ANNUAL REPORT

2024

The Mueller Health Foundation

“Our hope is to live in a world where every person has access to effective treatment options for infectious diseases and more and more infectious diseases ultimately become eradicated.”

The Mueller Health Foundation Vision

A LETTER FROM THE PRESIDENT

Dear Members of the TB Community,

As we reflect on 2024, I am both inspired by the progress we have made and reminded of the immense work still ahead in the fight against tuberculosis (TB). On behalf of The Mueller Health Foundation, I extend my deepest gratitude to our partners, collaborators, and every individual who has dedicated their time, energy, and passion to ending this devastating disease.

Despite global efforts, TB has unfortunately reclaimed its place as the leading infectious disease killer worldwide, claiming over 1.6 million lives annually. This year has reminded us that while advancements in diagnostics, treatment, and advocacy have made strides, the road to eradicating TB is long and fraught with challenges. Emerging health threats, deep-rooted systemic inequities, and lingering impacts from the COVID-19 pandemic have all underscored the urgency of maintaining TB as a global health priority.

In 2024, we saw the power of collective action across our community. Whether it was advancing research toward shorter drug-resistant TB treatment regimens or advocating for more robust funding at global and local levels, your commitment has been steadfast. These efforts have been especially critical in communities grappling with overlapping crises—conflict, poverty, and underfunded health systems—where TB's impact is most severe.

At the same time, there are gaps we must urgently address. Frailty among TB survivors, isolation during treatment, and the social determinants that fuel the TB epidemic—poverty, stigma, and lack of access to care—continue to limit recovery and perpetuate inequities. Our focus must include innovative approaches that not only treat TB but also support patients and survivors holistically.

The Mueller Health Foundation remains committed to fostering community-led solutions that put patients at the center. This year, we worked hand-in-hand with partners to expand drug-resistant TB community care models in India, create educational resources for high-burden migrant populations in New York City, and address challenges that patients with comorbidities such as diabetes and TB face. These projects remind us that sustainable change is possible when we listen to the voices of those most affected and empower them to lead.

Looking ahead to 2025, we must amplify our collective voice to demand greater accountability and investment from governments, funders, and other stakeholders. Only by prioritizing equitable access to life-saving care and addressing the structural barriers perpetuating TB will we achieve the global goals of TB elimination.

Thank you for your unwavering dedication to the fight against TB. Together, we have the power to turn the tide against this disease, ensuring that no one is left behind. I am confident that with resilience, collaboration, and a shared vision, we can make 2025 a year of transformative progress.

With gratitude and solidarity,

Prof. Dr. Peter Mueller
Founder and President
The Mueller Health Foundation

MHF 2024 HIGHLIGHTS IN NUMBERS

MHF is ranked **No. 11** globally among the 29 private philanthropies that have contributed funds across the TB fields in basic science, diagnostics, drugs, vaccines, and research infrastructure in 2024. (1)

MHF was **one of only eight** philanthropic funders globally that have contributed funds directly toward TB Drug Research and Development efforts in 2024. (1)

MHF Investments Made

$686,987 USD
Distributed in New Grant Funds in 2024

17.5% increase in MHF grant funds spent from 2023

Grant Funds Spent by Strategic Pillar in 2024

$499,603 USD

I. Clinical Research and Science

$ 25,000 USD

II. Data and Technology

$162,384 USD

III. Education and Awareness

(1) Based on estimates provided in the report titled "Tuberculosis Research Funding Trends, 2005–2024" published by the Stop TB Partnership and Treatment Action Group (TAG) in December 2024.

Creating Awareness and Telling Stories

We at The Mueller Health Foundation strongly believe in giving a voice to those affected by tuberculosis. Throughout 2024, thanks to a great repository of stories collected by the Centers for Disease Control (CDC) and APOPO HeroRats, we have made great efforts to amplify patient voices by including these stories in our monthly newsletter as well as posting weekly videos and inspirational lessons learned on our social media channels from those directly affected by TB.

In 2024, we have shared **64** unique stories of TB patients and survivors through weekly social media posts and in our monthly newsletter.

Picture Credit: CDC TB Personal Stories, APOPO HeroRats

Our Hero Rat: Carolina

For the past three years, The Mueller Health Foundation has proudly sponsored one of the tiniest and most extraordinary TB heroes, Carolina, a HeroRat trained by the APOPO non-profit organization, which operates across Africa. Carolina has played a critical role in the fight against tuberculosis by assisting her handlers in detecting TB in sputum samples from patients. These samples are heat-treated to ensure the safety of both the HeroRats and their trainers. Carolina worked alongside 10 other HeroRats at a TB testing facility in Tanzania, with additional HeroRat teams operating in Mozambique and Ethiopia.

At the end of October, Carolina began her well-earned retirement after years of dedicated service. We are immensely grateful for her hard work and the innovative contributions she made to TB care and diagnosis. Below is a snapshot of Carolina's incredible accomplishments throughout her career.

RETIRED

NAME: CAROLINA

GENDER: FEMALE

SCIENTIFIC NAME: CRICETOMYS ANSROGEI

DATE OF BIRTH: SEPTEMBER 5, 2016

OCCUPATION: TUBERCULOSIS DETECTION RAT

LOCATION: TANZANIA

FAVORITE FOOD: PEANUTS

FAVORITE PASTIME: GROOMING

MEASUREMENT: 64 CM

WEIGHT: 4.9 POUNDS

PERSONALITY: CUTE AND HARDWORKING

Carolina and her trainer Ezekiel

Carolina's Retirement Party

Carolina's Impact Over Her 6.8 Year Career

3,126
New TB-positive cases Carolina identified that had initially been missed by health clinics

208,235
Total samples screened by Carolina

86.3%
The overall detection accuracy rate Carolina achieved over her career.

Picture and Impact Credit: APOPO HeroRats

Our Hero Rat: Tamasha

This year, we are thrilled to welcome Tamasha to our team. Tamasha is an inspiring HeroRat with an exceptional dedication to her work. In November 2024, she proudly stepped into the role of our adopted HeroRat, succeeding her remarkable colleague, Carolina. Just as skilled in detecting tuberculosis, Tamasha is a wonder to watch as she moves effortlessly from plate to plate, diligently searching for signs of TB in the samples.

Every morning, this little expert starts her day with enthusiasm. In a focused 20-minute session, Tamasha uses her incredible sense of smell to examine 100 heat-inactivated sputum samples for TB. When she detects TB, she signals her find by holding her nose over the hole above the sputum sample plate for three seconds, earning herself a well-deserved treat.

Together with her HeroRat colleagues, Tamasha is making a meaningful impact on TB diagnosis, ensuring that patients receive accurate and timely results. Take a look at the details of her and her colleagues' incredible work below!

ACTIVE

NAME: TAMASHA

GENDER: FEMALE

SCIENTIFIC NAME: CRICETOMYS ANSROGEI

DATE OF BIRTH: DECEMBER 19, 2022

OCCUPATION: TUBERCULOSIS DETECTION RAT

LOCATION: TANZANIA

FAVORITE FOOD: AVOCADO, PEANUTS

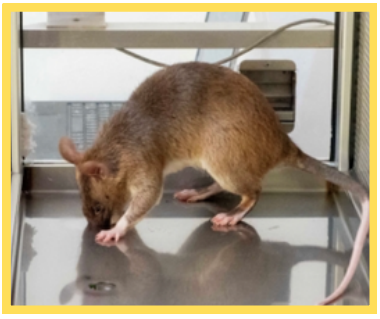
FAVORITE PASTIME: JUMPING, CLIMBING

MEASUREMENT: 60.2 CM

WEIGHT: 4.8 POUNDS

PERSONALITY: PLAYFUL AND ENTHUSIASTIC

Tamasha and her trainer Priscus



Tamasha sniffing TB samples

Impact of All HeroRats

30,869
Additional TB cases detected by HeroRats

985,201
Total samples screened by HeroRats

311,709
Total potential TB infections halted by HeroRats by preventing further spread

Picture and Impact Credit: APOPO HeroRats

Community Building: Social Media

At MHF, we are always eager to showcase our work and the work of our grantees and partners across a variety of different outlets. We have worked hard this year to expand our followers and to create an engaged online community across the globe to help us increase awareness for TB and infectious diseases.

FOLLOWERS

>1,000 is the number of new followers that we have gained in 2024 across our social media channels.

Across our four platforms, this expands our total number of followers to more than **>2,600**

NEWS AND TOPICS

NEWS

Throughout the year, we provided our followers with a summary of all the latest TB news in our monthly newsletter **The Monthly Dose**.

Knowledge Sharing Across Six Different Topic Areas

- Monthly TB Statistics
- Bi-Monthly Fun Fact About Tuberculosis
- Monthly Update on Our TB-Sniffing Rat Carolina
- Weekly Patient Stories
- Scientific Publication of the Month
- Bi-Monthly Inspirational Quotes for Patients

POSTS

496 Unique posts were created by MHF throughout 2024 across our social media accounts.

>20,000 is the number of impressions on social media that were made by our MHF post throughout 2024.

On average, our posts on social media throughout the year have a **37.5% higher engagement rate** than the current non-profit industry average. MHF is ranked consistently in the top performing organizations on social media based on posting frequency, follower engagement, and increase in followers. (2)

(2) Analysis and ranking is based on Hootsuite's Social Score and Annual Analytics Report

Community Building: Educational Materials

At The Mueller Health Foundation, our mission is deeply rooted in creating and supporting communities, especially among vulnerable populations. This year, we were proud to work alongside the TB-Free NYC Coalition, fostering partnerships, collaboration, and the development of impactful resources to raise awareness about tuberculosis in New York City. Through this collaboration, we aim to ensure that resources and initiatives are inclusive, empowering, and accessible to those who need them most.

OUTCOMES

COALITION FOR A TB-FREE NEW YORK

In 2024, our Executive Director proudly served as the co-lead for the TB-Free NYC Coalition Education Group, a dynamic team of 20 members representing diverse sectors—including physicians, public health professionals, TB survivors, and community organizations.

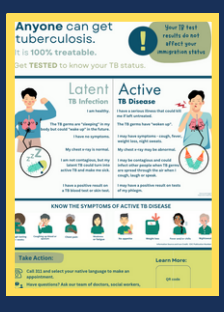
Over a span of four months, this collaborative group worked tirelessly to develop educational materials tailored for newly arrived migrants in New York City.

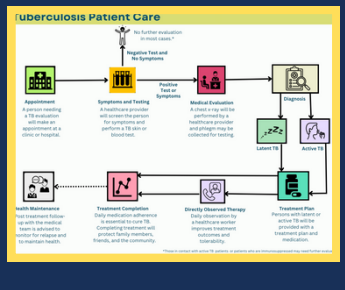
The goal was clear: Create materials that are simple, visually engaging, and offer messages of hope and comfort to those navigating a new environment while facing potential health concerns.

The result? Three impactful resources that are already making a difference:

1. **TB 101:** A user-friendly guide offering basic information on TB and latent TB infection, enriched with survivor stories to inspire understanding and resilience.
2. **Risk Assessment Questionnaire:** A practical tool designed to help identify individuals at potential risk for TB through lifestyle and exposure-related questions.
3. **TB Patient Care Cascade:** A visually engaging diagram that demystifies the journey from testing to treatment completion, providing patients with clarity and reassurance about what to expect.

These materials exemplify the power of collaboration and patient-centered design. By addressing the unique needs of new arrivals in New York City, they aim to foster understanding, reduce stigma, and empower individuals to take charge of their health. Together, we are building a stronger, more informed community in the fight against TB in New York City.





Community Building: On-Going Projects

Given the success of the educational materials created for new arrivals in New York City, MHF continues to lead the Education Workgroup for the TB-Free NYC coalition. Ongoing projects that kicked off at the end of 2024 are showcased below.

COALITION FOR A TB-FREE NEW YORK

We are proud to continue leading the Education Workgroup for TB-Free NYC, building on the success of our past efforts with exciting new projects aimed at supporting local communities and raising awareness about tuberculosis. The Education Workgroup has embarked on creating additional impactful materials to address critical challenges, including stigma and access to care.

By fostering collaboration and delivering practical, evidence-based tools, the Education Workgroup continues to empower communities, combat stigma, and strengthen the fight against TB in New York City.

One of our key initiatives is developing a short, visually engaging report designed to reduce TB-related stigma by dispelling common myths and misconceptions about the disease. Targeted at the general population, this report provides evidence-based information to replace fear and misinformation with accurate, accessible facts, fostering understanding and empathy.

BREAK the STIGMA

Recognizing the dynamic political environment and its potential impact on healthcare access, the Education Workgroup is also creating an updated resource list for those seeking TB testing and treatment in New York City. This resource aims to ensure that individuals can easily connect with available services, minimizing disruptions and bridging gaps in care.

World TB Day 2024: MHF in Times Square

On World TB Day in March 2024, The Mueller Health Foundation took to one of the world's most iconic locations—Times Square—to shine a spotlight on tuberculosis. The video created by MHF highlighted key facts about TB, dispelled myths, and inspired action to combat the world's leading infectious disease killer. This impactful initiative underscored our commitment to raising awareness and fostering global solidarity in the fight against TB.

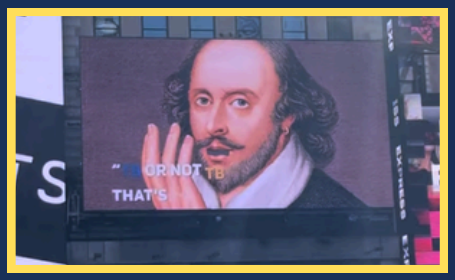
Displaying a 30-second video twice every hour for 24 hours in Times Square can significantly raise awareness for tuberculosis:

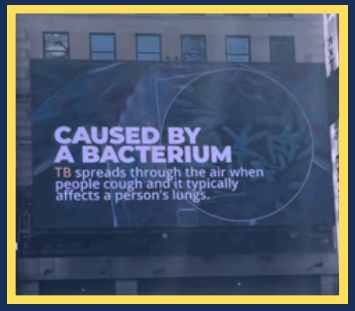
Times Square is one of the world's most iconic and bustling locations, with an average daily pedestrian count of approximately 286,000* people.

Additionally, over 243,000* individuals post about Times Square on social media daily, amplifying the reach of any displayed content.

By airing our video 48 times throughout the day, our awareness campaign achieved substantial exposure, potentially reaching hundreds of thousands of pedestrians and countless more through social media sharing. This level of visibility can play a crucial role in educating the public about tuberculosis.

Moreover, the continuous display ensured that the message reached a diverse audience, including both tourists and locals, thereby broadening the impact of the awareness campaign.





NEW YORK

*Estimates based on data from Outfront Media.

TBConnect Blockchain Application

The Mueller Health Foundation is excited about the creation of its Ethereum blockchain application TBConnect, which aims to create a global network of key stakeholders in the field of tuberculosis to allow for improved information exchange and collaboration. TBConnect is designed from the ground up to foster an open environment where ideas can flow freely between all stakeholders. This is achieved by onboarding all parties on a unified platform, including but not limited to scientists and researchers, practitioners and healthcare workers, non-profits and government bodies, lateral partners and organizations, and the wider public. The novel portal empowers all parties with an open platform where they can freely voice their opinions, network with a diverse group of stakeholders, and disseminate their ideas and share information far and wide.

Key Updates

The MHF team, together with the developer, streamlined the backend systems of TBConnect to be more efficient and to improve operating speed and functionality.

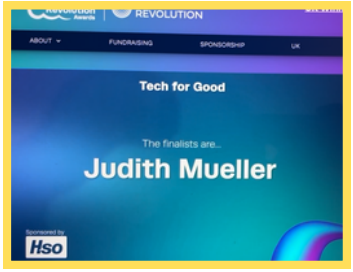
Together with our partners the MHF team continues to build out the body of knowledge on the TBConnect Blockchain Application. TBConnect currently hosts more than 175 documents related to TB awareness and education.

Compared to 2023, the team at MHF has tripled the number of documents housed in the TBConnect Blockchain Application in 2024.

Finalist in the Digital Revolution Awards

Owing to its revolutionary, first-of-its-kind approach in the field of tuberculosis, TBConnect is already gaining wide recognition. While still in its infancy, the next-generation portal was selected from more than 700 submissions and made it into the top 5 finalists for the Digital Revolution Award in the Tech for Good category.

Finalist in the Digital Revolution Award



HIGHLIGHTS FROM OUR GRANTEES

REACH

The Mueller Health Foundation has partnered with the Resource Group for Education and Advocacy for Community Health (REACH) on the creation and implementation of two major projects focused on providing a community care model for people with drug-resistant tuberculosis (DRTB) as well as a CARE Connect community care model that focuses on TB patients with diabetes. India currently has the highest number of people with TB and DRTB in the world, comprising almost a quarter of the total global burden. We at the Mueller Health Foundation believe in a bottom-up approach that incorporates community needs at its core. When effectively implemented, community-based care has been shown to improve adherence and treatment success rates, reduce loss to follow-up, and minimize delays. Community care models and a more holistic and patient-centered approach can also help to address limitations of facility-based interventions, such as limited mobility of patients and high costs associated with attending regular visits. Community care models also have broader applicability, not only in India but in the rest of the world, and MHF has been in active dialogue with public health agencies across the United States to share findings and lessons learned from this project.

REACH - Overview of Key Projects

DRTB Community Care Model

The key objective of the two-year project was to provide comprehensive, equitable, stigma-free, quality care, treatment, and support services for DRTB patients through integrated approaches that combine government, private sector, and community engagement. The specific objectives of the project were:

- **To design and demonstrate a community care model for people with DRTB in Tamil Nadu, India by adopting an evidence-based participatory approach.**
- **To develop a package of person-centered services that can improve the physical, mental, social, and economic well-being of people with DR TB.**

The project has been extended beyond the initial two-year implementation and will be expanded to address the needs of DRTB patients post-treatment completion to facilitate reintegration into the workforce and daily life.

CARE Connect Community Care Model for TB Patients with Diabetes

The CARE Connect project aims to redefine the co-management of TB and diabetes over a four-year period in the Chennai metropolitan area, with the goal of improving TB treatment outcomes and delivering comprehensive integrated healthcare solutions. The specific objectives of the CARE Connect project are:

- **To develop the CARE Connect model by comprehensively assessing the clinical, social, economic, and psychosocial determinants impacting individuals with TB and diabetes. (Phase-1 launched in July 2024).**
- **To implement the CARE Connect model aimed at addressing the clinical management of TB and diabetes and improving TB treatment outcomes and diabetes treatment adherence. (Phase-2).**
- **To integrate socio-behavioral dimensions within the CARE Connect model and enhance interventions for people with TB and diabetes (Phase-3).**
- **To facilitate knowledge transfer of best practices from the CARE Connect model by establishing knowledge satellites in select districts and states in the country (Phase-3).**

REACH - DRTB Community Care Model

The Mueller Health Foundation, in partnership with REACH, is dedicated to placing the needs of patients at the heart of its efforts. Through the DRTB Community Care model, MHF emphasizes a comprehensive, patient-centered approach, delivering holistic services that support both patients and their families. As one of the few global funders consistently implementing such programs, MHF demonstrates an unwavering commitment to a patient-first philosophy, ensuring compassionate and effective care.

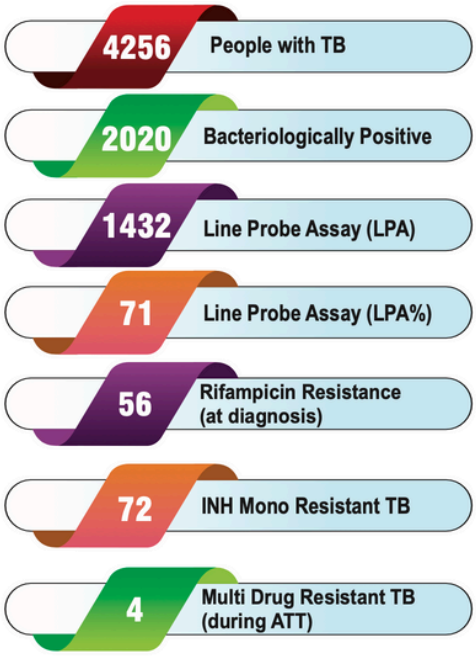
Patient-Centered Care Support Services

A patient-centric approach is considered to be the key to delivering high-quality healthcare. TB programs are now increasingly adopting newer strategies by engaging with the local communities to strengthen patient-centric approaches. Care and support services need to be individualized for each person with TB in health care settings, prioritizing needs according to their socio-economic status. While diagnosis and treatment are vital factors for a person with DRTB, assessing the individual, family, and social environment becomes critical to ensure a continuum of care during the treatment period. Integrated care and support can improve patient experience and treatment outcomes, ensuring better outcomes and reducing spread in the community. REACH provides comprehensive care services through the following approaches:

REACH - DRTB Community Care Model
Highlights in Numbers

Following an intensive six-month design phase, the DRTB Community Care Model was launched in Tamil Nadu and successfully implemented between January 2023 and June 2024. The implementation phase brought significant milestones, with key highlights presented below. Building on this success, the project has been extended for another four years, now expanding to include vital post-treatment support. This new phase aims to empower patients who have completed DRTB treatment, helping them reintegrate into daily life and rejoin the workforce with confidence.

KEY HIGHLIGHTS



SERVICES PROVIDED

TREATMENT OUTCOMES

TREATMENT STATUS OF PWDR TB (N=119)

Outcome	No	%
Completed Treatment	65	55
Treatment Failure	4	3
Lost to Follow Up	2	2
Died	5	4
Currently On Treatment	43	36

SUPPORT GROUPS

Support group meetings provided a platform for patients with DRTB and their families. The sessions included education on DRTB, sharing personal experiences, clarifying treatment-related doubts, addressing concerns about adverse drug reactions, sharing coping mechanisms, and offering emotional support and motivation. Between January 2023 and June 2024:

14 Support Group meetings were held

73 Individuals benefited from the support groups, including **40** People with DRTB and **33** family members

REACH - DRTB Community Care Model
Key Learnings

The implementation of the DRTB Community Care Model brought invaluable insights into addressing the complex needs of patients and improving treatment outcomes. This model emphasized a patient-centric approach, streamlining processes, building trust, and fostering collaboration among stakeholders. From advocacy and diagnosis to providing comprehensive care packages and nutritional support, each element of the program contributed to better DRTB management. Below are the key learnings that highlight the transformative impact of this innovative approach.

KEY LEARNINGS

Advocacy for DRTB care: Sensitizing the referring doctors about the facilities at Government tertiary centers increased referrals for DRTB care.

Facilitating DRTB Diagnosis: A dedicated follow-up process improved LPA testing for confirmation of DRTB, and early treatment initiation.

Facilitating referral process: A “green channel” for admission to the tertiary centers simplified the complex process for treatment initiation.

Care package for DRTB: A comprehensive care package was provided to the PwDRTB* to facilitate diagnosis and treatment.

Dedicated DRTB Coordinators: Trained DRTB coordinators motivated people with TB to seek timely care at DRTB tertiary centers.

Person-Centric Approach: Dedicated staff provided care with trust, dignity, and compassion, alleviating the fear of DRTB.

Nutritional Support: Protein-rich packages were given to PwDRTB* to supplement their nutritional needs during DRTB treatment.

Support Group Meetings: Provided a platform for knowledge and experience sharing about DRTB thus improving the coping mechanism for DRTB management.

Communication Materials: Reference materials specially designed for PwDRTB* helped in understanding the disease and reducing stigma.

Stakeholder Involvement: Active involvement of various partners- physicians, health care staff TB Nanbans, and community volunteers improved DRTB management.

Sharing Learnings: A landscape assessment of DRTB care in India and the patient-centric community care model was shared with all stakeholders, enhancing understanding of DRTB care.

*PWDRTB: PEOPLE WITH DRUG RESISTANT TB

REACH - DRTB Community Care Model

Patient Feedback

We have compiled feedback from people with DRTB and their family members gathered during interactions at Nakshatra centres and support group meetings. This highlights the personal struggles and challenges faced by those battling the disease and offers invaluable insights for a comprehensive understanding of the problem. Listening to the voices of those affected by DRTB helps us promote a healthier, more inclusive society.

“Having the support of a health care worker during TB treatment is very important. When I got to know my diagnosis, I felt my life was over. Though I was educated, I was ignorant about TB. In those dark days, it was the REACH staff who motivated me and gave me hope.”

"Facing the choice between my drinking habit and my life following counseling for DRTB, I realized what truly mattered. Prioritizing my health, I embarked on the treatment journey despite the terrible challenges. Today I have completed my treatment, stopped alcohol and am living a happy life with my family.”

“The support group meetings provided information which was very useful to me. While I received the same messages earlier during the care-seeking process, this was helpful due to the type of communication that I received.”

“Helping us navigate through the unfamiliar departments of the hospital, reassuring us at every step, making us feel comfortable and explaining the process of care in simple language was the most important care service that we received. In those painful situations of life, we could feel and experience “hope” that the DRTB coordinator provided for us to walk through successfully.”

"While these services may seem simple to some, for individuals like me going through DRTB, it means everything."

“I had to face a loss of pay due to not being able to go to my job during my illness. The amount of money was very helpful for me to manage the expenses of travel and food. I will never be able to forget the timely help I received”.

“I suffered from many severe adverse side effects due to the DRTB medication and was often hospitalized. There was good care from all the doctors and nurses at the tertiary care centers. The DRTB coordinator visited me during this time, and now, when I look back, I really appreciate their coming in to see me. It was the simplest action, but having someone to check on you gave me the strength to overcome my difficult times.”

REACH - CARE Connect Community Care Model

The CARE Connect Project, a four-year collaboration between MHF and REACH, aims to revolutionize TB and diabetes co-management using the Triple-A approach: Access to early diagnosis, access to quality treatment, and access to health education. Launched in July 2024, Phase 1 focuses on developing the CARE Connect model through a comprehensive assessment of the clinical, social, economic, and psychosocial factors impacting individuals with TB and diabetes. This phase includes a landscape review of community-based care models and a 360-degree analysis to identify gaps and challenges, laying the foundation for impactful, patient-centered healthcare interventions.

KEY ACTIVITIES - PHASE 1

KEY ACTIVITIES FOR PHASE 1:

1. Rapid Assessment of Tuberculosis and Diabetes Landscape in India
There has not been a systematic assessment of community care models for people with tuberculosis and diabetes, in public and private settings in India. The objective of this rapid assessment is two-fold:

- To identify, map, and consolidate existing approaches to tuberculosis and diabetes in India.
- To understand and document the experience of tuberculosis and diabetes care services in India.

2.Comprehensive 360-degree Assessment
A detailed protocol will be developed for this assessment in order to comprehensively understand the interplay between these disease conditions and optimize their management. Through a multidimensional approach, the assessment will determine various facets including clinical, economic, behavioral, and psychosocial factors affecting tuberculosis and diabetes groups. Utilizing qualitative and quantitative methodologies, data will be collected from a range of stakeholders to capture a holistic view of the challenges faced by people with both diseases.

3. Constitution of Technical Advisory Group
A Technical Advisory Group (TAG) of experts has been created to obtain insights, guidance, and expert opinions at every phase of the project roll-out. The TAG will include TB Experts, Diabetologists, People with TB and Diabetes, and Public Health Specialists. This group will review the findings of the assessment conducted among people with TB and diabetes and private practitioners. Discussions will be held to identify potential solutions, which will be included in the CARE Connect Model. Based on previous experience, TAG could play a key role in creating champions and advocates for TB-DM comprehensive care.

4. Development of Standard Operating Procedures (SOP)
An SOP (Standard Operating Procedure) will be developed in accordance with the findings from the assessment. This will help to ensure standardized guidelines for the diagnosis, treatment, and management of people with TB and diabetes. The SOP will provide detailed information on interventions including support for drug adherence, regular glucose monitoring, reminders for follow-up consultations, counseling on proper nutrition, regular exercise, tracking lifestyle modifications, and counseling on substance use.

5. Development of Module on Caregivers Training
The findings from the assessment will also help in the development of a caregiver's module. This module will focus on how caregivers can support and guide a person with tuberculosis and diabetes to adhere to the treatment regimens. This training will cover a range of topics, including signs and symptoms of diabetes and other risk factors such as hypertension, malnutrition, and substance use. The training will also emphasize the importance of patient support, promoting adherence to medication, dietary/ lifestyle changes, and addressing the psychosocial needs of people with diabetes and tuberculosis.

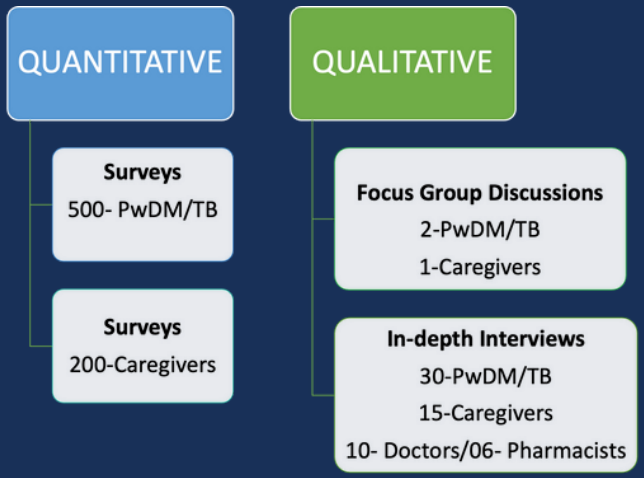
REACH - CARE Connect Community Care Model Needs Assessment Mixed Methods Study

As part of 360-degree assessement for the CARE Connect Project, a mixed-methods study will delve into the lived experiences of people managing both TB and diabetes, uncovering the barriers and challenges they face. By exploring the critical role of caregivers and understanding the unique needs of those affected, this study aims to inform patient-centric interventions that not only address these challenges but also improve the quality of life for patients and their families. Insights gained will shape innovative solutions to bridge gaps in care and provide holistic support.

The Key Objectives of the Mixed Methods Study

- Comprehensive Assessment of People with TB and Diabetes (DM)
- Understand the Lived Experiences of People with TB and DM
- Identify Barriers and Challenges in TB and DM
- Role of Caregivers in the Management of TB and DM
- Disease Management Practices in Health System

STUDY STRUCTURE



STUDY ELEMENTS

Questionnaires

- FGD Guide-Caregivers
- FGD Guide-PwDM/TB
- IDI Guide- Caregivers
- IDI Guide- PwDM/TB
- IDI Guide-Health Care Providers
- IDI Guide- Pharmacists
- Survey- PwDM/TB
- Survey- Caregivers

Consent Forms

- ❑ Participant Consent form-FGD-Caregivers
- ❑ Participant Consent form-FGD- PwDM/TB
- ❑ Participant Consent form-IDI-Caregivers
- ❑ Participant Consent form- IDI- PwDM/TB
- ❑ Participant Consent form-IDI- Health Care Providers
- ❑ Participant Consent form-IDI-Pharmacists
- ❑ Participant Consent form-Survey-PwDM/TB
- ❑ Participant Consent form-Survey-Caregivers

*PWDM/TB: PEOPLE WITH DIABETES AND TUBERCULOSIS

REACH - CARE Connect Community Care Model Technical Advisory Group

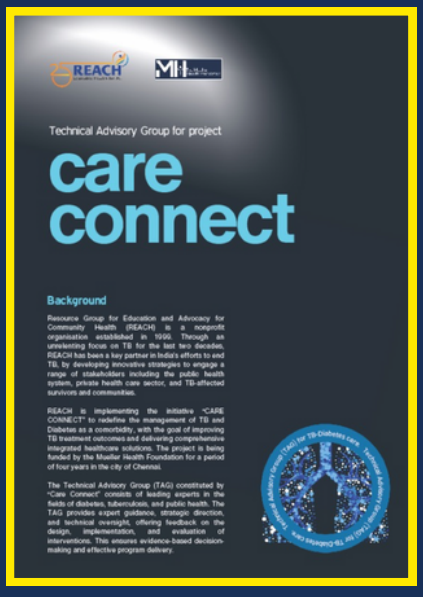
The CARE Connect Project will be guided by a Technical Advisory Group (TAG) comprising 11 leading experts, including diabetes specialists, nutritionists, community representatives, and officials from the District TB Office and WHO. This diverse team will provide invaluable insights to ensure the project's interventions are impactful, patient-centered, and address the needs of all stakeholders involved.

TAG GROUP MEMBERS

Technical Advisory Group Members

1. **Dr. J.Lavanya ,** District TB Officer, NTEP
2. **Dr. Hemanth Shewade ,** Scientist-E, National Institute of Epidemiology (NIE)
3. **Dr. Vinod Kumar,** Member of the NITI Aayog, Director of Health and Nutrition vertical.
4. **Dr. R.M. Anjana,** Managing Director, Dr.Mohan's Diabetes Speciality Centre
5. **Dr. M.K.Mohan,** Director, MK Nursing Home
6. **Dr. Suma.S,** WHO consultant, NTEP
7. **Dr.Usha Sriram,** Diabetologist, HOD, VHS
8. **Dr. Rama Subramanian,** Infectious Disease Specialist, Apollo Hospital
9. **Mr. Vimal Fernandez,** Community Representative
10. **Dr. Janani Sankar,** Paediatrician, KKTCH
11. **Prof.Dr. R.Sridhar,** Vice Chancellor, Chettinad Academy of Research & Education

TERMS OF REFERENCE



REACH - Additional Activities

WORLD DIABETES DAY ACTIVITIES 2024

On World Diabetes Day 2024, REACH commemorated the occasion across India with impactful activities aimed at raising awareness about diabetes and its connection to TB. The day featured a Diabetes and Wellness Signature Campaign and information sessions at hospitals, public health centers, and NGOs, alongside patient and community education and counseling. These efforts underscored the importance of holistic health and the need for integrated care in managing diabetes and TB.

Sir Ivan Stedeford Hospital

CSI Rainy Hospital

Public Health Center

NGO Udavi -Shelter for Homeless Women

Nutritional Flyers on Diabetes and Counselling for People with Diabetes

Diabetes and Wellbeing Signature Campaign

REACH - Additional Activities

WORLD TB DAY ACTIVITIES 2024

REACH commemorated World TB Day 2024 at Nakshatra Centres by promoting awareness around the theme "Yes, we can END TB." Posters emphasizing key activities to combat TB, such as testing for persistent coughs, consulting doctors, adhering to treatment, and practicing respiratory etiquette, were prominently displayed. Banners featuring these messages were also prominently placed at Nakshatra Centres for public visibility. Furthermore, staff conducted awareness programs in outpatient departments and within the community to educate individuals about TB prevention and treatment.

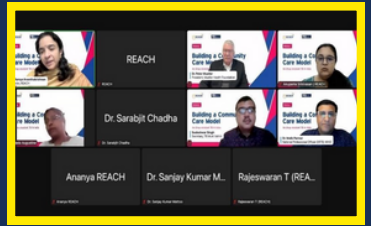
World TB Day 2024 - Poster displayed in Nakshatra Centres

Nurses supporting the World TB Day campaign at a Nakshatra Centre

WEBINAR

On April 4, 2024, a webinar titled "Building a Community Care Model for DRTB in India" was held, featuring global experts discussing innovative strategies for managing Drug-Resistant Tuberculosis (DRTB). Moderated by Dr. Ramya Ananthakrishnan, Director of REACH, the first session covered DRTB in India with insights from Dr. Sarabjit Chadha, Regional Technical Director at FIND, on diagnosis and Dr. Malik Parmar, National Professional Officer at WHO, on treatment. The second session highlighted the needs of people with DRTB, including a REACH film showcasing TB survivors' experiences. Mr. Sudeshwar Kumar Singh, Secretary of TB Mukt Vahini, stressed community empowerment for people with DRTB.

The webinar also saw the release of a publication titled “Building a Community Care Model for Drug-resistant TB in India,” with a keynote address by Dr. Sanjay Kumar Mattoo and closing remarks from Dr. Peter Mueller, President, The Mueller Health Foundation. The webinar attracted 245 participants and reached a maximum concurrent viewership of 158.



David Russell's Lab at Cornell University

The Russell Lab at Cornell University has developed a novel approach to analyze how individual host immune cells react divergently to the bacteria that cause tuberculosis. Over a four-year period, together with The Mueller Health Foundation, the Russell Lab is building on this platform of single-cell profiling of active Mycobacterium tuberculosis (Mtb) infection in vivo to assess the relative susceptibility of Mtb subpopulations to the actions of current and emerging anti-tuberculosis drugs. The goal is to generate a "road map" that connects drug-susceptible and drug-tolerant bacterial populations and facilitates the rational design of combinatorial anti-tuberculosis drug regimens to provide more effective coverage of the total bacterial population. This could increase efficacy and shorten the course of treatment. Due to the host cell responses to TB infection being epigenetically controlled, the collaboration further focuses on a new approach that takes epigenetic reprogramming into consideration. Over the first two years of this collaboration, the project has been generating single-cell RNA-seq maps for frontline drugs that are mapped to the relative sensitivity of Mtb in different host cell subsets to these drugs. The rationale being that the intracellular environment exploited by Mtb has a major impact on bacterial susceptibility to drug action and that the diversity of host cell types would drive differential drug action, promote induction of drug tolerance, and render some bacteria inherently insensitive to the drugs. The team also worked on screening a library of inhibitors of host epigenetic modeling to modify the host environments and render more bacteria susceptible to frontline drugs. A brief overview of key advancements from the third year of the project is provided below.

Key Advancements in Year 3

Optimization of a Novel Platform for Profiling Anti-TB Drugs and Screening for Synergistic Drug/Drug Combinations

A major advance in Years 2 and 3 was the development of an in vitro assay to profile interactions between the host cell environment and the activity of frontline anti-TB drugs. This platform supports a broader evaluation of candidate compounds, testing more drug/drug combinations and dose ranges. The detailed datasets generated are analyzed using SynergyFinder software, which identifies positive drug interactions, significantly advancing the identification of effective synergistic combinations.

Preliminary Mouse Infection Studies on Host Directed Therapy Candidates and Epigenetic Modifiers Combined with Frontline Anti-TB Compounds

Two preliminary mouse studies assessed the in vivo efficacy of Tilorone and RSVA405, host-directed therapy (HDT) candidates. In the first study, mice infected with Mtb received either compound alone, isoniazid (INH), or their combinations. Both compounds reduced bacterial burden, with RSVA405 showing comparable efficacy to INH and demonstrating further reduction when combined with INH. Tilorone alone showed significant reduction but was less effective than INH, with marginal improvements in combination. The second study varied the timing and duration of HDT treatment combined with the standard HRZE regimen. RSVA405 for four weeks was as effective as HRZE for two weeks, with the best results achieved by their combination. Tilorone's efficacy was influenced by timing, with its combination with HRZE proving most effective during established infections. These findings suggest timing and drug pairing are crucial, warranting further investigation.

David Russell's Lab at Cornell University

A brief overview of key milestones that have been achieved from the first year to the third year of the project is provided below:

Summary of Milestones from Year 1 through Year 3

Year 1:

- **Completed scRNA-seq road maps assessing differential drug susceptibility for Mtb in the mouse lung for frontline drugs (INH, RIF, EMB, and PZA).**
- **Developed a pipeline for onboarding new compounds, focusing on host-active compounds that influence Mtb sensitivity to frontline drugs.**

Year 2:

- **Completed scRNA-seq road maps for newer frontline drugs (Linezolid, Pretomanid, and Bedaquiline). Developed an in vitro platform for functional profiling of compounds, enhancing drug combination design by assessing independent, antagonistic, and synergistic effects with the host environment.**
- **Conducted preliminary assessments of inhibitors of epigenetic modification for modulating macrophage behavior and bacterial survival. Established an in vitro screening platform to prioritize compounds before in vivo testing.**
- **Completed initial drug/drug assessment studies on host-active compounds from Year 1 in combination with anti-TB drugs.**

Year 3:

- **Designed and tested anti-TB drug regimens based on the scRNA-seq road map, optimizing bacterial population coverage and focusing on in vitro platforms for initial assessment.**
- **Developed and tested anti-TB and host-active drug combinations using an Optimized Informer Deck and macrophage screening platforms.**
- **Identified and preliminarily characterized bacterial sub-populations least susceptible to anti-TB drugs in vivo. Conducted pilot studies combining anti-TB drugs with epigenetic inhibitors.**
- **Defined combinatorial drug regimens for effective treatment of Mtb infection in vivo.**
- **Identified host environments and cells responsible for maintaining tolerant and persistent bacilli, improving understanding of macrophage populations' response to therapies.**
- **Established robust in vitro models for reduced drug susceptibility, now used to screen additional compound collections.**

Diabetes Mellitus and TB Pilot Study in Malawi

An ongoing project is a pilot study in Malawi, which aims to understand the fundamental impacts of comorbidities, specifically diabetes mellitus (DM), in the context of TB treatment. Malawi faces a dual burden of communicable and non-communicable diseases, including TB and DM. Unfortunately, data on the prevalence of DM among TB patients are not collected by the Malawi National TB Control Programme, leaving us unaware of whether DM is a significant risk factor for TB among Malawians. Furthermore, HIV infection is the strongest risk factor for the development of TB among people living with HIV (PLHIV) in Malawi. While the success of the Malawi antiretroviral therapy program has reduced the incidence of HIV-associated TB, it has also increased the risk of metabolic syndromes, predisposing PLHIV to DM.

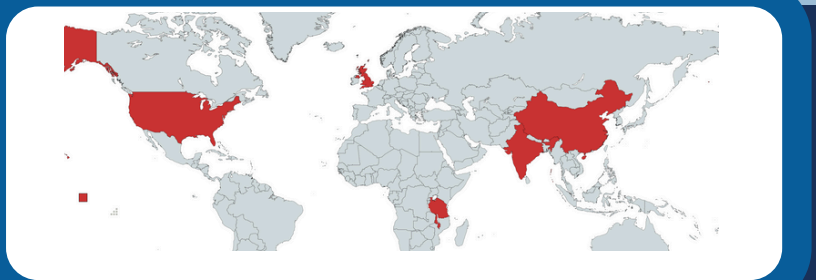
To gain a better understanding of the relationship between DM and TB, MHF has initiated a pilot study in collaboration with David Russell's Lab at Cornell University and Queen Elizabeth Central Hospital in Malawi. The study aims to perform bronchoalveolar lavage to recover airway macrophages from healthy and diabetic donors, shedding light on this crucial intersection of diseases. Due to natural disasters, including the flooding of key hospital infrastructure in 2023, activities in 2024 were delayed and continue to be on hold. However, MHF remains committed to its mission and aims to resume activities in 2025.

Overview of Key On-Going Activities

- **Obtained Institutional Review Boards (IRB) Approval to conduct the pilot study.**
- **Assembled list of suitable candidates in Malawi based on pre-determined set of characteristics to participate in the pilot study.**
- **Waiting to resume recruiting suitable candidates in Malawi.**

Our Global Reach

We are very proud to see our grantees making a truly needed impact across four different continents including Africa, Asia, Europe, and North America.



THANK YOU

We would like to express our deepest gratitude to our supporters, grantees, partners, and collaborators, for their time, insight, wisdom and contributions. Our work would not be possible without the many individuals from academic institutions, scientific and medical experts, biotech- and high-tech companies, multilateral agencies, non-governmental organizations and global networks, who willingly gave their time, experience and contributions to make a difference in the fight against TB and infectious diseases!

REACH leading the fight against TB

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University of Liverpool

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