkage and capture-recapture method on Pulmonary TB (PTB) cases registered between January 2016 and December 2017 in five districts. Matched and unmatched records of bacteriologically confirmed PTB cases across three TB registers were analysed to assess adherence to follow-up laboratory testing guidelines at distinct intervals (months 2/3, 5, and 6/8).

Sensitivity analysis compared TB records in laboratory registries with those in the district TB registry for matching purposes. Logistic regression models, were used to identify factors associated with adherence to follow-up laboratory testing.

Results: There were 773 bacteriologically confirmed PTB cases, with mean age of 42.6 years (SD=±15.0). Follow-up test results were not documented for 37.1% of the cases at month 2/3, 72.5% at month 5, and 66.4% at month 6/8 in the district register. The laboratory register had less than 1% of follow-up test results at month 6/8 recorded. Sensitivity analysis revealed significant matching of results in both registers, particularly at month 6/8 (66.2%; 95% CI=62.8-69.5; P <0001).

Patients aged 15-64 years were less likely to adhere (aOR: 0.1, CI: 0.0 - 0.7, p<0.016) compared to patients aged 0-14 years. Patients from the Kwahu West Municipality were more likely to have better adherence to follow-up testing (aOR: 3.9, CI: 2.1 - 7.1, p<0.0001) compared to those residing in Akyemansa District.

Conclusion: Adherence to follow-up laboratory testing guidelines for TB treatment monitoring in the districts studied was suboptimal. Interventions are needed to improve adherence to follow-up testing in these districts.

TBS-EP-150 Safety of short oral treatment regimens for the treatment of drug-resistant TB

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Introduction: In patients with drug-resistant tuberculosis, managing adverse reactions is crucial to improve adherence to the chemotherapy regimen and reduce the risk of treatment interruption.
Materials and methods: An analysis of the safety of treatment for multiple and pre-extensively drug-resistant tuberculosis (MDR and pre–XDR TB), using short oral treatment regimens from 2023 to 2024 at the Federal State Budgetary Institution. The treatment regimens lasted 9-11 months and included 4-5 drugs: bedaquiline, linezolid, clofazimine, fluoroquinolone, pyrazinamide, delamanide. The study involved 44 patients with MDR or pre–XDR TB, 18 men (40.9%) and 26 women (59.1%), average age 36.7 ± 11.2 years. MDR TB was diagnosed in 31 patients (70.5%), pre–XDR in 13 (29.5%). The adverse events (AEs) were assessed using the CTCAE scale.
Result: a total of 30 AEs were registered. GRADE 1 and GRADE 2 AEs were recorded, such as polyneuropathy – 8 of 30 (26.7%), myelosuppression – 2 of 30 (6.7%), toxic allergic reactions – 3 of 30 (10.0%), toxic liver damage – 2 of 30 (6.7%), diarrhea – 6 of 30 (20.0%), panic attacks – 4 of 30 (13.3%), hand tremor – 1 of 30 (3.3%). The regimen was canceled in 4 patients due to the development of GRADE 3 AEs (2 of 30 (6.7%) – myelosuppression, 2 of 30 (6.7%) –polyneuropathy). AEs did not meet the criteria for serious AEs.
The average time before the onset of polyneuropathy is 107.2 days, myelosuppression is 71.7 days, toxic allergic reaction is 46.5 days, toxic liver damage is 50 days, diarrhea is 57.3 days, panic attack is 55.8 days, hand tremor is 35 days. ECG analysis during treatment did not reveal a pathological increase in the QTc interval (M±SD 411,4 ±18.3 ms).
Discussion: GRADE 1 and 2 AEs can be managed by proper monitoring and monitoring with minimal additional intervention. No cardiotoxic reactions were detected.

TBS-EP-151 Long-term adverse effects of linezolid in the treatment of multi-drug-resistant TB

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Rationale: Linezolid plays an important role as part of drug regimen for multidrug-resistant tuberculosis (MDR-TB). However, linezolid has the highest discontinuation rate due to adverse effects such as myelosuppression or neuropathy, which can be a major therapeutic challenge. Few studies have examined the long-term prolonged side effects of this drug.
Methods: This retrospective cohort study included patients treated with regimen including linezolid for MDR-TB from 1 April 2018 to 31 May 2022 in Kinki Chuo Chest Medical Center, a referral respiratory hospital in Osaka, Japan. We collected the information of adverse effects and whether linezolid administration was discontinued.
Results: Among 17 patients receiving linezolid, 13 patients experienced any adverse effects (76.5%) including peripheral neuropathy (10/17, 58.8%) and myelosuppression (4/17, 23.5%), 12 of which discontinued linezolid administration. Peripheral neuropathy in 4 patients persisted after the end of the treatment.
Conclusion: A substantial portion of patients receiving linezolid experienced adverse effects requiring discontinuation. Peripheral neuropathy persisted long after the end of the treatment in part of the patients, which may affect quality of life.

TBS-EP-152 Studying the effectiveness of bedaquiline versus kanamycin-based treatment regimens of multi-drug-resistant TB in terms of occurrence of treatment failure

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The National Tuberculosis Elimination Programme (NTEP) formulates guidelines for treatment of Drug Sensitive Tuberculosis (DSTB) and Drug Resistant Tuberculosis . The latest guidelines set up in 2020 advocate the use of Bedaquiline based regimens for treating Multi – Drug Resistant Tuberculosis (MDR TB). The earlier guidelines recommended Injection Kanamycin for treatment of MDR TB. Injectables have completely been eliminated in current guidelines.
This study aimed to compare the treatment failure rates in Kanamycin and Bedaquiline based MDR TB regimens. The data was collected from Nikshay portal. A list of all the patients treated with Kanamycin based treatment regimens (from years 2018 - 19) and Bedaquiline based treatment regimens (from years 2020-21) was obtained.

Freshly diagnosed cases were segregated by studying the reports of the patients on the Nikshay Portal. Patients with treatment failure were sorted from them and their clinico-demographic data along with data for comorbidities was collected from Nikshay Portal. Treatment failure rate for both the regimens was calculated and compared. Influence of clinicodemographic parameters along with comorbidities on treatment failure was studied.
It was found that treatment failure rates were same for both – Kanamycin and Bedaquiline based treatment regimens of MDR TB. Amongst Bedaquiline based regimens – Shorter MDR/RR-TB regimen had more rate of treatment failure as compared to Oral Longer Regimen. In Kanamycin based regimens - MDR with Fluoroquinolone resistance regimen had higher rate of treatment failure as compared to MDR Conventional regimen, but not significantly. Diabetes, HIV Co – infection, Past history of DSTB and Past history of DSTB treatment failures did not affect treatment failure rates in patients put on either regimen. Treatment failure was slightly higher in younger age group in patients on Kanamycin based regimens. Majority of the treatment failures consisted of Males, Pulmonary Tuberculosis and had MDR pattern in both the regimens.

TBS-EP-153 An assay toolkit for the assessment of anti-TB drugs in the Hollow-Fiber system for TB

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The Hollow-Fiber system for Tuberculosis (HFS-TB) is a novel preclinical *in vitro* pharmacokinetic/pharmacodynamic (PKPD) tool qualified by the European Medicines Agency to buttress the anti-TB drug development. It allows to simulate *in vivo* PKPD parameters of selected drugs in the presence of *Mycobacterium tuberculosis* growing in an enclosed cartridge bioreactor. This technique feeds *in silico* mathematical models to inform the design of Phase II/III clinical trials.
De novo implementation of the HFS-TB in research laboratories is a challenging task due to the lack of clearly defined guidelines.
In addition, historical data and published protocols omit key information needed for data reproducibility. Particularly, a key aspect barely reported is drug–fibres compatibility within the system, i.e., drug physiochemical suitability of diverse fibers' materials (polysulfone, PVDF or cellulose) within the cartridge. This key step needs to be assessed before actually performing PKPD assays to ensure optimal mimicking of desired PK profiles in the extracapillary space, where bacteria reside. Omission of this test hampers the quality of the study, because unspecific binding between the drug and the HFS materials could occur, thus limiting correct drug exposures.
Hence, in this work, we have unveiled different compatibility features of the most common anti-TB drugs with the HFS cartridges: isoniazid, ethambutol, rifampicin, rifapentine, linezolid, moxifloxacin, pretomanid and delamanid.
We performed *in vitro* PK mimicking studies with the different cartridge materials and quantified by liquid chromatography–tandem mass spectrometry the actual drug concentrations in both the intracapillary and extracapillary spaces compared to expected profiles. Thus, identifying the most suitable one for each drug.
Altogether, our data contribute to the necessary standardization of HFS-TB experiments and provides essential information -currently overlooked in the field- needed for the evaluation of novel combination therapies.
This work received support from the Innovative Medicines Initiatives 2 Joint Undertaking (grant No 853989).

COMMUNITY CONNECT SESSIONS: TUESDAY 12 NOVEMBER 2024

CCSA001 Empowering people: Transforming TB care through person-centred approaches

Coordinator: Usman Lodhi, DOPASI Foundation, Pakistan
Chair: Jacob Creswell, Stop TB, Switzerland

Person-centered care (PCC) and stigma reduction are fundamental pillars of the Global Plan and End TB strategy. Despite their critical importance, specific guidelines for effectively integrating PCC and addressing stigma in TB programs remain scarce. This session will focus on tools designed to assess PCC and mitigate stigma for people with TB, demonstrating their application across TB REACH projects.
Key components of the session include:

- The development process of the PCC tool, encompassing initial pilot phases and refinement based on field data.
- Strategies for implementing PCC and stigma reduction tools across diverse geographic and socio-economic contexts in eight countries.
- Feasibility assessments and the integration of these tools into routine monitoring and evaluation.
- Analysis of preliminary data highlighting individual experiences, satisfaction, stigma levels, and areas needing improvement.
- Discussions on the challenges and successes in adopting person-centered approaches and stigma reduction in TB-care.

The session aims to present and discuss the development, implementation, and impact of quantitative tools designed to measure PCC and reduce stigma for TB across various settings. By emphasizing both PCC and stigma reduction, the session will highlight their importance in improving individual outcomes and healthcare delivery in TB programs.
Attendees will gain insights into the rigorous processes involved in creating, pilot testing, and refining these tools. The session will cover the challenges faced during implementation and the innovative solutions developed to overcome these hurdles. Feasibility assessments will evaluate how well the PCC and stigma reduction tools integrate into routine monitoring and evaluation frameworks, including resource allocation, training requirements, and scalability.
The session will also present an analysis of preliminary data collected using these tools. This data will shed light on individual experiences, satisfaction, and stigma levels, offering valuable insights into areas that need improvement. By understanding the individual perspective and the impact of stigma, the session aims to foster a more empathetic and effective approach to TB care.
A significant portion of the session will be dedicated to discussing the challenges and successes in adopting person-centered approaches and reducing stigma. Real-world examples from different countries will illustrate the practical benefits and obstacles of PCC and stigma reduction implementation, providing a balanced view of their impact.
Ultimately, the session aims to underscore the importance of PCC and stigma reduction in enhancing individual outcomes and overall healthcare delivery in TB programs. By sharing the development journey, implementation strategies, feasibility assessments, and preliminary data, the session will equip attendees with the knowledge and tools needed to advocate for and implement PCC and stigma reduction in their own settings.
Addressing stigma is a core component of effective TB care. Stigma can deter individuals from seeking diagnosis and treatment, exacerbating the spread of TB. This session will introduce tools for assessing and mitigating TB-related stigma, sharing insights from different countries on how these tools have been implemented and their impact on individual care and community perceptions. By focusing on these areas, the session aims to provide a comprehensive understanding of how these tools can transform TB care, making it more equitable and effective.

Overview of person-centred care in TB: PCC tool by Stop TB Partnership

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Implementation of PCC tool in Pakistan: Insights and outcomes

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Combating TB stigma and promoting person-centred care: Lessons from Nigeria

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Effective communication strategies for TB stigma reduction and PCC enhancement

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Comparative insights on PCC and stigma reduction: Perspectives from developed countries

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CCSA002 Capacitating communities to engage with research through responsive and interactive online curriculum

Coordinator: Erin McConnell, TAG, United States
Chair: Rekha Radhakrishnan, SMART4TB, United States

CABLab is an online, synchronous, and interactive curriculum designed by the SMART4TB project in collaboration with three regional community advisory boards (rCABs) – APCASO, Afrocab, and ECAT. The curriculum was designed to cover research fundamentals; the basics of TB, including treatments for TB infection and disease, vaccines, and diagnostics; and methods for supporting communities and civil society partners to engage with researchers and other key stakeholders at key points along the research to policy pipeline.

Members of the three rCABs served as an initial cohort of CABLab students – 48 rCAB members completed the curriculum between September and December 2023 and provided feedback on each module. We measured learners' progress and evaluated the curriculum using pre- and post-assessments. The initial cohort of CABLab students scored an average of 42% on the pre-assessment and 78% on the post-assessment, demonstrating a 36% improvement in knowledge and understanding by the end of the original nine-week course.

CAB member feedback informed improvements to the content, design, and interactive elements of the course. Each of the three rCABs also developed learning modules for incorporation into the CABLab curriculum —covering community led monitoring, intellectual property and other access barriers, sex and gender in TB, and practical examples of CAB-led advocacy campaigns. CABLab was launched to a wider TB community and civil society constituency in three languages (English, French, and Russian) in mid-2024 and is currently accepting students on a rolling basis.

Through interactive discussion, this session will present the CABLab curriculum and show how CABLab can be a tool for capacitating community members to engage researchers and policymakers. Speakers will discuss how community input in curriculum and platform development was critical to developing impactful training that is responsive and flexible to unique learning contexts. The session will focus on the perspectives of the rCABs in developing and improving CABLab for their regions and community contexts.

CABLab: An interactive, asynchronous TB curriculum for all

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Importance of innovative educational tools and overcoming language barriers in outreach to communities and education

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Community engagement, human rights, and gender: Lessons learned from Asia-Pacific implementation of CABLab.

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Impact on the ground: Tangible impact of community-driven learning in TB advocacy and accountability

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CCSA003 Harmonising health: AI, acoustics, and innovations in TB diagnosis

Coordinator: Kinz Ul Eman, Dopasi Foundation, Islamabad, Pakistan
Chair: Zhi Zhen Qin, Stop TB Partnership, Dubai, United Arab Emirates
Chair: Kinz Ul Eman, Dopasi Foundation, Islamabad, Pakistan

The battle against tuberculosis stands at a critical juncture, poised for transformation through the convergence of artificial intelligence, digital health innovations, and cutting-edge acoustic biomarkers. This convergence promises not only to enhance TB diagnostics but also to revolutionize the delivery of care, particularly in remote and underserved regions where traditional healthcare infrastructure is often lacking.

At the forefront of this transformative wave is the session titled „Harmonizing Health: AI, Acoustics, and Innovations in TB Diagnosis," a 45-minute exploration into how these technological advancements are reshaping the landscape of TB management.
This session is not just a platform for discussion but a beacon of hope, illuminating the path towards more accurate, timely, and accessible TB diagnosis and treatment worldwide.

The session will feature presentations from four visionary leaders who have pioneered breakthroughs at the nexus of technology and healthcare. Their insights and innovations will highlight the practical applications of AI and acoustic biomarkers in TB diagnostics, offering tangible examples of how these tools are overcoming longstanding challenges in detecting and monitoring the disease.

Imagine a scenario where a simple cough can be analyzed with AI-powered algorithms to distinguish between TB and other respiratory conditions swiftly and accurately. This capability has the potential to drastically reduce misdiagnosis rates, ensuring that patients receive appropriate treatment promptly.
Moreover, in regions with limited access to healthcare professionals, digital health innovations can empower community health workers with handheld devices equipped to collect and transmit diagnostic data in real-time, facilitating timely intervention and monitoring.

The session will delve into these advancements through compelling presentations that showcase real-world implementations and outcomes. Each leader will share case studies and data-driven insights that underscore the transformative impact of AI and acoustic biomarkers on TB care pathways. Moreover, a thought-provoking panel discussion will provide a platform for collaborative dialogue among experts, exploring the challenges and opportunities inherent in scaling these innovations across diverse healthcare settings.

Central to the session's mission is fostering equitable healthcare access. By leveraging AI and digital tools, healthcare disparities can be addressed more effectively, bridging the gap between urban centers and remote communities. The session's interactive Q&A segment will invite attendees to explore how these innovations can be adapted and integrated into existing healthcare frameworks, ensuring that all individuals, regardless of location or socioeconomic status, can benefit from the latest advancements in TB diagnostics and care.

Beyond technological prowess, the session embodies a spirit of collaboration and innovation-driven by a collective commitment to global health equity. It serves as a catalyst for partnerships between technology developers, healthcare providers, policymakers, and community stakeholders, fostering a holistic approach to combating TB on a global scale.

It is more than a session; it is a testament to the power of innovation to transform lives and communities. As we embark on this journey towards a TB-free world, let us embrace the potential of AI, digital health, and acoustic biomarkers to create a future where TB is no longer a threat, and healthcare is truly universal and equitable for all.

Potential of artificial intelligence-powered cough classification for TB: A mini review

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HeAR: Unlocking the power of acoustic biomarkers for global health

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Transformative tech: Real-world successes in AI and digital health innovations for community well-being

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Revolutionising rural healthcare with AI-powered telemedicine and smart diagnostics

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CCSA004 From data to action: Mapping diversities in TB key and vulnerable populations

Coordinator: Kinz Ul Eman, Dopasi Foundation, Islamabad, Pakistan
Chair: James Malar, Stop TB Partnership, Geneva, Switzerland

Key vulnerable populations (KVPs) for tuberculosis (TB) vary significantly across different regions and include groups such as prisoners, people living with HIV, migrants, healthcare workers, and indigenous populations, among others. Understanding the burden of TB within these populations is crucial for developing targeted interventions and ensuring equitable access to TB care.
This session will provide an overview of the KVP size estimation tool developed by the Stop TB Partnership (STP), which aims to facilitate the identification and quantification of these populations to better allocate resources and design effective TB programs.
This session is dedicated to discussing the diversity of key vulnerable populations (KVPs) for tuberculosis (TB) across various countries, with a particular focus on the differences between developed and developing nations. The session will delve into the importance of identifying and estimating the size of these populations to effectively target TB interventions and resources.
By examining the Stop TB Partnership's (STP) KVP size estimation tool, the session will highlight its development, implementation, and the experiences of different countries in using this tool.
The session will introduce the KVP size estimation tool developed by STP which is designed to help countries identify and quantify their key vulnerable populations, enabling more accurate and effective planning and resource allocation. The tool's development process, including the methodology used and the data sources leveraged, will be explained in detail. Participants will learn how the tool can be adapted to different country contexts and how it has been implemented in both developed and developing nations.
Country case studies will be presented to illustrate the practical application of the KVP size estimation. These case studies will provide insights into how different countries have used the tool to inform their TB programs and what future strategies are being adopted for TB care in KVPs.
The session will also explore the challenges and lessons learnt during KVP size estimation. This includes discussing the limitations of the tool, potential biases in data collection, and strategies for overcoming these challenges. The role of community engagement and collaboration with local organizations in the implementation of the tool will be emphasized.
Finally, the session will conclude with a discussion on the future directions for using the KVP size estimation in TB control efforts. Participants will be encouraged to think about how they can apply the insights gained from the session to their own contexts. By highlighting the importance of identifying and supporting key vulnerable populations, this session aims to inspire stakeholders to adopt more inclusive and effective approaches to TB care, ultimately contributing to the global effort to end TB.
This session promises to be an informative and impactful discussion on the future of TB care, emphasizing the critical role of identifying and supporting key vulnerable populations in shaping effective health interventions.

Unveiling challenges and pathways: TB impact on key and vulnerable population, and the quest for equity

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Empowering change: Leveraging the KVP size estimation tool to identify and support key and vulnerable populations in TB elimination

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TB KVP size estimation in Moldova: Results, lessons learned and data for use

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Tailoring TB services: Aligning care with the unique needs of key and vulnerable populations for enhanced accessibility, availability, acceptability, and quality

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Enhancing TB care with one impact CLM: Insights and field experiences for key and vulnerable populations

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CCSS001 From awareness to action: Community-based approaches to TB stigma

Coordinator: Vlada Rabinova, TB Europe Coalition, Ukraine
Chair: Zahedul Islam, Alliance for public health, Ukraine

This session serves as a critical platform for examining the pivotal role of civil society organizations (CSOs) and community participation in tackling issues related to community rights, gender equality, and stigma. Through the lens of various speakers including representatives from diverse communities from Ukraine, Cambodia, Côte d'Ivoire the session will underscore the significance of community efforts in addressing barriers to accessing quality TB services while upholding human rights and gender equity.

Stigma and discrimination towards TB-affected people were not confined to the healthcare sector, they extend to other spheres of social interactions. Speakers will share their experiences and insights, shedding light on the transformative impact of community-led interventions in breaking down systemic stigma and discrimination. By amplifying the voices of community leaders and advocates, the session will emphasize the power of CSOs and communities in driving sustainable change.

Central to the discussion will be an exploration of the gender dimensions of stigma and discrimination. Speakers will dissect how societal norms and biases can exacerbate disparities, particularly affecting marginalized individuals. Through a gender-sensitive approach, the session aims to uncover underlying inequities and advocate for policies that prioritize inclusivity and respect for diverse identities.

Speakers will discuss the interventions they are implementing to address gender, stigma and discrimination within their countries. These interventions encompass a range of activities aimed at fostering gender equality and reducing stigma across diverse contexts. Examples include community-based awareness campaigns, assessments, legal analysis, capacity-building workshops, and advocacy efforts to influence policies and practices.

Participants can anticipate gaining valuable insights into effective strategies for combating stigma and discrimination, both within healthcare settings and broader societal contexts. Moreover, the session will showcase innovative approaches to promoting equality and rights within communities, fostering an environment of mutual support and empowerment.

Ultimately, this session offers a dynamic platform for dialogue and advocacy. By centering the voices of communities and CSOs, it seeks to catalyze collective action toward building more supportive and equitable societies, where every individual, regardless of health status or gender identity, can thrive with dignity and respect.

Making the TB response rights-based, equitable, and stigma free: Results from the community, rights and gender assessment in Cambodia

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Unveiling stigma: Employment challenges for people with TB

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Enhancing community resilience: CRG assessment impact through Côte d'Ivoire's experiences

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CCSS002 Survivor-led networks as a catalyst for ending TB in high burden countries: A case study of Touched by TB, the national coalition of TB-affected communities in India

Coordinator: Raghavan Gopa Kumar, Touched by TB, New Delhi, India
Chair: Raghavan Gopa Kumar, Touched by TB, New Delhi, India

In India the involvement of TB survivors in TB control efforts continue to be minimal even after advocacy at various levels. There is an urgent need to empower survivors to become the voice for the needs of the TB affected community. The meaningful engagement of the TB survivors in policy formulation and program design lay the foundation for an effective TB elimination program. India needs TB champions/ ambassadors at grassroots level and at state and national levels to help support and strengthen program implementation, and address issues of deep-seated stigma that continue to persist.
A national level survivor network is best placed to facilitate the assurance of quality service delivery and ensure access to healthcare services especially to poor and marginalized in difficult to reach areas. In order to address this situation, an urgent need of a national level network of TB survivors was felt among the TB community. A TB survivor network managed by survivors can themselves raise issues relevant to them and identify potential solutions without much delay. This network of survivors also work as advocates and spokespersons in TB response at the national and sub national level. These survivors come from diverse states, economic strata, and experiences and work together to discuss and highlight issues in TB from the perspective of affected communities.
These groups also act as peer counsellors to encourage people living with TB and immediate family members explaining their own TB journey, how they could defeat the disease and lead a normal life in their present-day life so that they complete the treatment.
With this idea in mind Touched by TB started work in the remote areas of four North Eastern states and Delhi. The districts and survivors in each of the selected districts were identified by the National TB Elimination Program (NTEP) staff and Touched by TB. The selected survivors were trained on three days modules recommended by Central TB Division.
These survivors upon completion of the trainings became TB Champions/ change makers and work within the radius of 3-5 KM of their habitations. They launched district level networks and add more survivors as volunteers and later scaled up to and form State level survivor networks and formally register as legal entity. These 10 district and 5 state level networks echo the voices of the community and raise the issues at district TB forums and State TB forums as well as National and international level.
In an organized manner these champions make home visits and and spread TB awareness among the community and establish a two way communication system from grassroots to national level. The first national convention of TB survivor led networks was organized to chalk out the future road map of networks to end TB program of Government of India. Due to continuous efforts of these national and subnational networks under the umbrella of Touched by TB, these networks and champions are going to be involved in the Global Fund GC 7 implementation in all major states starting mid of 2024.

TB survivor engagement with programme division in Delhi: Challenges and opportunities

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TB survivor engagement in Nagaland to end TB: Challenges and opportunities

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Formation and programme implementation of survivor-led network in Sikkim: Experience of hard-to-reach areas in North East India

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Challenges of formation of survivor-led network in Meghalaya, India

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CCSS003 Challenging local funding support for community-based TB initiatives to End TB: Experiences from Indonesia

Coordinator: Dini Andriani, USAID BEBAS-TB, Jakarta, Indonesia
Chair: Budi Susilo, Penabulu Foundation, Indonesia
Chair: Dini Andriani, USAID BEBAS-TB, Jakarta, Indonesia

Community health organizations play a vital role in TB control by contributing to case detection, patient and community education, and treatment success. These community health volunteers, often called TB cadres, are essential to the health system, acting as the frontline in accelerating TB elimination and increasing treatment success rates.

Given their key role, it is crucial to sustain the participation of community organizations in TB control program. It is estimated that 11 trillion rupiah is required to combat TB in Indonesia. Most of this funding currently comes from the national state budget and international donors, with a portion allocated to support community-based TB services and initiatives. However, these sources of funds are often temporary and uncertain, with limited flexibility in their use. Investments from domestic resources, including sub-national governments, are essential to support community organizations' initiatives.

Innovative approaches have been implemented in many countries to sustain community participation. One key strategy is Domestic Resource Mobilization (DRM), which involves creating an environment where local funding meets the population's needs, including health. Learning from the successes of local communities and CSOs (Civil Society Organizations) in mobilizing domestic resources can inform future financing efforts for community-based TB initiatives.

This community connect session aims to discuss the experiences of CSOs in Indonesia and Asia in mobilizing local funding for community-based TB initiatives. We will highlight the importance of leveraging village funds to support TB initiatives in remote areas and cover advocacy efforts to increase local government funding contributions to TB programs, emphasizing the role of local leadership in sustaining community health initiatives. Additionally, we will offer a comparative perspective, providing valuable insights into successful DRM implementation from other countries that can be adapted to Low-Middle Income Countries, fostering innovation in local financing. Finally, we will explore existing gaps and reveal potential opportunities to advance DRM, ensuring long-term sustainability of community-based TB care and prevention efforts.

Mobilising village fund to address TB in remote areas

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Bridging the gap: Addressing resource shortfalls in community-based TB initiatives

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Healthy housing to improve quality of life of people affected by TB

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Policy gaps and opportunities in mobilising domestic resources for community-based TB initiatives

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CCSS013 The vital role of communities and civil society organisations in implementing the ten key actions of the 2023 Roadmap towards ending TB in children and adolescents

Coordinator: Cosette Audi, Elizabeth Glaser Pediatric AIDS Foundation, United States
Chair: Gloriah Moses, ITPC Global, Kenya
Chair: Moorine Penninah Sekadde, Uganda Ministry of Health – National TB and Leprosy Program, Kampala, Uganda

Despite ambitious commitments made at the United Nation high level meetings (UNHLM) on tuberculosis (TB) in 2018 and 2023, and increased attention on TB in children and adolescents in recent years, there are still critical gaps that remain to be addressed when it comes to ensuring adequate access to TB care for children and adolescents.
As highlighted in the World Health Organization (WHO) Global TB report 2023, an estimated 1.25 million children and young adolescents (0–14 years old) fell ill with TB in 2022 and 214,000 died due to this preventable and curable disease. Half of them (51%) were not diagnosed or not reported to national TB programmes. Thousands of children and young adolescents are therefore missed by health systems due to limited access to TB services and related logistical and financial challenges, as well as stigma. Weak implementation of integrated family- and community-centered services as well as lack of adolescent-friendly services are still a major barrier. In September 2023, Member States renewed their commitments towards ending TB, including in children and adolescents, and agreed to ambitious targets to be met by 2027, reflected in the political declaration arising from the 2023 UN HLM.
During the annual meeting of the Child and Adolescent TB Working Group in November 2023, WHO, in collaboration with the Child and Adolescent TB Working Group of the Stop TB Partnership, launched the Roadmap Towards Ending TB in Children and Adolescents third edition.
This document outlines ten priority actions that need to be undertaken by key stakeholders to end TB in children and adolescents and to achieve the targets included in the political declaration arising from the 2023 UN HLM on TB. Progress can only be made if the key actions included in the Roadmap are fully implemented and this cannot happen without strong support from communities and civil society organizations (CSOs).
This Community Connect session will provide an overview of the progress towards the implementation of the Roadmap, one year after it was launched, identify key challenges related to implementation and discuss how CSOs and communities can play a key role in advocating for the implementation of the 10 key actions outlined in the Roadmap.

The main objectives of this session are to:
- Discuss progress made towards implementation of the Roadmap.
- Share examples and experiences of the critical role that civil society can play in supporting the implementation of the key actions in the Roadmap, including ensuring key stakeholders' accountability.
- share reflections and ideas from relevant stakeholders on opportunities to accelerate the implementation of the 10 key actions in the Roadmap.

Toward ending TB in children and adolescents: What is needed to implement the ten key actions?

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How investing in TB community-led programmes can contribute to strengthening the response to ending TB in children and adolescents

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Community engagement to support TB case finding and TB preventive treatment provision for children and adolescents in Indonesia

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Community-driven accountability in the TB response: Addressing the specific needs of children and adolescents

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Fostering collaboration between national TB programmes, the Ministry of Education and learning institutions: Key contributions from members of civil society

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COMMUNITY CONNECT SESSIONS: WEDNESDAY 13 NOVEMBER 2024

CCSA005 The power of storytelling in TB care: Empowering key and vulnerable populations

Coordinator: Dozia Joseph, Global Coalition of TB Advocates, New Delhi, India
Chair: Blessina Kumar, Global Coalition of TB Advocates, New Delhi, India

The Global Coalition of TB Advocates (GCTA) continues its commitment to amplify the voices of those affected by TB through the power of storytelling. Building on the success of our session at the Union Conference last year, where we showcased the strength and resilience of five female TB survivors who are changing the TB landscape with their inspirational work, we would like to propose "The Power of Storytelling in TB Care: Empowering Key and Vulnerable Populations" as a vital part of this year's Community Connect.

In our journey towards achieving the Sustainable Development Goals (SDGs), Universal Health Coverage (UHC), and the targets set by the United Nations High-Level Meeting (UNHLM) to eliminate TB by 2030, it is imperative to recognize the unique challenges faced by key and vulnerable populations. These include people living with HIV (PLHIV), people who use drugs (PWUD), sex workers, and individuals from the LGBTQIA+ community, among others.

Our session will feature a diverse panel of speakers, each representing a different key or vulnerable population affected by TB. Their stories are not only a testament to their resilience but also serve as powerful advocacy tools to drive change in TB care and support systems.

Through their narratives, we aim to shed light on the intersectionality of TB with other health and social issues, such as HIV/AIDS, substance use, stigma, discrimination, and access to healthcare.

By amplifying their voices, we seek to promote a more inclusive and person-centered approach to TB care that addresses the specific needs and challenges faced by key and vulnerable populations.

In addition to sharing personal stories, our session will delve into practical strategies and best practices for healthcare providers, policymakers, and civil society organizations to ensure that TB care is accessible, non-discriminatory, and supportive of key and vulnerable populations.

These stories have the potential to become catalysts for change, empathy, and actionable solutions. Together, let us harness the power of storytelling to empower key and vulnerable populations in TB care, ensuring that no one is left behind in our collective efforts to end TB as a global health threat by 2030.

Personal journey with TB and strategies to make TB care more inclusive for sex workers

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Personal journey with TB and strategies to make TB care more inclusive for PLHIV

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Personal journey with TB and strategies to make TB care more inclusive for people who use drugs

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Personal journey with TB and strategies to make TB care more inclusive for women

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Personal journey with TB and strategies to make TB care more inclusive for people who use drugs

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CCSA006 Unlocking the power of community advisory groups: Navigating who, what, where, when, and how

Coordinator: Nicola James, Independent consultant, United Kingdom
Chair: Madhava Sai Sivapuram, The Union, India
Chair: Nicola James, Independent consultant, United Kingdom

This session will be an informative panel discussion where existing Community Advisory Group (CAG) and Board (CAB) members share their valuable experiences and insights within the TB and lung health communities. Through personal anecdotes and real-world examples, the panelists will explore the critical role of CAGs in community health initiatives, emphasizing their importance in bringing together communities and health organizations and promoting changes towards the common goal to End TB by 2030.

Who: Panelists will discuss the stakeholders involved in CAGs and the importance of diverse communities. They will highlight the significance of inclusive representation, ensuring that all voices, especially those from key and vulnerable groups are heard and valued.

What: The discussion will delve into the core functions and objectives of CAGs, such as providing community input on health programs and advocating for community needs. Stories of success where CAGs have positively influenced health policies and improved outcomes will be shared.

Where: Panelists will highlight various contexts in which CAGs operate, demonstrating their adaptability to different settings, from local clinics to national health programs. Case studies will illustrate the diverse environments where CAGs have made significant impacts.

When: The timing and integration of CAGs into health initiatives will be a key topic. Panelists will discuss the benefits of early and continuous engagement throughout the lifecycle of health programs, from planning to evaluation and beyond.

How: Practical advice on establishing and sustaining CAGs will be shared, including recruitment strategies, governance structures, and effective communication. Common challenges and solutions in managing CAGs will be addressed, providing attendees with actionable insights.

The session will emphasize the transformative potential of CAGs in driving innovation and enhancing community trust in health initiatives. Panelists will showcase innovative approaches and future directions for expanding the impact of CAGs. By attending this session, attendees will have the opportunity to engage with the panelists, share their own experiences, and gain practical knowledge to implement CAGs in their communities.

They will gain a comprehensive understanding of the role and operation of CAGs, equipped with practical tools and strategies to leverage the power of CAGs in TB and lung health initiatives. This session is designed for community members, health professionals, and advocates committed to driving meaningful health outcomes through community engagement.

Sharing the experiences of CABs - CAB member UNITE4TB, benefit kids and co-chair national CAB, ICMR, India.

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Sharing the experiences of facilitating a CAG in Vietnam

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Community leaders taking action to increase accountability for TB policy implementation in South Africa

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Sharing the experiences of a CAG member from a war torn country, Ukraine

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CCSA007 Driving innovation in TB vaccine advocacy, policy, and access to End TB: An interactive community and civil society discussion

Coordinator: Shaun Palmer, IAVI, Netherlands
Chair: Priyanka Aiyer, Global Fund Advocates Network, Delhi, India
Chair: Shaun Palmer, IAVI, Netherlands

Following years of ingenuity and perseverance, new TB vaccines could be available this decade. Multiple promising candidates are in late-stage efficacy trials and efforts are progressing to ensure their globally affordable and equitable access once available. This is a global effort driven by the commitment of researchers, affected communities, product developers, country leaders, funders, policymakers, advocates, and many others around the world.
Momentum across the field is growing. Years of dedicated advocacy saw member states commit to deliver new TB vaccines as early as 2028 at the 2023 United Nations High-Level Meeting on TB (TBHLM), alongside commitments to invest US$5 billion per year in TB research by 2027, including $1.25 billion for vaccines.
In 2023, we also saw the largest investments to date in TB vaccine development, while the World Health Organization launched the TB Vaccine Accelerator Council, co-chaired by Brazil and Indonesia, which seeks to facilitate the development, availability, and use of new TB vaccines.
These welcome developments and commitments have generated significant optimism and anticipation across the field. The world may soon deliver new TB vaccines – but only if we significantly increase and consolidate our joint efforts to bring these essential tools to those who need them.
A paradigm shift is needed that leverages the financing, research, manufacturing, regulatory, and implementation capacities of world governments, including high burden middle-income countries, to secure the resources needed to deliver new TB vaccines – saving millions of lives and billions of dollars. Civil society and affected communities play leading roles in this effort. This includes developing innovative advocacy initiatives and policy proposals, with calls for context-specific approaches and multilateral collaboration to maximize impact and meet the TBHLM targets.
This interactive session will feature a panel of experts in TB vaccine development, access, and policy. During this session, we will take stock of progress in TB vaccine development and access over the last year and explore the advocacy needs and opportunities to support joint, sustained, and scaled up investments and partnerships.
The session will also reflect on recent developments and news from the WHO TB Vaccine Accelerator Council, the 7th Global Forum on TB Vaccines, and other relevant events such as the World Health Summit.
This session is open to anyone involved or interested in new TB vaccines. Participants, including civil society representatives, community members, high burden country partners, and researchers, are invited to engage in a dynamic discussion with the panelists and audience members alike. This moderated session seeks to highlight the expertise and experiences of all in attendance and is an opportunity for panelists and participants to share key updates, questions, and ideas with one another on the topics of TB vaccine development, access, advocacy, and policy.

Realising the role of middle-income high burden countries

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Consensus statement on the inclusion of pregnant and lactating women in TB vaccine research

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Stakeholder voices in the WHO TB vaccine accelerator council

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TB vaccine development: Research institute perspective

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TB vaccine development: Non-profit perspective

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CCSS006 Advancing pregnancy inclusion in TB research: A model for engaging communities to set the agenda

Coordinator: Cosette Audi, Elizabeth Glaser Pediatric AIDS Foundation, United States
Chair: Cosette Audi, Elizabeth Glaser Pediatric AIDS Foundation, United States
Chair: Erin McConnell, TAG, United States

Each year more than 200 million women and persons become pregnant. Estimates suggest that 216,500 of them are diagnosed with TB disease, increasing their risk of poor maternal and pregnancy outcomes, including mortality, miscarriage, pre-eclampsia/eclampsia, low birthweight, and premature birth. Immune changes that occur during pregnancy make both pregnancy and the postpartum period a time when people — particularly those living in high TB burden settings — are at an increased likelihood of TB. Despite this, pregnant and breastfeeding populations are excluded from most TB therapeutics and vaccine research. As a result, this group is unable to access the full benefits of recent scientific advancements in TB, including the newer short-course prevention and treatment regimens.

In October 2023, the SMART4TB Consortium, the IMPAACT Network, and the WHO Global Tuberculosis Programme co-convened a meeting to launch a consensus building process on the inclusion of pregnant and breastfeeding people in TB research to improve the TB treatment and prevention options available to them. In conjunction, SMART4TB convened a meeting for representatives of affected communities to develop their own consensus on inclusion. This initial meeting has been followed by a year-long process, composed of five working groups: pre-clinical, therapeutics, vaccines, surveillance and advocacy.

This session will highlight the role of advocacy in driving the inclusion of pregnant populations in research forward. It will feature perspectives of advocates who have engaged in the SMART4TB and WHO pregnancy consensus process from across regions with high TB burdens. Additionally, it will share perspective from TB researchers on how advocacy informs their work. Finally, the session will provide a framework for engaging community advocates to advance equity in research.

Requiring consensus: A survivor's firsthand experience of TB during pregnancy and the need for improved research inclusion

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Reaching consensus: Community stakeholder experience generating a community consensus for pregnancy and TB

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Harmonising consensus: Centering and elevating community voices in advocacy

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Advancing consensus: TB Representative Studies Rubric (TB RSR) to assessing and advocate for equity and representation in research

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Responding to consensus: A researcher's experience incorporating community feedback

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CCSS008 Empowering communities in public-private mix models for ending TB in India

Coordinator: Mohanambe Lingappa, TBPPM Learning Network (Secretariat at Institute of Public Health Bengaluru), India
Chair: Meena Putturaj, TBPPM Learning Network (secretariat at Institute of Public Health, Bengaluru), India
Chair: Mohanambe Lingappa, TBPPM Learning Network (Secretariat at Institute of Public Health Bengaluru), India

Introduction: Traditional methods often struggle to reach underserved communities, hindering access to effective TB diagnosis and treatment. Public-private Mix (PPM) have emerged as a promising strategy to revitalize TB ending efforts. Engaging communities in PPM models and fostering partnership with various stakeholders is essential for democratizing TB service delivery in India.
The TBPPM Learning Network, an online platform (Community of Practice) introduced the TBPPM compendium in 2023. This comprehensive resource showcases community engagement in PPM models in India. In this Community Connect session, we'll explore how four such innovative models are empowering communities to fight TB.

1. Roping informal providers for enhanced TB case detection: This model in Telangana equips informal healthcare providers (e.g family members, local traditional healers) with the skills and tools to diagnose TB thereby increasing detection rates within communities.

2. Bolstering community health workers in Bihar for TB care: This initiative aims to increase access, improve quality, and prevent TB through tuberculosis preventive treatment in communities vulnerable for TB. The capacity of Community Health Workers is bolstered to enable active case finding and patient accompaniment throughout the care cascade.

3. Leveraging mobile technology for empowering TB affected communities: This model implemented in Karnataka, Telangana, Bihar and Assam fosters community engagement through virtual support. Patients receive counselling and follow-ups remotely, improving treatment adherence and addressing knowledge gaps while respecting privacy.

4. Capacitating PwTB to navigate the complex TB care ecosystem: This is an innovative public private partnership model for engaging private practitioners in Chennai city. A core feature of this model is the concept of "Nakshatra Centres" in private hospitals which serve as "Centres of excellence for TB". A TB Nanban (Health Care Worker) at the Nakshatra Center empower health care seeking individuals to navigate the TB diagnostic and treatment ecosystem.

Format of the session:
- The session will be chaired/moderated by a TBPPM Learning Network representative.
- The chair will pose three critical questions concerning empowering communities in TB care to the audience using aha slides (an interactive ppt approach). The chair will summarize the results of the poll questions, introduces the session and invite speakers to present their models.
- Each speaker will present their respective model's experiences, challenges, and their critical reflection on the model.
- The moderator/chair will summarize key messages and pose two reflective questions sparking discussion with the audience before concluding the session.

Conclusion: Community engagement should not be treated as the means to accomplish the targets of national TB elimination programs, rather community engagement should be seen as an end. This is because of the mandate of the values of democracy in a country. The goal of this session is to inspire the development of innovative, sustainable solutions that position people at the center of the global fight against TB. By showcasing these diverse models, we aim to inspire and equip communities to play a more active role in ending TB.

REACH Nakshatra: A private health sector engagement initiative

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Engaging community health workers in increasing TB notifications and TPT coverage in rural India

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TB careline by the Karnataka Health Promotion Trust (KHPT)

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Roping Informal Private Providers for Enhanced TB Detection (RIPEND)

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CCSS009 Working with TB champions to mobilise domestic resources for TB

Coordinator: Mayowa Joel, Stop TB Partnership Nigeria
Chair: Mayowa Joel, Stop TB Partnership Nigeria
Chair: Queen Ogbuji-Ladipo, Association for Reproductive and Family Health (ARFH), Nigeria

Nigeria is one of the high-burden TB countries, ranking 1st in Africa and 6th globally. Despite the efforts of the government and all stakeholders, one of the major challenges in ending TB in Nigeria is inadequate resources especially from domestic sources.
Funding for TB control in Nigeria is largely donor dependent. The Global Fund to fight AIDS, TB and Malaria, the United States Agency for International Development (USAID), and Stop TB Partnership Geneva are the major funders for TB activities in Nigeria. In 2023, the total budget for TB was $388m USD. Funding from domestic sources was $23m (6.1%), External Sources including the Global Fund was $92m USD (23.9%), with funding gap of $272m USD (70%).
Advocacy for domestic resource mobilization for TB is one of the core mandates of Stop TB Partnership Nigeria. Through high-level advocacy and other innovative strategies, Stop TB Partnership Nigeria advocates to the government – executive and legislature (parliament) – at the federal and state (sub-national) levels for increased funding for TB especially through budgetary allocation. The Partnership also engages the private sector and other stakeholders especially high-level personalities including the State Governors, First Lady of Nigeria, Wives of State Governors, and Parliamentarians as Stop TB Champions to increase awareness among political elites and advocate for more resources for TB.
Since 2016, when the former First Lady of Nigeria was nominated as the Global Stop TB Champion, Stop TB Partnership Nigeria has been working with the First Lady of Nigeria to support advocacy for domestic resource mobilization in the country. This effort has been replicated at the State level with the Investiture of the wives of the State Governors as TB Champions. And despite, the change in government administration at the federal and state levels in 2023, Stop TB Partnership Nigeria has been able to replicate and sustain the engagement of the current First Lady and wives of State Governors as Stop TB Champions.
Stop TB Partnership Nigeria is also engaging the private sector by establishing the Private Sector Constituency and launched the Private Sector Strategy to End TB in Nigeria. With the support and leadership of the Honourable Coordinating Minister for Health and Social Welfare – Prof. Muhammed Ali Pate – the government and the private sector through a match funding mobilized $50m USD to end TB in Nigeria. The Partnership also identified leaders in the private sector of Nigeria as TB Champions to lead this effort.
?Though the advocacy for mobilizing domestic resources for TB in Nigeria had yielded some successes, funding for TB advocacy activities has been a major challenge as it is grossly in adequate; hence very few organizations are involved. Major sources of support for TB advocacy activities has been through the Challenge Facility for Civil Society (CFCS) of the Global Stop TB Partnership Geneva, USAID and recently through the Global Fund.
This session is an opportunity for other countries and organisations, especially National Stop TB Partnerships to learn from the experience of Stop TB Partnership Nigeria in advocating for increased political commitments and domestic resources through the engagement of TB Champions especially the First Lady, Wives of State Governors, parliamentarians, and private sector leaders. Speakers at this Session will include key actors at the global and national levels that supported Stop TB Partnership Nigeria to achieve some of its landmark achievements in its advocacy for increased domestic resource mobilization to end TB in Nigeria.
Stop TB Partnership Nigeria is a multi-stakeholder partnership advocating for policies and resources, and working in partnership with all stakeholders to end TB and other related diseases in Nigeria. The organization is one of the National Partnerships of Global Stop TB Partnership - a UN-hosted organisation based in Geneva, Switzerland.

Stop TB Partnership Nigeria: The paradigm shift in advocacy for domestic resource mobilisation for TB in Nigeria

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Comparative advantage of advocacy organisations in complementing the role of the national TB programme

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Support for TB advocacy and need for national stop TB partnerships

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Role of women leaders in ending TB: Case study of first ladies in Nigeria

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Critical role of advocacy in supporting the work of partners and other stakeholders in providing effective and sustainable TB services

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CCSS010 Breaking the silence: TB survivors share their mental health journeys

Coordinator: Vashita Madan, Survivors Against TB, India
Chair: Chapal Mehra, Survivors Against TB, India

Tuberculosis (TB) affected individuals face challenges that extend far beyond the physical impact of treatment, encompassing profound psychological struggles and significant mental health repercussions. TB diagnosis and treatment often lead to psychological distress, anxiety, depression, and even suicidal ideation.
These mental health issues, compounded by stigma and treatment side effects, can disrupt treatment continuity, mental health, and familial relations, leading to further self-stigma, social stigma, isolation, hopelessness, gender-based violence, and familial abuse. The long-term mental health effects can persist even after TB is cured and sometimes throughout lifetime.
Current TB care paradigms remain overmedicated and overlook these emotional and psychological dimensions. This panel aims to shine a light on these issues by listening to the voices of survivors who will share their personal experiences with mental health challenges during and after treatment.The discussion will explore various themes, including:

- Mental health disorders associated with TB
- Stigma and its impact on mental health
- The intersection of gender and mental health in TB
- The necessity of mental health support in TB recovery
- The resilience of survivors in the face of TB

We will also discuss the implications of TB-related mental health issues post-recovery, emphasising the role of community support, family, caregiving, public health policies, and the fight against stigma.
By amplifying the voices of survivors, this panel seeks to foster greater understanding and awareness among healthcare providers, policymakers, and the public. It aims to create a space for survivors to share their struggles and resilience, discuss the impact of stigma on their well-being, and highlight the importance of mental health support. The panel will advocate for more holistic and person-centred approaches to TB treatment and support, emphasising the integration of mental health services into TB care.

The hidden cost of TB: The psychological journey of TB diagnosis and treatment

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Affected community perspectives: How social isolation and stigma impact TB care

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Integrating mental healthcare into TB treatment programmes

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Healthcare professionals' perspectives on mental health support for people with TB

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COMMUNITY CONNECT SESSIONS: THURSDAY 14 NOVEMBER 2024

CCSA008 Harmonising research: Collaborative perspectives from community advisory groups and researchers

Coordinator: Nicola James, Independent consultant, United Kingdom
Chair: Madhava Sai Sivapuram, The Union, India
Chair: Nicola James, Independent consultant, United Kingdom

Community Advisory Groups (CAGs) play a pivotal role in tuberculosis (TB) research, representing community interests, fostering trust, and facilitating meaningful collaboration between researchers and those affected by TB. The shift towards meaningful engagement of people affected by TB as equal partners, empowering them to contribute as experts on local needs and lived experiences, is crucial at all stages of the research cycle. Despite these well-recognised benefits, the practical implementation of such collaborations remains inconsistent and challenging. This panel discussion aims to bridge the gap between CAGs and researchers and delve into the practicalities of effective partnerships for more inclusive and impactful research environments.

Strengthening the meaningful engagement of civil society and TB-affected local communities is a commitment made at the Second UN High-Level Meeting on TB in 2023, and reinforced in The Global Plan to End TB with CAGs recommended as an effective model. Moreover, in recent years, meaningful collaborations with civil society on drug development and policy change, has made new life-changing TB treatments and diagnostics more accessible to affected communities.

Nonetheless, challenges including stigma, service accessibility, and the adoption of innovative research persist, as does the lack of comprehensive, long-term approaches to community participation and the metrics to measure this. Hence, as the TB research landscape continues to advance, particularly with accelerated efforts towards developing new TB vaccines and treatments for key and vulnerable populations, these partnerships become even more crucial. CAGs provide a platform for open and consistent dialogue, strengthening relationships, building research literacy, and empowering people affected by TB to advocate for their interests and needs. This improves TB research and ultimately person-centered policies and healthcare delivery.

Featuring insights from expert panelists, including seasoned researchers and experienced CAG members who have successfully navigated these partnerships, this session aims to provide a roadmap for embedding community voices into the heart of TB research. Key discussion points will include strategies for establishing and maintaining robust CAGs, understanding active participation and strategic collaboration, and ensuring meaningful inclusion at every stage of the research process. The panel will highlight successful examples that have led to improved research outcomes, exploring how aligning research goals with community needs can enhance both scientific rigor and community trust.

Particularly relevant for researchers, public health professionals, and community representatives, this participatory session aims to gather diverse perspectives and generate rich dialogue with the audience. By promoting a deeper understanding of the benefits and challenges of effective researcher-CAG partnerships, we aim to advance the practice of collaborative TB research globally and deliver tangible benefits to communities affected by TB.

Community engagement in TB drug trials, impact of strong partnerships

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The UNITE4TB community advisory group: Real-world experience on TB drug development and clinical trials

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The Union's Community Advisory Panel (UCAP): Amplifying community voices in a collaborative global platform

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What can we learn from what exists and what still needs to be 'made' to improve collaborative TB research with affected communities?

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CCSA009 Targeted next-generation sequencing: Why should communities care?

Coordinator: Karishma Saran, FIND, Switzerland
Chair: Anita Suresh, FIND, Singapore, Singapore

A novel class of diagnostic technologies called targeted next generation sequencing (tNGS) can analyze the genes of the TB bacteria infecting a person and determine, in 1-2 days, which drugs are likely to work best. tNGS is a World Health Organization (WHO)-recommended diagnostic technology and compared with conventional culture-based tests that require up to eight weeks to identify resistance, these tools could significantly improve diagnosis and treatment success if implemented widely.
Targeted NGS can detect resistance to multiple drugs simultaneously including Bedaquiline, and has the potential to integrate new resistance profiles as they become known – critical to staying ahead of TB mutations.
The availability of NGS technologies, which can be used for many applications including monitoring and detection of several diseases, rapidly expanded during the COVID-19 pandemic – infrastructure that TB programs can now build on to improve care and reduce the spread of drug-resistant TB.
The session will provide a basic understanding of the role of tNGS in delivering universal access to drug susceptibility testing (DST). It will aim to answer unanswered questions regarding access to tNGS and the need to sensitize civil society and affected communities to the technology and new WHO guidance for improved TB DST alongside the new and improved treatment regimens.

Strategies to improve community understanding of tNGS

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Current status of tNGS implementation and challenges to its uptake

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Experience living through MDR-TB, and how access to tNGS can improve test and treat approaches

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CCSA010 "Beyond Cure": Interactive art and overlooked struggles - Engage in the post-TB journey

Coordinator: Fiona BUDGE, Americas TB Coalition, Indonesia
Chair: Fiona BUDGE, Americas TB Coalition, Indonesia
Chair: Trisasi Lestari, Vital Strategies, Jakarta, Indonesia

This session involves the following art forms related to people living with Post-Tuberculosis (PTB):
"Neural narratives: A collaborative canvas of PTB lives". A large outline of a brain with neurons extending from the brain is placed on one of the walls. Art materials, including colored markers, paint, brushes, glue, and pictures, will be made available and session participants will be invited to co-create this mural with people who live with PTB and collaboratively reflect on their experiences living with PTB.
"Stage of Survival: A theatrical reflection of life after TB treatment". A corner is set up with a small platform for acting. These theatrical sessions will, through theatre and dance, convey the emotional and personal depth of PTB experiences, maintaining a focus on the resilience and reality of life after TB treatment.
"Commitment Wall": On one wall a large paper is placed, where participants of the session are invited to write commitments, they are prepared to make to reduce the negative impacts encountered in people living with PTB. Commitments made will inform advocacy efforts of TB affected people and relevant PTB oriented organizations
"Beyond Cure" is an interactive art session where people who have been affected by TB convey the complexities of their PTB lives, which remain burdened by health challenges. Although officially *cured*, people still face residual disabilities, chronic anxiety, depression, and other long-term effects of TB and its treatments.
Of significant concern, for many people living with PTB, is the negative impact of side-effects of drugs used in TB treatment.
Furthermore, catastrophic costs incurred because of loss of work and medical expenses are crippling for many affected people and their families, causing significant disruption to lives. These impacts are far reaching and devastating on multiple fronts including, among others, mental health problems, hearing loss, visual impairments, and skin discoloration, often leading to discrimination, particularly in workplaces.
This session provides a platform for TB affected people now living with PTB to interact with health professionals, policymakers, and the broader public to convey the complexities of their lives post-treatment, challenging the conventional notion of what it means to be 'cured'.
Participants will leave with an enriched perspective into the complex realities faced by TB affected people, promoting greater empathy and action towards their ongoing needs.
The objective is to raise awareness and stimulate enthusiasm for the need to advocate for comprehensive PTB care policies to be integrated into TB programmes, to address long-term effects faced by people living with PTB and their significant others. The effects of living with PTB extend beyond the lives of people directly affected by TB as it has detrimental impacts on lives of families and communities, causing significant disruption to lives.

"Beyond Cure" interactive art and overlooked struggles: Engage in the post-TB journey

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"Beyond Cure" interactive art and overlooked struggles: Engage in the post-TB journey

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"Beyond Cure" interactive art and overlooked struggles: Engage in the post-TB journey

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"Beyond Cure" interactive art and overlooked struggles: Engage in the post-TB journey

Hanadi Hussien Taj Alsir[1] [1]Sudan.

CCSS011 Innovative models to bring new TB tools from the clinic to communities: The role of Product Development Partnerships

Coordinator: Shaun Palmer, IAVI, Netherlands
Chair: Robyn Waite, TB Alliance, Ottawa, Canada
Chair: Ganendra Kristandya, Global Health Strategies, Indonesia

Attention on new TB tools has seen a resurgence in recent years as efforts advance to develop and deliver the urgently needed new tools to end TB. Innovative science is bringing about next-generation drugs and diagnostics and the first wave of new TB vaccines in over a century.
New diagnostics – including rapid non-sputum tests, rapid drug resistance testing and sequencing – are a critical component of finding the many "missing" millions of people with TB who are not diagnosed or properly treated. Major breakthroughs in TB therapy for both latent and active TB and drug-resistant TB are also bringing us closer to a sustainable pipeline of drug regimens to effectively treat every person with TB. This is also a historic time for TB vaccine development, with more vaccines in development than ever before and several promising candidates in late-stage efficacy trials. Product Development Partnerships (PDPs), like TB Alliance, IAVI and FIND, are also working closely with civil society organizations and communities to inform access initiatives and drive demand for these urgently needed new tools.
The 2023 United Nations High-Level Meeting on TB (TBHLM) saw world leaders endorse global commitments to invest US$5 billion per year in TB research by 2027 as part of the End TB response, including a commitment to ensure access to the benefits of science. These commitments must be fulfilled if we are to secure the innovations and access pathways needed to ensure new TB tools are universally, affordably, and equitable accessible to all who need them. Attention is now turning to realizing these goals in alignment with the Global Plan to End TB 2023-2030.
PDPs play a unique role in this effort as part of a holistic response to develop an inventory of effective and accessible health technologies. The PDP model represents an evolving paradigm in the global health R&D space and has been a mainstay in global health innovation for almost three decades. PDPs continue to conduct world leading science while refining their approach to research and development, community engagement, and access. Civil society and affected communities are core to these partnerships and their shared mission to deliver equitably accessible health technologies.
This session will convene a panel of experts from FIND, IAVI, TB Alliance, and civil society to explore advances over the last 12 months in science, advocacy, and policy for new TB tools. Further, this session will reflect on best practices and explore what is needed for the field, including by PDPs, civil society, affected communities, funders, and decision makers, to realize the TBHLM commitments. Participants will have the opportunity to share their questions, concerns, and ideas with the panel toward greater collective engagement in TB R&D and access.

Advancing TB vaccines through licensure

Saif ul Hadi,[1] [1]India.

Innovating TB treatments to tackle drug resistance

Pietro Turilli,[1] [1]United States.

Next-generation diagnostics to find the missing millions

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Community action for new TB tools

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CCSS012 Increasing accountability for TB policy implementation in South Africa

Coordinator: Michelle Galloway, TB Proof, South Africa
Chair: Erika Mohr-Holland, Cape Town, South Africa

Background: TB is the leading cause of infectious death in South Africa, killing 54,000 people in 2022. The National Strategic Plan for HIV, TB, and STIs (2023-2028) and TB Recovery Plan outline key interventions to close TB care cascade gaps. However, the release of policies to scale up TB testing to all high-risk groups has not translated into these services being widely available at the clinic level. Civil society organizations (CSOs) collaborated with key stakeholders to develop an action plan to scale up TB testing as a priority at a pilot site in the Western Cape province of South Africa
Objective: During this panel discussion, speakers will share organizational experiences, lessons learned, and the impact of advocacy tactics used to close policy implementation gaps.
Results:
TB Proof will present outcomes of a community TB Imbizo and advocacy letters to secure political commitments for policy implementation. The TB Imbizo brought together 130 key stakeholders to review progress towards TB policy implementation at district-level. Civil society coordinated key asks in advance of the meeting to set collective advocacy asks with sustained advocacy pressure. An outcome of the TB Imbizo was commitment from Department of Health, Western Cape, to host monthly TB meetings at district-level to address bottlenecks in TB policy implementation and to increase TB testing.
TB Accountability SA will present on the provision of TB services within the accountability ecosystem for the provision of publicly funded health care system . Firstly in respect of the obligation to take reasonable measures to protect the right to health care particularly of high risk groups such as people living with TB (Political Accountability). Secondly to ensure that health care provision to high risk groups is prioritised in resource allocation processes at national and provincial levels (Financial Accountability). Lastly the implementation of TB policy is evaluated against performance against targets as set out in the National Strategic Plan for HIV, TB and STIs (NSP).
TB HIV Care will present some of the early results of OneImpact South Africa, an approach which aims to put people affected by TB at the centre of the TB response. This includes documenting some of the barriers to accessing compensation for miners and ex-miners with silicosis and/or TB in South Africa, and collaborative work with the Department of Health in the Western Cape after the TB Imbizo.
Lessons Learned and conclusion: Accountability for new TB policies can be effectively strengthened through civil society partnerships with the Department of Health. Focusing on district-level (pilot site) enabled relationship building, collective goal setting, and development of action plans with clear roles and responsibilities for partners to support TB policy implementation. Political commitments can be secured through collaborative events such as TB Imbizos to advance TB policy implementation at district-level.

Securing political commitments for TB policy implementation at a TB Imbizo in the Western Cape province of South Africa

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Community leader mentorship: A grassroots approach to TB advocacy and accountability

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Strengthening accountability for implementation of national TB strategies

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Implementing the OneImpact South Africa approach: Early success stories from community-led accountability

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CCSS014 Empowering TB survivors: Voices, needs, and action

Coordinator: Vashita Madan, Survivors Against TB, India
Chair: Vashita Madan, Survivors Against TB, India

The Panel will shed light on the unmet needs of TB patients during their treatment and recovery journey, aiming at amplifying the most important voices in this battle. TB survivors, through their stories, will discuss the various socio-economic and cultural challenges that they had to encounter during this journey, including but not limited to loss of income, social isolation, and lack of support. By sharing these experiences, the TB affected individuals can illustrate the importance of comprehensive, person-centred care that addresses their diverse needs.
Along with this, survivors will share their insights on the significance of survivor engagement in all stages of TB action, from research to policy formation and care delivery. They will discuss the barriers they encounter in participating in these processes and propose strategies for overcoming them. The panel will underscore the need for meaningful engagement that transcends tokenism, ensuring that the voices of those who are affected are heard and valued in shaping TB policies and programs.
By centring the voices and discussing the needs of the affected individuals and the actions that can lead the way forward, this panel aims to emphasise the importance of positioning survivors as active participants in the TB care landscape. This panel will serve as a platform for survivors to drive meaningful change, contributing to a more inclusive and effective approach to addressing TB on a global scale.

Why we must listen to survivors

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Unheard voice: A personal account of TB treatment and recovery

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My journey: Overcoming TB stigma and advocating for change

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Breaking the silence: How my TB experience inspired me to advocate for better care

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CCSS015 Carrying TB innovations to new heights: The adventures and learnings from donating portable X-ray technology combined with artificial intelligence to a remote mountainous community in Nepal

Coordinator: Jacob Creswell, Stop TB, Switzerland
Chair: Kinz Ul Eman, Dopasi Foundation, Islamabad, Pakistan
Chair: Jeanne Walter, MinXray, United States

In May of this year, speakers on this panel representing the Stop TB Partnership, MinXray, Qure.ai, and Project Data Sphere trekked through the Khumbu region of Nepal reaching Mount Everest Base Camp and Kala Patthar. They carried a portable X-ray machine equipped with artificial intelligence (AI) to raise awareness and demonstrate how new tools and technologies can reach and support remote and underserved communities.
In hard-to-reach places, imaging technology and the human resources to interpret images are extremely limited. Portable technology can help close this access gap, which was why throughout the trip the x-ray equipment was used to screen local community members, porters, and sherpas. The trek team also visited health facilities and spoke with local healthcare providers in the villages of Lukla, Namche Bazaar, and Pheriche to understand their diagnostic capacity and needs. The need for portable, and durable imaging equipment was repeated often, with capabilities of the x-ray technology operating without direct electricity and with the support of AI being greatly appreciated. Because the geography poses a significant barrier to accessing healthcare and technology, people who are sick or injured on the mountain typically must take a helicopter down to Kathmandu to get a proper diagnosis and treatment.
At the end of the journey, the equipment was ultimately donated to the Himalayan Rescue Association's (HRA) health facility in the village of Pheriche, which sits at an altitude of 4,250 meters. HRA provides services to more than 100,000 people annually in remote mountainous regions throughout Nepal. Access to a new portable X-ray device will go a long way in diagnosing illnesses and developing informed treatment plans in the community.
This health mission not only contributed to the fight against TB by supporting the Himalayan regions with new innovations where healthcare access is often hampered by geographic and economic barriers, it garnered serious attention and awareness for TB and access to healthcare. The "Carrying TB Innovations to New Heights" initiative and team successfully completed a mission to secure a Guinness World Record for taking an X-ray to the highest altitude ever, on Kala Patthar, above Everest Base Camp in Nepal at approximately 5,644 meters above sea level!
In this session you will hear about the trek experience and learn about how this X-ray and AI technology alongside the TB REACH grant mechanism are facilitating the diagnosis of people with TB in hard-to-reach communities. Each speaker will dig into the details of their respective contribution to developing and delivering TB innovations for early detection and comprehensive healthcare in isolated areas.

From Mount Everest and beyond: How TB REACH helps find people with TB and bring TB innovations to scale

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From Mount Everest and beyond: How MinXray portable machines reach and empower communities to diagnose TB where they are

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From Mount Everest and Beyond: How Qure.ai removes barriers to diagnosing TB with fast and accurate X-ray reporting

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From Mount Everest and Beyond: How Project Data Sphere is accelerating healthcare access by developing innovative AI solutions

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COMMUNITY CONNECT SESSIONS: FRIDAY 15 NOVEMBER 2024

CCSA011 Advocacy across borders: A case study of 1/4/6x24 Campaign's national, regional, and global approach to advocacy

Coordinator: Erin McConnell, TAG, United States
Chair: Jonathan Stillo, Wayne State University, Ferndale, United States

The 1/4/6x24 Campaign was launched in 2022 with the goal of ensuring everyone who needs them will have access to the best available TB prevention and treatment tools by the end of 2024. Specifically, the campaign calls on countries to adopt the newer, shorter, and safer 1/4/6 TB regimens: 1-month or once-weekly regimens for TB prevention (1HP, 3HP, & 3HR), 4-month regimens for treating drug-susceptible TB (4HPMZ & 4HRZE), and 6-month regimens for treating drug-resistant TB (6BPaL[M]). Further, the campaign underscores the need to put in place the full healthcare infrastructure of the '5 Ss' — stuff, staff, space, systems, and support — necessary to facilitate access and realize the full potential of the 1/4/6 regimens.

Community and civil society advocates are demanding access to the shorter, safer 1/4/6 regimens at the global, regional, and national levels, including by advocating for incorporation of the regimens and supportive diagnostics in their countries' funding requests to the Global Fund. Advocacy and accountability for the adoption and rollout of these regimens references country government commitments made at the UN High Level Meeting on TB in 2023, including to significantly increase investments in and expand access to the best available tools for prevention, diagnosis, and treatment. Advocates are also calling on market-shaping actors to invest in catalyzing uptake of the shorter, safer regimens and diagnostics by working with manufacturers to reduce prices and remove other barriers to access.
While progress has been made in advancing advocacy for the 1/4/6 regimens at the global level, major gaps remain. Advocates working at the regional and national levels are now mobilizing community and civil society organizations to engage with country governments to escalate accountability for fully rolling out the shorter, safer TB regimens to achieve 1/4/6x24.

This session will offer an overview on the progress towards 1/4/6x24 and explore next steps through the lens of regionally led Campaign advocacy. Participants will walk away with an understanding of what is required to meet the goals of 1/4/6x24 not just globally, but regionally and nationally, and avenues for continuing to push for greater access to shorter, safer TB regimens into 2025 and beyond.

The road ahead: A retrospective of 1/4/6x24 campaign successes and next steps in 2025 and beyond

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Access to essential TB treatment in EECA: Progress, barriers and next steps - A view from the community

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Mobilising communities and civil society in Asia-Pacific for 1/4/6x24, post 2023 health HLMs and beyond

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Community voices, government accountability: Ensuring Africa delivers on shorter TB regimens

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CCSS016 Community leadership is building power and driving #FindAllTB / #TreatAllTB / #PreventAllTB / #EndTB initiative in high TB burden countries

Coordinator: Shobha Shukla, CNS, India
Chair: Tariro Kutadza, TB People (Zimbabwe), Zimbabwe
Chair: Shobha Shukla, CNS, India

Unless we stop missing TB cases, we cannot end TB. That is why several TB survivors and affected communities came together to put the spotlight on: Treatment is prevention: Find all TB / treat all TB / prevent all TB / End TB

One of the key actions enshrined in the WHO Director General's flagship initiative to Find. Treat. All (first launched in 2018) is to replace microscopy with upfront rapid molecular diagnostic test by 2027, because microscopy underperforms in diagnosing TB, and thereby misses TB cases.
More importantly, the WHO initiative backed by the Stop TB Partnership and The Global Fund, calls for a people-centred and rights-based TB response, through community-led and gender-transformative interventions.

But the progress is way off the mark.

Early and accurate TB diagnosis is not only a critical gateway to TB care pathway, but also a public health and human rights imperative. It helps stop the spread of TB infection as well as reduces unnecessary human suffering and risk of untimely deaths due to TB.

Bringing "lab to the people" (and not people to the lab) is the first vital step towards finding TB. If we fail to do this, we will keep missing TB cases despite having the best of tools in the labs.

Also, we have to SCREEN EVERYONE for TB in high burden settings as a lot of people with TB are asymptomatic.

Additionally, we must ensure that the full cascade of TB care services is people centred.

TB survivors, affected communities and several other stakeholders came together on 3rd November 2023 to launch the Global Call to #FindAllTB / #TreatAllTB / #PreventAllTB / #EndTB. Two weeks later at the 2023 Union World Conference on Lung Health, The Union had endorsed the Global Call along with 500 other organisations and people from over 40 countries worldwide.
In December 2023 at Africa's largest AIDS conference (22nd ICASA) in Harare, Zimbabwe, TB People (Zimbabwe) led the AFRICA LAUNCH of the Global Call to #FindAllTB ? #TreatAllTB ? #PreventAllTB ? #EndTB.

At World Social Forum 2024 in February 2024, Global Call to #FindAllTB / #TreatAllTB / #PreventAllTB / #EndTB had organised a special session with Nepal's Health TV Online in Ministry of Heath and Population Nepal - which was the ONLY TB session at WSF.
In March 2024, we co-hosted the END TB DIALOGUES SUMMIT with over 700 participants worldwide who unequivocally called for finding all TB, treating all of them, and advance all TB prevention measures to STOP THE SPREAD.

In May 2024, The Global Call to #FindAllTB / #TreatAllTB / #PreventAllTB / #EndTB along with TB People (India), TB People (Zimbabwe) and CNS, with support from Molbio Diagnostics, co-hosted delegates from 34 countries including those from NTPs of Ministries of Health, other govt representatives, communities, media, private sector, and other stakeholders.
This session will launch a ROADMAP for 2024-2030 of people-centred ways to #FindAllTB / #TreatAllTB / #PreventAllTB

365 days since the launch of global call to find all TB

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Africa launch of call to find all TB: Experiences and learnings and way forward

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Screening everyone for TB with ultraportable x-rays and offering point-of-care molecular tests to those with presumptive TB

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Evidence of screening everyone in high-burden settings: Making an impact to find all TB, treat all and prevent all TB

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Local actions are critical to find all TB, treat all TB and prevent all TB (and reduce and address risk factors of TB)

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Reaching the homeless and migrant people with TB services: making a difference where its needed most

L Aarup,[1] [1]India.

CCSS017 Translating UNHLM commitments into reality

Coordinator: Dozia Joseph, Global Coalition of TB Advocates, New Delhi, India
Chair: Blessina Kumar, Global Coalition of TB Advocates, New Delhi, India

Despite being curable and preventable, Tuberculosis (TB) remains the leading infectious cause of death globally. The Sustainable Development Goals and the WHO End TB Strategy aim to end the TB pandemic by 2030. In September 2023, the United Nations (UN) General Assembly held a High-Level Meeting (HLM) on TB in New York, with Heads of State, Government representatives, and other stakeholders in attendance. This meeting resulted in an updated Political Declaration on Tuberculosis, reinforcing the commitment to end the global TB epidemic by 2030.
The declaration included ambitious targets for scaling up TB care and prevention services, emphasized equity and human rights principles, and outlined resource needs for both implementation and research.
This session will feature presentations from various stakeholders sharing their experiences on progress, best practices, challenges faced, and future needs to achieve the targets.
Following the presentations, a discussion will be held to explore how to effectively implement these commitments at the ground level.
Main Objective:
Objective Description:
1. Review Progress and Challenges: Assess the progress made towards the UNHLM targets in Sept 2023 – Sept 2024 and identify the challenges encountered.
2. Discuss Implementation Strategies: Deliberate on the strategies to implement the commitments made during the High-Level Meeting.
3. Identify Technical Assistance Needs: Pinpoint areas requiring additional technical support to meet the targets.
4. Reinforce Commitments and Urgency: Emphasize the urgency and reaffirm the commitment to achieving the targets.
5. Highlight the Role of Civil Society and Affected Communities: Underline the crucial role of civil society and communities affected by TB in the global effort to end the epidemic.
By reframing the commitments from the political declaration into actionable strategies, this session aims to foster a collaborative approach to ending TB by 2030.

Global perspective and WHO's commitments to ending TB

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Translating UNHLM commitments into national plans

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The role of Stop TB Partnership in achieving UNHLM TB targets

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UNHLM commitments: A reality check from the ground

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Civil society and community-based organisation perspective on UNHLM targets

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CCSS018 Gender and stigma factor in TB care: The lived realities of inequity and moving towards gender-responsive care

Coordinator: Vashita Madan, Survivors Against TB, India
Chair: Vashita Madan, Survivors Against TB, India

In low- and middle-income countries (LMICs), gender plays a critical role in health outcomes, particularly in TB care. This panel delves into the intersection of gender disparities and TB treatment, exploring challenges and solutions, highlighting strategies and emphasising the urgent need for gender-responsive care.

Through survivor narratives and lived experiences, the discussion will examine how different genders experience TB and its treatment, highlighting the unique challenges faced by women, transgender individuals, and marginalised genders in accessing TB care. Drawing insights from gender-responsive healthcare approaches in managing HIV in South Africa and South Asia, we will explore how these learnings can be applied to TB care to enhance gender responsiveness.

Critically analysing the shortcomings of TB care systems in LMICs, the panel will address issues such as the lack of access to gender-sensitive healthcare, stigma, and discrimination within the health system. Survivors from diverse gender backgrounds will share their lived experiences, shedding light on how gender-based discrimination acts as a barrier to accessing TB care. These narratives will explore the stigma, social and cultural barriers, and inadequate support systems that contribute to disparities in TB care outcomes.

This will be combined with health care stakeholders and experts as also gender specialists who can highlight some of the solutions and also global best practices to make care in TB and HIV more gender-responsive.

By centering the voices of TB survivors, the panel aims to promote inclusivity and and highlight the importance of tailored interventions and addressing social determinants of health to ensure gender responsiveness in TB.

Overall, the panel seeks to foster a deeper understanding of the impact of gender disparities in TB care and to advocate for strategies that improve health outcomes, promote equity, and enhance the quality of care in LMIC health systems. Strengthening gender-sensitive TB care is essential for creating a more inclusive and equitable healthcare system that meets the diverse needs of all individuals.

Unveiling disparities: Gender responsiveness in the Indian TB care system

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Voices of resilience: Survivor experiences of gender-based discrimination in TB care

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Breaking barriers: Gender-sensitive healthcare lessons from practice

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Towards inclusivity: Creating a roadmap for gender-responsive TB care in LMICs

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CCSS019 Climate change and TB: Community-driven solutions from the frontlines

Coordinator: Priyanka Aiyer, Global Fund Advocates Network, Delhi, India
Chair: Ani Hernasari, Yayasan Rekat Peduli Indonesia, Indonesia

As the world grapples with the dual crises of climate change and tuberculosis (TB), vulnerable populations in high-burden countries face heightened risks and barriers to accessing essential TB care and services. This session will explore the critical intersection of climate change and TB, highlighting community-driven solutions from South Africa, Indonesia, and Pakistan.
The indirect impacts of climate change—such as displacement, malnutrition, and interrupted healthcare access—significantly worsen the TB crisis. More frequent and severe natural disasters lead to massive displacements, creating overcrowded and unsanitary living conditions where TB can easily spread. Displaced individuals often face disrupted treatment, leading to prolonged infectious periods and increased risk of developing drug-resistant TB. Additionally, climate-driven food insecurity exacerbates malnutrition, making individuals more susceptible to TB infection.
In this session, community representatives from South Africa, Indonesia, and Pakistan will share their firsthand experiences and innovative approaches to addressing the TB-climate change nexus. Their insights will illuminate the challenges faced on the ground and showcase how grassroots advocacy and community-led initiatives are pivotal in mitigating these challenges.
This session will provide a platform for exchanging best practices and strategies that can be replicated in other high-burden TB settings. By focusing on community perspectives and solutions, it will emphasize the importance of local knowledge and leadership in overcoming the intertwined crises of climate change and TB. Participants will leave with a deeper understanding of how community-led advocacy and accountability frameworks can drive meaningful progress towards ending TB by 2030, even in the face of climate adversity.
Experience powerful stories of resilience and innovation, and to learn how communities are leading the charge in creating sustainable, climate-conscious TB care systems. Together, we can build a future where no one is left behind in the fight against TB and climate change.

Uniting against TB and climate change: A call to action ahead of the 8th Global Fund Replenishment

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Community-led responses to TB and climate change: Insights from Pakistan

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Weathering the storm: Perspectives on climate change from South Africa

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Innovative approaches to tackling TB and climate challenges: Insights from Indonesia

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CCSS023 Leadership in action: Political advocacy for TB prevention and care

Coordinator: Usman Lodhi, DOPASI Foundation, Pakistan
Chair: Suvanand Sahu, Stop TB Partnership, Switzerland
Chair: Syed Karam Shah, Stop TB Partnership, Pakistan

This session focuses on strategic policy implementation, advocacy initiatives, financial commitments, TB financing, and accountability frameworks essential to achieve the goal of ending TB by 2030. Representatives from various countries will share their national-level policies that have either advanced or impeded progress on TB control and discuss community-led advocacy programs, including the context post-United Nations High-Level Meeting (UNHLM). The session underscores the pivotal role of political advocacy in transforming TB care and control, drawing insights from global efforts and strategies.
Political advocacy has proven to be a game-changer in the global fight against TB. The World Health Organization (WHO) and the Stop TB Partnership emphasize the importance of political commitment in their Global Plan to End TB, which aims to reduce TB deaths by 90% and cut new cases by 80% by 2030. Engaging high-level political stakeholders is crucial for securing commitment and accountability for TB initiatives, as evidenced by success stories from various countries.
This session aims to provide a comprehensive understanding of the challenges and successes in political advocacy for TB, highlighting how strategic political engagement can lead to significant advancements in TB care.
The session will delve into the experiences of countries that have effectively engaged political leaders to drive TB control efforts, focusing on high-level advocacy and accountability frameworks. It will feature speakers who have successfully navigated the political landscape to advance TB care in their respective countries. These speakers will share their experiences, highlighting the strategies used to engage high-level political leaders, the challenges faced, and the outcomes achieved.

Engaging political leadership in TB prevention and care: The global experience

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Implementing the multi-sectoral accountability framework for TB: From inception to impact

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Securing increase domestic funding: High-level political engagement in Pakistan

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Transforming TB care through political advocacy and MAF implementation in Pakistan

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COMMUNITY CONNECT SESSIONS: SATURDAY 16 NOVEMBER 2024

CCSA012 Empowering communities to take charge: Building capacity for TB prevention and care

Coordinator: Vimbai Mlambo, Students And Youth Working on reproductive Health Action Team (SAYWHAT), Zimbabwe
Chair: Vimbai Mlambo, Students And Youth Working on reproductive Health Action Team (SAYWHAT), Zimbabwe

This interactive session, to be conducted by the Students And Youth Working on reproductive Health Action Team (SAYWHAT), aims to empower communities to take ownership of their health, particularly in the fight against tuberculosis (TB).
Guided by the principles of community engagement, mobilization, and advocacy, this session will equip participants with the knowledge, skills, and resources necessary to effectively prevent, diagnose, treat, and support people affected with TB.

Objectives:
1. To build the capacity of community members to identify and address local needs and challenges related to TB.
2. To strengthen community-led initiatives and mobilize resources for TB prevention and care.
3. To promote advocacy and policy change to address systemic barriers to TB prevention and care.
4. To facilitate collaboration and networking among community leaders, healthcare providers, and stakeholders.

Session Outline:
1. Introduction (5 minutes):
- Overview of the session and its objectives.
- Icebreaker activity to engage participants and establish a shared understanding of the importance of community empowerment in TB prevention and care.

2. Young People's Perspective: TB Experiences and Challenges (5 minutes)
- A TB Champion, a young person who is amongst SAYWHAT`s cohort of young people trained as TB Champion under the Stop TB Partnership grant being implemented in Zimbabwe, shares their personal experiences and challenges with TB to raise awareness and understanding of TB from a young people's perspective

3. Community Capacity Building (15 minutes):
- Presentation on the principles of community engagement, mobilization, and advocacy in TB prevention and care.
- Group discussions to identify local needs and challenges related to TB prevention and care.
- Brainstorming session to develop community-led initiatives and resource mobilization strategies.

4. Advocacy and Policy Change (15 minutes):
- Presentation on the role of advocacy and policy change in addressing systemic barriers to TB prevention and care.
- Case studies of successful advocacy initiatives and policy changes.
- Group discussions to develop advocacy plans and policy recommendations.

5. Conclusion and Way Forward (5 minutes):
- Recap of the session's key takeaways and outcomes.
- Call to action: Empowering communities to take charge of TB prevention and support.

Expected Outcomes:
1. Community members equipped with knowledge, skills, and resources to effectively prevent, diagnose, treat, and support people affected with TB.
2. Strengthened community-led initiatives and mobilized resources for TB prevention and care.
3. Advocacy plans and policy recommendations developed to address systemic barriers to TB prevention and care.
4. Established partnerships and resource sharing opportunities among community leaders, healthcare providers, and stakeholders.
Through community-led initiatives and empowering communities to take charge of their health, we can revolutionize the fight against TB and ensure universal access to equitable healthcare. Through community-led solutions and inclusive decision-making, we can bridge the gaps in healthcare systems, address the root causes of health inequities, and ultimately, eradicate TB.

Principles of community engagement, mobilisation, and advocacy in TB prevention and care

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Advocacy and policy change in addressing systemic barriers to TB prevention and care

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Young people's perspective: TB experiences and challenges

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CCSA013 Breaking barriers in TB for a people-centred, rights-based TB response

Chair: Blessina Kumar, Global Coalition of TB Advocates, New Delhi, India
Coordinator: Dozia Joseph, Global Coalition of TB Advocates, New Delhi, India

Tuberculosis (TB) remains the leading cause of death from infectious diseases worldwide. Despite the Sustainable Development Goals and the WHO End TB Strategy aim to eliminate TB by 2030, with a strong focus on equity and human rights, millions of people who become ill with TB are not diagnosed, and only about a third of those with drug-resistant TB have access to treatment.
TB is a disease of poverty and inequality. Human rights violations, TB-related stigma and discrimination, harmful laws, policies and practices, gender inequality and gender-based violence continue to keep people in need from gaining access to TB health services. Breaking these barriers requires a comprehensive and multi-sectoral approach, involving governments, civil society, the private sector, and affected communities. These barriers can be overcome by implementing and scaling up recognized, well-defined, evidence-based programs that should be part of every national TB programme. By eliminating these barriers, we can accelerate progress towards ending the TB epidemic.
In this session, we will explore the critical barriers faced by people affected by TB including key and vulnerable populations and propose solutions to overcome these challenges identifying practical and inclusive solutions.
The discussion will focus on the integration of human rights principles into TB care, the importance of tailored health services, and the need for sustained financial investment, ultimately contributing to the global effort to eradicate TB by 2030. The session will feature insights from experts working at the intersection of TB care, human rights, and public policy.

Importance of a people-centred, rights-based approach to TB care

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Role of civil society and legal community in breaking barriers in TB care

Timothy Wafula,[1] [1]Kenya.

Best practices, India: Breaking the barriers in TB care

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Combatting stigma

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Best practices, Europe: Breaking the barriers in TB care

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CCSS020 Experience of CSOs in Moldova, Uzbekistan and Tajikistan in supporting the introduction and roll-out of video-supported treatment (VST)

Coordinator: Cristina Celan, Center for Health Policies and Studies, Chisinau, Moldova
Chair: Cristina Celan, Center for Health Policies and Studies, Chisinau, Moldova
Chair: Inez de Kruijf-Carter, KNCV Tuberculosis Foundation, Netherlands

In 2019, PAS Center developed and started to roll-out in the Republic of Moldova a home-grown solution for video-supported treatment, I LIKE VST, to increase the adherence to TB treatment and implement a new model of TB care. As the VST roll-out started in 2020 during the Covid-19 pandemic, it was possible only with the support and involvement of CSOs, PAS Center and NGO AFI leading the process. PAS Center and AFI facilitate the patient enrolment through providing continuous support both to the health staff and to the patients. AFI and PAS Center ensured the allocation of the necessary human resources for the assistance of each TB cabinet and of the enrolled patients.
The above-mentioned NGOs are responsible for training of the medical staff, training of TB patients enrolled in VOT and providing uninterrupted technical support to medical staff during 2 months after the initial training, until the stage when TB services will be able to independently manage the processes. PAS Center also fulfills the role of VST system administrator together with NTP, for issuing access data to medical staff and patients, as well as providing the necessary technical support. The gradual transfer of knowledge to the NTP staff is currently taking place for the full transfer of the ownership.
Covid-19 has accelerated use of digital technologies for treatment adherence – in 2021, with the support of PAS Center, existing Moldovan tool was rapidly replicated for Tajikistan, Uzbekistan and Turkmenistan to respond to emerging care needs. This was done through small grant from PAS Center to CSOs within the regional TB project. Currently VST is a routine method of TB care in Moldova, Tajikistan and Uzbekistan as an alternative to traditional DOT to meet persons' individual needs. CSOs have been instrumental in advocating for the introduction of the new method, support in implementation, roll-out and scale-up.

VST in the Republic of Moldova: Digital adherence technology for a better programmatic approach on TB people-centred care implementation

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VST in Uzbekistan: The effective intersectoral cooperation for the benefit of people affected by TB

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Video-supported treatment (VST) to enhance treatment adherence in Tajikistan

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Ethics considerations in implementing digital adherence technology: A community perspective

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CCSS021 Designing interventions to address TB stigma and its impact on mental health

Coordinator: Ingrid Schoeman, TB Proof, Pretoria, South Africa
Chair: Erika Mohr-Holland, City of Cape Town, Cape Town, South Africa
Chair: Phumeza Tisile, TB Proof, South Africa

Background: Tuberculosis (TB) remains a leading cause of infectious death, with 10.6 million people getting sick in 2022. Stigma negatively impacts each stage of the TB cascade of care from health-seeking behaviour, engagement and retention in care, treatment completion, and post-TB well-being. The World Health Organization End TB strategy and declarations from the United Nations High- Level Meeting on TB highlight the importance of stigma reduction and commitment to the highest attainable standard of physical and mental health for all people with TB. This includes psychosocial support and social protection. However, data on stigma reduction interventions are limited and mental health remains inadequately prioritized for people with TB.
Objective: This session aims to:
- Provide an overview of TB-related stigma and how it impacts mental health.
- Share insights on enhanced treatment adherence counselling for people with TB.
- Share findings from TB stigma intervention co-development.
- Discuss the use of motivational interviewing as part of a peer support intervention.

Results and recommendations:
Dr. Sweetland will provide a brief overview of TB-related stigma, including a summary of current evidence regarding types of stigma, and its impacts on TB and mental health. She will then describe strategies to reduce stigma, including gender responsive interventions.
Ms. Ngozo, Chief Director of Strategic Health Programme (KwaZulu-Natal Department of Health, South Africa) will share programmatic experiences and lessons learned to address TB stigma to improve TB outcomes.
Dr. Nathavitharana, Assistant Professor of Medicine (Harvard Medical School) and Chair, TB Proof, will present findings from a pilot project in the Western Cape implementing motivational interviewing to counsel people diagnosed with TB to address anticipated, internal and enacted stigma.
Dr. Nathavitharana will share lessons learned about the co-development of the counselling intervention with peer research associates, securing buy-in from health workers through training on mental health screening and motivational interviewing, and advocacy for scaling up counselling interventions at district-level.
Mr Makanda, MDR-TB survivor and TB Advocacy Officer, will share experiences from the perspective as a peer research associate of conducting community-based participatory research co-led by TB survivors in the Western Cape, South Africa. He will discuss the importance of equitable involvement of community members in the development and piloting of a TB stigma intervention, and how TB survivors can co-design quality TB counselling interventions to address TB stigma as well as broader barriers to accessing care and completing treatment.

Overview of TB-related stigma and its impact on mental health

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Lessons learned from KwaZulu-Natal to improve treatment outcomes through support for people with TB

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Using mixed methods approaches and human-centred design to co-develop multi-level TB stigma intervention and use motivational interviewing to deliver peer counselling

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Engaging communities to be active participants in stigma intervention research and implementation of peer counselling in Khayelitsha, South Africa

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CCSS022 Shattering silos: The cross-disease network

Coordinator: Dozia Joseph, Global Coalition of TB Advocates, New Delhi, India
Chair: Mike Frick, Treatment Action Group (TAG), New York City, United States

In the global healthcare landscape, disease interventions and social causes often operate within isolated silos, leading to fragmented efforts and limited impact. To address this systemic challenge and catalyze transformative change, the Global Coalition of TB Advocates (GCTA), as part of its IMPAACT4TB initiative, formed TPT4India, a cross-disease network to accelerate TPT in India, in 2023.

TPT4India represents a paradigm shift in health advocacy, breaking down traditional barriers by uniting diverse stakeholders and communities to work together towards a common goal.
Comprising of TB champions, influential leaders from at-risk communities including people living with HIV (PLHIV), people who use drugs (PWUD), TB survivors, sex workers, LGBTQIA+ representatives and TPT implementers, this network embodies inclusivity and collaboration.

At its core, TPT4India has empowered its members through capacity building, knowledge exchange, and collective action. By fostering meaningful engagement and dialogue among stakeholders and communities who traditionally operate in separate spheres, the network has catalyzed cross-pollination of ideas, experiences, and best practices.
These empowered community members have taken the knowledge gained through TPT4India to build capacity of those within their respective communities.
The network's approach is rooted in the recognition that health outcomes are intricately linked to social determinants and community dynamics. By bridging gaps between disease interventions and social causes, TPT4India has created synergies that amplify advocacy efforts, drive policy change, challenge stigma, address treatment literacy barriers, and mobilize communities towards a shared vision of a TB free world.

By supporting and scaling up cross-disease networks like the GCTA initiative in India, we can transcend silos and create a more inclusive and impactful approach to health promotion and disease prevention.

The importance of shattering silos to catalyse transformative change in health advocacy

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Lessons learned as a member of TPT4India and how that has transformed their approach to disease intervention within the PLHIV community

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Lessons learned as a member of TPT4India and how that has transformed their approach to disease intervention within the TB community

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Cross Disease Network: Bringing Marginalised Communities Together

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The importance of scaling up cross-disease networks to promote health and disease prevention

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