



**INDIA
HEALTH
FUND**

A TATA TRUSTS INITIATIVE

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ANNUAL REPORT



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Message From The CEO



Infectious diseases continue to exact a huge toll globally. In 2021, an estimated 10.6 million people fell ill with TB, and 1.6 million lost their lives to the disease. Malaria, while on the decline, still continues to affect 247 million people and caused 619,000 deaths in 2021. India shares an outsized proportion of this burden with more than a quarter of the global TB cases and 83% of malaria cases in South-East Asia. There were over 193,000 cases of dengue in 2021 in India, more than four times the cases in 2020 and highest in six years since 2015. Newer challenges such as the increasing toll of vector-borne diseases linked to the climate crisis and the rapid emergence of antimicrobial resistance are public health threats that humanity hasn't tackled before.

It was in 2015, that the United Nations enshrined the SDG goal 3.3 towards the global elimination of communicable diseases by 2030. India, put forward even bolder commitments, aiming to end TB by 2025. Despite bold political commitments and global as well as national goals, communicable diseases have suffered from a lack of patient capital for development and deployment of science- and tech-based innovations, that hold great potential in transforming the care continuum. For instance, while the global funding for TB research grew to \$1 Billion in 2021, it is only half of what the governments had committed to in 2018, and only one-fifth of the resources now required for TB research to put the world on track to end TB. Failure to invest in infectious diseases is estimated to cost trillions to the global economy by way of increased

sickness, deaths and loss of productivity. We can't bear the cost of inaction.

This is why the India Health Fund was founded by the Tata Trusts in 2016, soon after the UN global goals were penned, in a strategic partnership with The Global Fund. On the launch of IHF, Mr. Ratan Tata, the chairman of Tata Trusts, had said "Infectious diseases such as Malaria and Tuberculosis though widespread are treatable and controllable. In order to overcome the challenges associated with this issue, we should use innovations to create models that are not geographically bound & can be replicated anywhere in the world. The India Health Fund will endeavour to combine innovation and effort for the implementation of the project at a large scale."

Fast forward half a decade, today, India Health Fund is de-risking the development of 16 innovations – diagnostics, digital tools and platforms -- for infectious diseases such as malaria, TB, dengue, chikungunya and COVID-19. Six of these game-changing tools are now in use in public health settings, at a minimal or no cost to patients in the remotest corners of the country. In the last year alone, we started funding the development and validation of five new solutions which use cutting-edge technologies to make diagnosis and treatment faster, more accessible, accurate and affordable -- a cough detection algorithm for TB; a child-friendly sputum collection device for TB testing; a single sample panel for rapid detection of fever illnesses; a telepathology microscopy platform for malaria and a novel sputum storage and transportation device for TB testing.

But the scale of the infectious diseases burden calls for stronger investment and more multi-sectoral action. We must act together, if we are to beat these communicable diseases. Today, we are grateful for the support of our 30 partners (and growing).

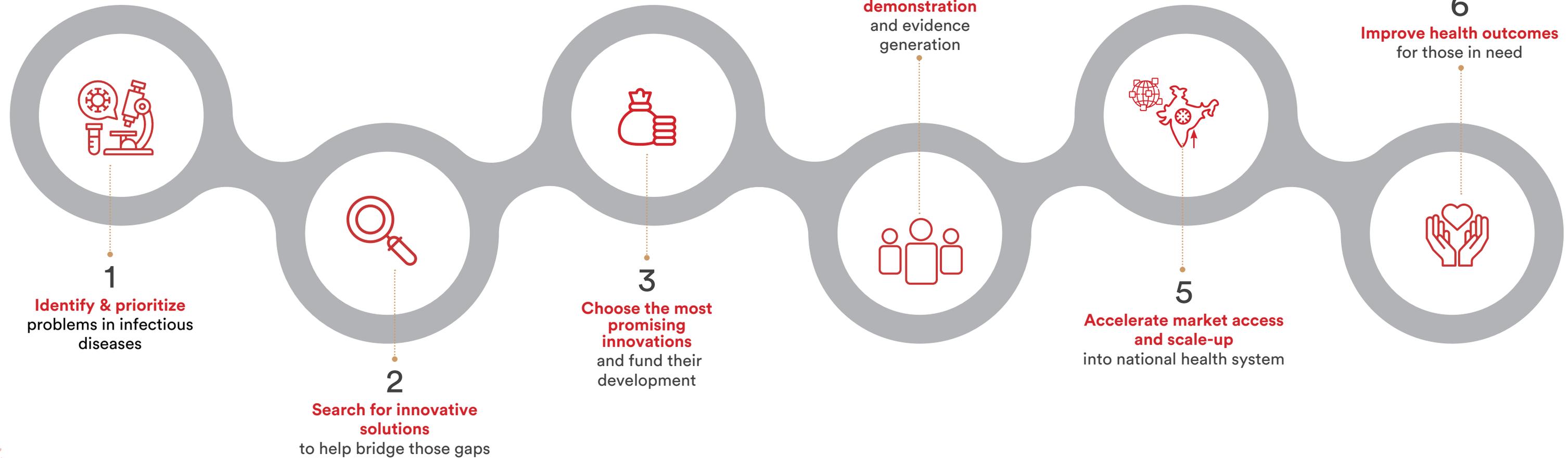
In this annual report, as we recollect and reflect on the progress and pitfalls of the year that went by, we invite you to join us in this journey.

Madhav Joshi,
Chief Executive Officer,
India Health Fund

What we do

End-to-end support for transforming an idea to large-scale impact

As a partner, financing mechanism, connector and ecosystem facilitator, IHF enables the lab to last mile journey for game-changing innovations through the following steps:



Areas of our work

SCREENING & DIAGNOSTICS



DISEASES

TB
Covid-19
Influenza
Vector-Borne
Diseases



THEMES

Rapid Tests
Molecular point-of-care Diagnostics
Climate & Health
Antimicrobial Resistance
One Health
User-centred design
Multi-disease solutions



PORTFOLIO



DIGITAL HEALTH

SCREENING & DIAGNOSTICS

SUPPLY CHAIN

SURVEILLANCE



DISEASES

TB
Vector-Borne
Diseases



THEMES

Internet of Things enabled devices
Artificial Intelligence and Machine Learning
Climate & Health
Tele-pathology
Treatment Adherence



PORTFOLIO



Our Portfolio

Driving innovation in Screening and Diagnostics at primary care

Why invest in Screening & Diagnostics

Nearly half the world has little or no access to diagnostics¹. This gap widens even further at the primary healthcare level in LMICs where 4 in 5 people don't have access to the simplest diagnostic tests². Prompt and accurate diagnosis, especially at primary level, can save lives. From quickly clarifying disease etiology, to influencing treatment modalities, to cutting down disease transmission, to improving public health surveillance – accurate and timely diagnosis at point of care is key.

Science- and tech-based screening and diagnostic innovations have an untapped potential to strengthen primary healthcare and improve health outcomes. Yet, healthcare workers struggle to make do with inadequate and antiquated testing technology for infectious diseases. If we are to control the world's greatest infectious disease killers³, it is imperative to invest in game-changing



screening and diagnostic tools suited for primary care, that can ensure earlier treatments and improve patient outcomes. Moreover, life-saving diagnostics, once developed must be available to everyone, everywhere -- people at high-risk such as children, pregnant women or immunocompromised individuals, as well as marginalized, disadvantaged populations such as refugees or internally displaced persons.

Plugging this need gap in screening and diagnostics & the focus on the underserved has been key to the theses of India Health Fund.



As health systems grapple with myriad challenges affecting their ability to deliver high-quality care, rapid and accurate diagnostics could play a crucial role in improving patient outcomes and saving lives. C-CAMP appreciates the catalytic role that India Health Fund is playing in finding and funding the development and deployment of life-saving diagnostic tools for infectious diseases.

Dr. Taslimarif Saiyed,
Director & CEO, Centre for Cellular and
Molecular Platforms (C-CAMP), Bengaluru.

¹ <https://www.thelancet.com/commissions/diagnostics> | ² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8654090>

³ <https://www.ncbi.nlm.nih.gov/books/NBK52875/>

The world's first point-of-care triage test to enable rapid and low-cost triage of potential TB patients

The Problem

In the absence of an effective triage test for TB, which can help narrow down the number of presumptive TB patients, health systems around the world have to undertake a large number of confirmatory TB tests – requiring more financial and human resources, and increased testing capacity. 7-10 presumptive TB suspects have to be tested to identify one TB patient. An accurate, fast and affordable identification of prospective TB patients at point of care by frontline health workers will help identify the “missing millions”, speed up their linkage to treatment as well as help reduce the number of confirmatory tests required.



The Solution



IHF engaged with Stellar Diagnostics India Pvt. Limited for the development of a TB triage test that can enable rapid triage (within 20 minutes at point of care) of potential TB patients, speeding up diagnosis and linkage to treatment and narrowing the number of TB suspects that need to be referred for confirmatory testing.

Moreover, the test, targeted at a cost of less than 200 INR, requires no laboratory infrastructure and requires minimal training of health care workers. This innovation holds the potential to dramatically reduce the financial burden on the TB control program.



Our Impact

As the test meets an urgent national priority and holds the potential to dramatically reduce the financial burden on the national TB control programme, the Ministry of Health and Family Welfare, Government of India, is closely following developments in the project and WHO and CTD have requested to fast-track development. Furthermore, ICMR has committed to undertake multi-centric validation for Stellar's TB triage test.

The Problem

Owing to the absence of an accurate, rapid diagnostic test for malaria, often there is delayed diagnosis, that can result in many avoidable deaths, especially in remote areas. 2-4% of malaria cases can be missed due to genetic mutations, leading to false negatives and potentially fatal consequences for patients. Existing tests are either very expensive or need highly skilled microscopists.

The Solution

Hemex Health IHF engaged with Hemex Health to develop Gazelle – a one-minute, highly sensitive and accurate, point-of-care, rapid diagnostic test for malaria that works on a simpler principle of detecting Hemozoin, a metabolic by-product formed due to malaria infections. The hand-held device can detect the presence of both *Plasmodium falciparum* (Pf) and *Plasmodium vivax* (Pv) parasites using a single blood sample at the patients' doorstep, with test results available



in 1 minute. Gazelle enables automated data acquisition and transmission of case-patient details to the malaria surveillance system resulting in real-time reporting. Targeted at cost of \$2 per test, Gazelle also supports multiplexing by testing for other diseases such as sickle cell disease, beta thalassemia, that often occur in the same area as malaria.

Gazelle's validation study is now underway for which:

228 subjects enrolled at the Gujarat Site	39 subjects enrolled at Jagdalpur Site	123 Malaria Positive Samples for <i>P. vivax</i>	38 Malaria Positive Samples for <i>P. falciparum</i>	4 Mixed Infection Positive Samples
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Our Impact

While Gazelle for malaria detection is under development, it is already being used in resource-limited settings for rapid detection of Sickle Cell Disease across 27 countries worldwide including in India⁴

⁴ <https://www.frontiersin.org/articles/10.3389/fmed.2021.639208/full>

OmiX: A low-cost multiplex platform to detect & distinguish respiratory ailments COVID-19, influenza & TB

The Problem

India reported 2.7 million cases of TB, Influenza burden is estimated at 0.6 -1 million while COVID-19 cases reached more than 25 million in India. Diseases like TB, influenza and COVID-19 manifest similar disease symptoms making accurate diagnosis at primary and secondary health care centers difficult, often needing patients to take multiple tests. This can be both costly and time-consuming and increases the risk of the patient's condition deteriorating.

The Solution



IHF funded OmiX Laboratories to develop OmiX iAMP, a platform trio test that uses Loop-mediated Isothermal Amplification (LAMP) technology to detect COVID-19, TB and Influenza. The point-of-care, automated platform is designed for use in low-resource settings, with simplified sample extraction and visual readout to facilitate diagnosis, which reduces the need for a skilled workforce

to interpret test results while making the test error-free. Moreover, the platform can potentially report 10x more tests in the same time at 1/10th the combined cost of RT-PCR tests (Test



price 1000 -1500 INR for 3 diseases), making vast scale adoption more feasible. With higher specificity, better throughput & ease of use, the platform overcomes the limitations of current molecular diagnostics and could be made available to patients in areas with low testing load.



Where does the OmiX platform stand today?

OmiX Labs has completed two validation studies of eziAMP platform and assay:

- 100 clinical samples (50 positive and 50 negative) in collaboration with St. John's Hospital, Bangalore. The preliminary sensitivity and specificity was found to be 98% and 100% respectively.
- 127 clinical samples in collaboration with Central TB Division. The sensitivity and specificity was found to be 88.2% and 94.5% respectively.

As the next step, eziAMP platform and assay kit will undergo multi-centric clinical validation for TB detection. Similar clinical validation will be conducted for detection of Influenza in collaboration with Manipal Institute of Virology. In addition, Central TB Division, Ministry of Health & Family Welfare, Government of India has

offered support for pilot testing of the device at selected sites of the national TB elimination program. The results of pilot study & feasibility study will enable the adoption of eziAMP devices for decentralized detection of TB at primary healthcare level.

The Problem

Malaria, dengue and chikungunya often present with similar fever symptoms at an early stage, which can lead to a misdiagnosis or even delayed diagnosis. Currently available rapid diagnostic tests (RDTs) detect individual diseases, have low sensitivity, and are often unavailable, especially in remote locations.

The Solution

Addressing this need, Ameliorate developed an accurate, multi-disease RDT, a fever panel of sorts, for differential detection of dengue, chikungunya and malaria (with plasmodium falciparum and vivax differentiation). The single test kit uses a single blood sample, is equipment free and can be easily used by minimally trained workforce at primary level. The process eliminates the need of serum/plasma samples, is instantaneous, doesn't need cold chain facility/ biosafety lab. The funding from IHF will enable prospective, multicentric performance and cost-effectiveness evaluation of the RDT, to be made available at a discounted price of INR 200/pc to the public health system for government procurements. This is far less than existing fever panels priced at INR 3000-4000.



Multi-disease Platform Diagnostic tools

Co-infections or infections with similar early symptoms like fever are a common occurrence in infectious diseases.

Most available diagnostic tools address individual diseases, often resulting in delayed diagnosis or missed diagnosis of co-infections, and thereby worsened health outcomes. Multi-disease platform diagnostics, that allow multiplex detection of a panel of pathogens using a single specimen, hold immense potential in improving testing efficiency and thus bettering health outcomes for

patients. Platform tools also deliver greater impact by being more cost-effective for health systems, sustainable for innovators, and help in bridging the testing gap across diseases – communicable, non-communicable or both, which especially holds tremendous value for lowest levels of healthcare where decentralization matters the most.

A breakthrough RT-PCR test to speed the detection of drug resistance in TB patients from 4 months to 2 weeks

The Problem

The standard first-line TB treatment typically involves two powerful antibiotics – isoniazid and rifampicin and lasts approximately 6 to 9 months. But often, antibiotic misuse for non-bacterial infections or incomplete treatment course can lead the TB bacteria to mutate into forms that stop responding to these prescribed antibiotics. This form of the disease, called multi-drug resistant TB (MDR-TB), is harder to treat. The ‘low responders’ to standard first-line TB treatment have a high chance of severe consequences, like organ failure, high probability of catching MDR-TB and, even, death. It also leads to increased risk of community transmission of DR-TB. In these drug-resistant cases, the patient must be switched to second-line treatment as soon as possible. Rapid diagnosis of drug resistance is a key step to make this happen. As per the current testing protocols, the response to first-line TB treatment and occurrence of DR-TB is detected four months following treatment initiation. At this time point, patients must undergo multiple tests to determine drug resistance, which delays administration of 2nd line therapy and increases chance of fatality linked to the disease. Also, diagnosing drug resistance is often expensive, costing ~INR 6000, and harder when sputum samples are unavailable as well as in cases of extra pulmonary TB.



The Solution



To shrink these timelines for diagnosis of DR-TB and linkage to 2nd-line treatment, IHF engaged HealSeq Precision Medicine Private Limited. HealSeq’s flagship host RNA biomarker-based blood test can accurately detect drug resistance from TB patients as early as two weeks after treatment initiation. The abundance of these RNA signatures can help doctors classify patients as good-, intermediate- or poor-responders to the first-line treatment. Intermediate- or poor-responders, diagnosed as DR-TB patients, can be immediately shifted to 2nd-line therapies within a couple of weeks after 1st line treatment initiation and don’t have to wait for four

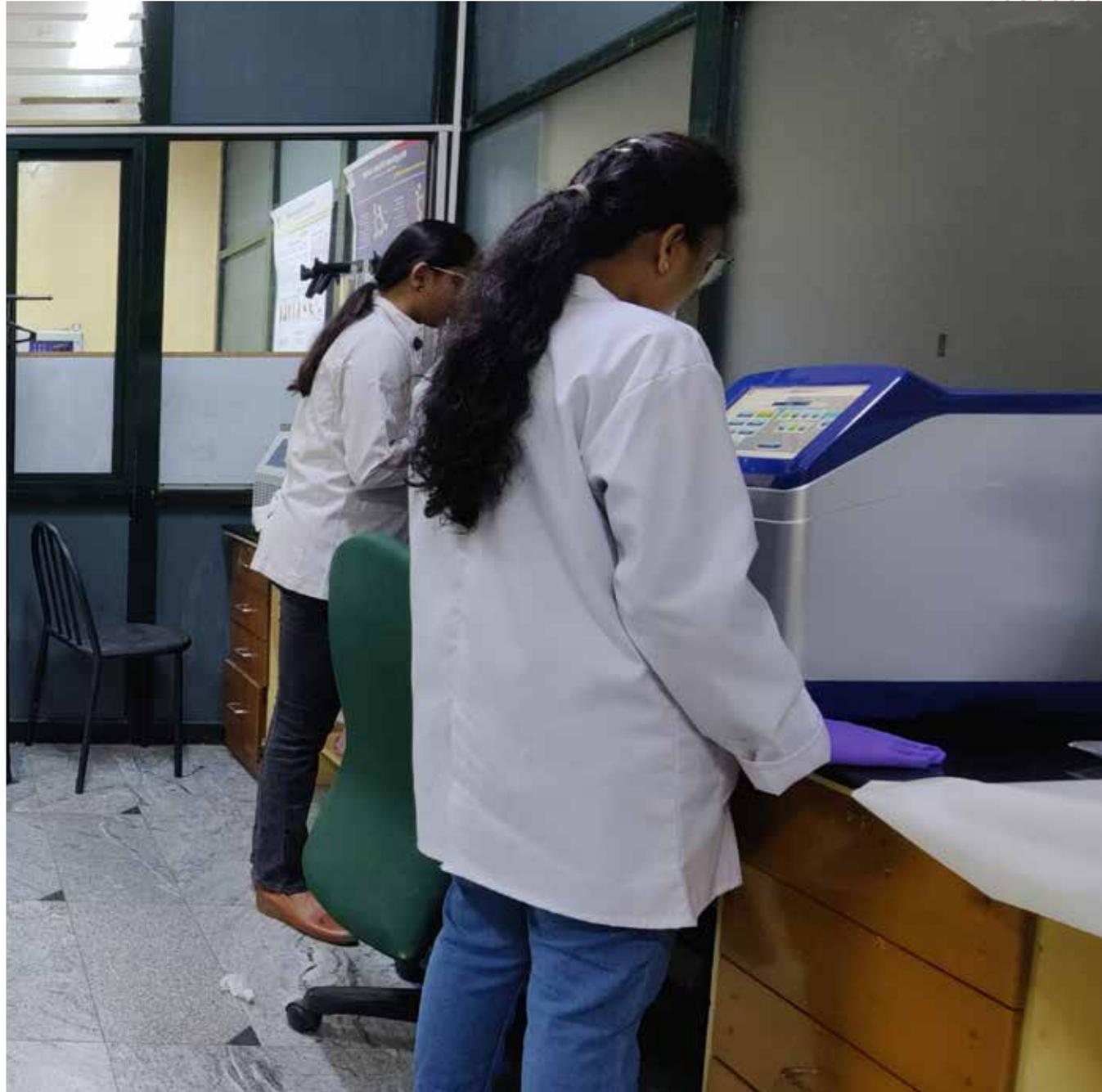
months, as is conventionally the case. This breakthrough has the potential to significantly speed up DR-TB diagnosis, guide fast shift to 2nd-line treatment and curtail the spread of the disease.

This easy-to-administer test, once developed, will be available at ~₹1000 per test, which is 1/6th the cumulative cost of the multiple tests that need to be taken during the TB treatment course. The test itself takes ~ 12-24 hours turnaround time vs. current methods that take 4-6 weeks. Moreover, the technology is a platform solution and can also be used to detect sepsis, extra pulmonary TB and cancer. HealSeq has completed product development and the test is being currently evaluated using TB patient samples from five tertiary hospitals in Karnataka.

Partners

HealSeq has been working with IHF’s portfolio company Omix as their technical development partner for assay development and internal/ laboratory testing for optimization and improvement of accuracy.





Diagnostics for drug-resistant TB at primary healthcare level

Antimicrobial resistance (AMR) is a phenomenon in which bacteria, viruses, fungi, and parasites evolve such that they stop responding to drugs used to treat them, making the infection difficult to treat, raising the risk of disease transmission, and death.

Each year, 700,000 people die of AMR, and without action, the death toll could rise even higher, to as many as 10 million deaths annually by 2050⁵. In the last two years, about 115,000 people were detected with drug resistant TB (DR-TB) with fatalities accounting for about 20% of the detected patients. Faster detection of DR-TB is key to linking patients to appropriate treatment, thus bettering health outcomes as well as curtailing the spread of the disease.

Currently, DR-TB detection happens primarily at tertiary care centres. However, at the forefront of

healthcare, primary health centres play a pivotal role, where timely and precise DR-TB identification and intervention would yield better outcomes for patients' health, help healthcare practitioners make well-informed decisions regarding the choice of antibiotic, and would contribute to containment of infection transmission, especially of the harder-to-treat forms of the disease. In doing so, prompt DR-TB detection at the lowest levels of care not only addresses the global AMR threat but also safeguards the effectiveness of hard-found antibiotics for generations to come.

⁵ New report calls for urgent action to avert antimicrobial resistance crisis (who.int)

Specially designed non-invasive device to aid sputum sample collection in children to improve diagnosis of paediatric TB

The Problem

Every year, 1-1.15 lakh children get affected by TB in India. Of these, 96% of deaths among paediatric TB patients are due to a lack of bacteriologic confirmation and early treatment. These missed cases not only contribute to higher mortality but also increased transmission of infection in communities. Exacerbating this are current sample collection methods, which are time-consuming, painful and inconvenient for children and often need the expertise of healthcare workers. There is absence of effective, convenient, and child-friendly sputum collection methods which can be used in conjunction with existing diagnostic platforms.

The Solution

Addressing this unmet need and keeping children at the heart of the innovation, IHF engaged with 221B Biomedical to pave the development and clinical validation of 221B Biomedical's simulated method: a first-of-its-kind specially designed non-invasive sputum collection device for testing tuberculosis (TB) among children. 'Blow-Pop', the flavoured low-cost device will require children

to simply chew and blow or cough for easy and safe sample collection of oral fluids. The innovation will make testing simpler and will increase testing and treatment rates, lower mortality and infection transmission due to TB. Owing to its simplicity, the tool will be ideal for low-resource settings, including primary healthcare setups. The device can also be used as sample collection tool for other diseases where sputum sample is required. Targeted at a test price: 80 INR (~ \$1), the device helps in obtaining specimen with improved quality, enhanced quantity, and viability suitable for processing within <10 min.



Chew + Soft Blow or Soft Cough



User-centred design and diagnostics

While there is continuous development of innovations for diagnosing infectious diseases, the potential for such technologies to be deployed widely at the last mile directly depends on several factors including effectiveness, accuracy, cost efficiency and acceptance and engagement by the end-users.

Hence, a user-centric approach to innovation design that understands the values and motivations of the end-user is imperative. Every end-user has different needs, whether it is patient populations (e.g. children, pregnant women) or it is healthcare workers or lab technicians. IHF endeavours that

every project it supports has user-centric design built into it, whether it is by focusing on innovation biodesign for the end users such as children, or it is by creating use cases in conversation with users and implementers on the ground.

The Problem

Owing to the limited number of accredited TB testing laboratories, there is a necessity to transport sputum samples to approved facilities for molecular testing. Sample transportation sometimes takes more than a week due to logistic constraints, leading to an increased risk of contamination of samples and loss of viable cultures. As a result, 10% of all sputum samples get contaminated during transit. Sample transportation from peripheral sites to a centralized testing laboratory also means high costs and logistical complexities such as the need for cold chain to maintain sample quality. Such challenges delay testing and also affect correct test reporting. There is a critical need for an easy-to-use, affordable and safe sample storage and transportation method that can preserve sputum for a long duration without dependency on cold chain.



The Solution

Addressing this need, Wobble Base Bioresearch Private Limited developed a “TBSend card” in which sputum samples can be easily and safely stored and transported. The card is a solid cellulose matrix coated with proprietary reagents which store DNA from the sputum. This sample-coated card can then be used at accredited testing laboratories to release DNA using a brief protocol and tested on any DNA testing platform for TB diagnosis. To ensure biosafety, the TBSend card has a pick-up handle and is placed in a container with an airtight lid that has absorbents beneath the lid to safeguard from spillage and contamination. To add another safety layer, the sputum is mixed with a denaturant that inactivates TB bacteria in the sample before the sample is stored on the card. The stored sample in the TBSend card is stable to be transported at room temperature and can be stored for more than 6 years without losing the viability of the sample. The product can also be repurposed for other human clinical samples that are fluid in nature such as blood, serum, and plasma.



IHF has engaged with Wobble Base to evaluate the biosafety of the TBSend Card, and the Central TB Division, Govt. of India, will be an active participant in this study. Once completed, this may lead to a second phase involving manufacturing the product at scale, clinical validation through field trials, regulatory approvals and market access initiation.

The Problem

Bovine TB, an infectious disease of cattle, remains the 7th largest disease threat to humans transmitted from animals. There is high risk of transmission of TB from cattle to humans which is made worse by low diagnosis owing to the lack of an efficient test for bovine TB, which is estimated to account for up to 10% of human tuberculosis cases in some countries⁶. The currently available test for diagnosing bovine TB amongst cattle takes 4 days and 2 farm visits by a veterinary doctor – which is time and labour intensive, while also increasing the risk of disease transmission.

The Solution

IHF engaged with CisGEN Biotech Discoveries Private Limited to develop, validate and manufacture an accurate, rapid (under 10 minutes) and affordable (INR 50 per animal) bovine TB test kit that uses a unique combination of antigen proteins that can differentiate whether the bacterial infection is from TB-causing bacteria or from another environmental mycobacterium. First of its kind, the kit is truly a “One Health product” which looks at the interconnectedness between humans, animals, and the environment. Moreover, the Cisgen kit is deployable in farms with minimally trained manpower and does not need any bio-containment facility.



⁶ <https://www.woah.org/en/disease/bovine-tuberculosis/>



How Cisgen is making an impact?

- The in-lab validation for Cisgen kit was conducted on samples from India, UK, Ethiopia that showed 95% sensitivity and 100% specificity, making it superior to existing kits and facilitating its adoption by the dairy industry – public and private.
- Field testing and adoption discussions are underway with National Dairy Development Board (NDDB), Bharatiya Agro Industries Foundation and IIPHG, Gandhinagar.
- Cisgen's kit has already been adapted for another common zoonotic disease Brucellosis.
- The kit is a platform technology that can be used to diagnose other chronic disease of cattle such as Brucellosis, Johne's disease and Bovine Infectious Rhinotracheitis (IBR). CisGEN is also working on inclusion of Bovine Herpesvirus antigen and Brucella LPS in the kit.
- Finally, the kit can also be used for TB testing in other domesticated animals & has been found to be highly sensitive in testing TB in wild animals.

One Health and Diagnostics

The concept of “One Health” emphasizes the connection between the health of humans, animals, and the environment and the necessity of cross-sectoral cooperation to address health challenges at the point where these three domains meet.

Approximately sixty per cent of all infectious diseases that affect humans are diseases that can be spread from animals to humans⁷. The recent Covid-19 pandemic has been suspected to be of zoonotic origin. Moreover, with the impending climate crisis, and linked changes such as the melting permafrost, the world is on the brink of encountering ancient bacteria, viruses and potentially new ones that have remained lurking in the soil for thousands of years⁸. If we are to curb infectious diseases, we must thus take a comprehensive one health approach towards surveillance, diagnostics and

screening and view them not just from the lens of human health but also from the perspective of animal and environmental health. At IHF, we are working at the intersection of human health and environment through community surveillance and point-of-care diagnostics of vector borne and zoonotic diseases to decrease disease incidence. Improving early detection e.g. of zoonotic TB and strengthening health systems e.g. through vector-borne disease surveillance are our immediate priorities in One Health.

⁷ 75% emerging infectious diseases zoonotic: UN Report (downtoearth.org.in)

⁸ The deadly diseases being released by climate change | World Economic Forum (weforum.org)



The Problem

Sputum samples for diagnosis of TB are currently collected from patients at healthcare centres in plastic bottles. This process exposes healthcare workers to the risk of infection while collecting samples. Diagnosis of TB with these samples is done through sputum smear microscopy – a time consuming process with low accuracy which also requires skilled lab technicians. These result in delayed diagnosis & initiation of treatment, missed cases of TB and increased risk of infection to healthcare workers.

The Solution

IHF engaged with Valetude Primus Healthcare to develop Autogene. A one-stop shop for TB diagnosis, Autogene enables safe capture of sputum samples from patients in specially designed capture bottles, which protect the healthcare workers from exposure to highly contagious TB



bacteria. Furthermore, it provides rapid (TB diagnosis within 1 hour), accurate and affordable TB diagnosis without the need for skilled technicians at primary health level. The device includes a battery-operated RT-PCR diagnosis capability with an automatic gene detection feature that can be used for a broad range of automated applications including DNA isolation & extraction, enabling faster and error-free detection and allows for usage with minimal training of healthcare workers. It is a one-stop end-to-end detection solution -- from sample collection, processing to report generation – that provides a holistic report to clinicians on disease confirmation



as well as persisting bacterial resistance. Moreover, Autogene is integrated with National TB program and sends results for surveillance and reporting directly. Finally, it can also be used for the diagnosis of several bacterial and viral diseases including TB, COVID-19, Typhoid & Sepsis.



Truenat – a fast PCR-based TB detection method to find the missing millions

The Problem

The absence of specialized testing facilities and skilled technicians to diagnose TB often results in several cases of TB going undiagnosed (“the missing millions”) – hampering efforts to eliminate the disease around the world. TB patients in low-resource settings lack access to accurate and rapid TB diagnostic tests at point of care leading to delay in diagnosis and treatment initiation.

The Solution

IHF engaged with Molbio Diagnostics for validation of Truenat. Truenat is a compact, chip-based, battery-operated RT-PCR system which provides test results at the point of care within 90 minutes. This enables same day reporting and initiation of evidence-based treatment of TB, which reduces the risk of infection spreading while waiting for test results and facilitates faster recovery due to early initiation of treatment. It is significantly cheaper per test than other RT-PCR tests and needs minimally trained manpower at community health centres. Furthermore, Truenat is a multiplexing platform which supports tests for several diseases, including COVID-19, making it a cost effective and capital efficient solution.



How Truenat is making an impact?

- IHF-supported deployment of Truenat in two districts in Uttar Pradesh demonstrated significant improvement in testing presumptive TB patients – with 92% of the samples tested reporting results on the same day. Treatment initiation time improved by 45% as compared to the baseline, and 96% patients initiated their treatment within seven days of test results. Truenat was also validated for effectiveness as a TB/COVID-19 diagnostic test at community health centres in Uttar Pradesh with support from India Health Fund.
- IHF with The Foundation for Innovative New Diagnostics (FIND) and Municipal Corporation of Greater Mumbai (MCGM) successfully implemented India’s largest bi-directional testing for TB and COVID-19 using Truenat in five high volume COVID-19 tertiary hospitals. The initiative screened more than 17,000 antigen negative symptomatic patients, and 13,500 COVID-19 OPD walk-ins went through the TB questionnaire followed by diagnosis using Truenat. Of these, 2.7% (379) were identified as TB presumptive and 78% (297) were tested for TB (until September 2021).
- Through a global pricing agreement signed in March 2023, Truenat has been approved for worldwide scale-up by the Global Fund, StopTB Partnership and USAID⁹. The agreement will enable countries to procure the WHO endorsed-Truenat at internationally negotiated prices, making the technology more accessible and affordable across the world.

⁹ Global Fund, USAID and Stop TB Partnership's New Collaboration With Molbio Diagnostics Will Increase Access to Rapid Molecular Tests for TB - News Releases - The Global Fund to Fight AIDS, Tuberculosis and Malaria

Partners •

India Health Fund in partnership with FIND and Brihanmumbai Municipal Corporation (BMC) has implemented the bi-directional testing initiative for TB and COVID-19 using Truenat.

Molecular point-of-care (POC) diagnostics to reach the underserved

COVID-19 highlighted the importance and power of rapid molecular testing (e.g. RT-PCR based) at point of care in strengthening health systems, curbing the disease and reducing morbidity and mortality¹⁰

There is an increased need to replicate this decentralized access to molecular diagnostics and bring care closer to patients for other high-burden infectious diseases such as TB. Conventional diagnostics for TB often need expensive infrastructure and skilled technicians, limiting their use in primary health setups. By the time patients reach the secondary

and tertiary centres for diagnosis, often it is too late – the disease has advanced, infection has been transmitted to several others and the chance of recovery has drastically reduced. This is why the WHO has recommended to bring sensitive point-of-care diagnostic tests closer to patients as a key priority for global TB control.¹¹

¹⁰ [https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(23\)00044-5/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(23)00044-5/fulltext)
¹¹ PR_TrueNat_WHO_endorsement_02072020.pdf (icmr.nic.in)



HOW TRUENAT® IS ACCELERATING TB DIAGNOSIS IN GOA

A state that has transitioned 100% from age-old sputum microscopy to rapid molecular diagnosis



It has been more than three weeks that Ravi (name changed), who works in a PWD government office, has been coughing despite taking over-the-counter medicines. His colleagues are concerned and have asked him to attend the nearest Primary Healthcare Centre (PHC) to get tested for his illness. This brings Ravi to the nearest health facility in Madkai PHC, Goa.

He arrives early and registers for a consultation with the medical officer. He is worried that his condition will worsen, if the diagnosis is delayed.



Ravi consults with Dr. Geeta (name changed), who recommends a Nucleic Acid Amplification Test (NAAT) TB test to him. RT-PCR-based NAAT testing has been recommended by the WHO as an accurate and rapid TB diagnostic method, replacing the age-old sputum smear microscopy. Dr. Geeta assures that the sputum-based test is fast and he will know the test results within an hour.



Ravi promptly hands over his sputum specimen to the lab technician for NAAT testing using Truenat and finds a sitting spot to wait for his test results.



Within the next half hour, the laboratory technician prepares the sample, processes it, analyses it using Truenat machine and brings the test results to Ravi's attention. Ravi has been diagnosed with TB.

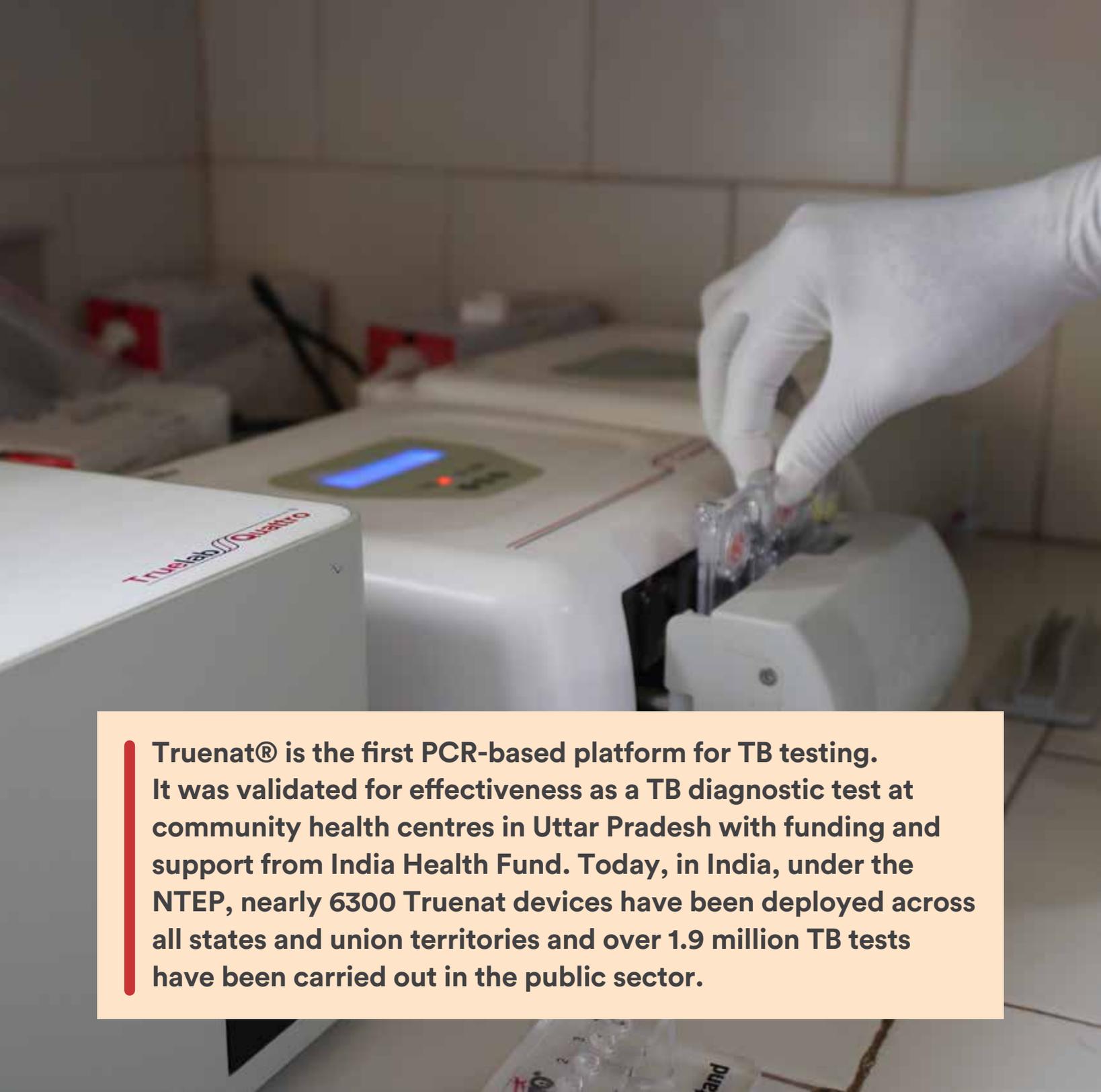


Dr Geeta informs Ravi about his illness, counsels him about the treatment and reminds him about the importance of taking medications in a timely manner and eating nutritious food to recover faster. Ravi is also briefed on infection transmission to his family and the community at large.

Immediately, on the same day, Ravi is put on a treatment regime by the National Tuberculosis Elimination Programme (NTEP), just hours after receiving his test results.



This story was captured in January 2023. Today, Ravi has recovered from TB with timely linkage to TB treatment and nutrition support from the national programme. He has resumed work, is providing for his family and has prevented the spread of infectious TB to his work colleagues and community.

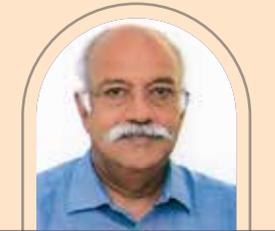


Truenat's NAAT-based testing ensured that Ravi got promptly tested for TB and was linked to treatment right away. But, hundreds and thousands of people in India still encounter delays in receiving their TB test results, and are often too late, when it comes to linkage to TB treatment.

Goa and Lakshadweep are the only Indian states that have completely replaced age-old sputum smear microscopy-based testing with NAAT technology¹². This has not only ensured that TB testing is more accurate but also has shortened the time it takes to diagnose TB and initiate treatment, thus saving lives and preventing the spread of the disease.



We are very happy to see the positive impact Truenat is making in improving case detection through early and accurate diagnosis right at the first time of patient contact. We thank India Health Fund for helping in impact assessment studies and advocacy for enabling universal access to the technology”.



Mr. Sriram Natarajan,
Director & CEO of Molbio Diagnostics

Truenat® is the first PCR-based platform for TB testing. It was validated for effectiveness as a TB diagnostic test at community health centres in Uttar Pradesh with funding and support from India Health Fund. Today, in India, under the NTEP, nearly 6300 Truenat devices have been deployed across all states and union territories and over 1.9 million TB tests have been carried out in the public sector.

¹² India TB Report 2023: Ministry of Health and Family Welfare (tbcindia.gov.in)

Our Portfolio

Digital Health Tools and Technologies for Infectious Diseases

Why invest in digital innovations for infectious diseases?

Digital technologies have become the drivers of increased productivity, economic growth, and innovation across sectors¹³. The digitization of several sectors of the economy has led to a reduction in transaction costs, improved access to services across population segments and enabled the wider participation of these sectors and segments in economic activity. However, healthcare as a sector, has lagged when it comes to adoption of digital technologies.

Challenges like limited resources and unequal coverage hinder disease management. With a projected global shortage of 10 million healthcare workers by 2030, digital innovations offer a solution to strengthen primary care delivery and data-driven decision support.

India, with its diverse healthcare landscape, can benefit by leveraging digital tools for inclusive universal healthcare. WHO estimates a billion

people could gain better healthcare access and protection through digital technologies.

However, hurdles persist. Many digital health solutions don't align with the needs of healthcare systems, leading to them not being adopted. Limited data access and funding hamper validation studies and evidence generation. Long validation timelines deter investors. Yet, the potential of digital tools in infectious and other diseases, especially at primary care, is significant. However, to harness this untapped potential of digital innovations, several challenges must be addressed.

IHF's work in digital health is focussing on design thinking and evidence generation including provider-defined use cases, solutions design, validation & evidence generation, community involvement & inclusion, investment cases, models for adoption and financing.



Digital tools hold the power to completely reshape healthcare by making advanced medical technologies accessible and affordable to everyone, everywhere, irrespective of who they are or where they live. ARTPARK recognizes how India Health Fund is leading the development of use cases and pioneering evidence generation for digital tools so that these latest advancements can achieve their true potential

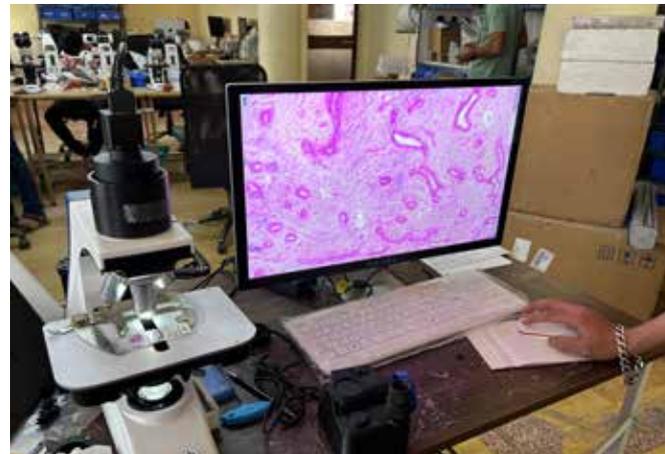
Raghu Dharmaraju
CEO, ARTPARK

The Problem

Evidence shows that conventional microscopy-based detection, which has been the primary tool for malaria detection, misses about 25% malaria cases in India; this problem is further exacerbated in hard-to-reach remote areas. One of the key reasons for this is the subjectivity that comes with dependence on skills and training of officials who use the microscopes. These limitations in traditional microscopy-based detection result in underdiagnosis and poor surveillance of malaria and other diseases.

The Solution

IHF engaged with Medprime Technologies for faster, more cost-effective and more accurate microscopy for disease diagnosis. Medprime's artificial intelligence algorithm, locally trained by machine learning, automatically detects, identifies and differentiates between malarial parasites (*P. falciparum* and *P. vivax*). This tool will be particularly useful in identifying infections with low-parasite loads, which are commonly missed by conventional microscopy.

The algorithm is microscope, disease (communicable and non-communicable) and sample (blood, urine, stool, pus) agnostic and will slash- by third- the time taken for slide viewing, image processing and result reporting. The algorithm will also overcome the need for trained manpower and will prove important for training and research for medical, paramedical and allied health staff that need remote collaboration and interoperability. IHF's support to Medprime will enable the development and pilot testing of this AI/Machine Learning (ML)-led multiplex diagnosis software. The platform algorithm can be used beyond malaria in WBC differentiation, histopathology and cytopathology for cancer, and sickle cell disease. and can run samples like blood, urine, stool, pus. Municipal Corporation of Greater Mumbai is also considering use of the algorithm as a training tool for microscopy.





AI for disease screening and diagnosis

AI holds significant potential in strengthening diagnostics and screening programs, especially at the last mile, by enhancing accuracy, speed, efficiency, and effectiveness.

According to a report by the World Economic Forum, India's expenditure on AI in healthcare is expected to reach USD 11.78 billion by 2025 and is projected to add USD 1 trillion to the economy by the end of 2035. AI algorithms can help speedily analyze and interpret large amounts of data, including slide images, X-rays, laboratory results, and cough sounds to identify patterns and detect disease-related abnormalities without manual intervention. AI can also assist healthcare workers in decision support by recommending follow-up actions based on evidence-based guidelines and best practices. This support has not only eliminated the basic human errors in screening but also made the screening and the subsequent

diagnostics faster and more robust, contributing to prompt linkage to treatment. In addition, AI can boost telepathology services owing to its capacity to transmit data and images in real time for research, educational, and diagnostic purposes. AI's potential in increasing accessibility to health services becomes especially important in remote locations where there is often a scarcity of expert pathologists and radiologists. In addition, these underserved locations often present with a shortage of medical equipment or there is a need for transferring physical samples from rural to urban testing centers, which can have safety concerns, speed limitations, and high costs. AI holds the power to circumvent many of these hurdles.

Non-invasive patient-friendly AI-led mobile application that can detect active TB cases in minutes by analysing cough sounds

The Problem

In 2021, out of 22.3 million patients screened for TB through government programs, 73,772 patients were identified through Active Case Finding¹⁴, an established measure for systematic disease screening in high-risk populations such as frontline health workers, people with HIV, diabetes, chronic kidney and liver disease and patients on immunosuppressants. Currently Active Case Finding uses manual methods like visual inspection, patient questionnaires, and assessing exposure to TB-infected individuals, but these have limited clinical application due to the associated subjectivity in understanding symptoms and deducing test results. This leads to about 64% of symptomatic TB patients, who are unable to seek appropriate care¹⁵ at the right time, leading to living with disability or mortality. There still exists a need for near-patient, affordable, rapid and sensitive screening tools that can help find the millions of active TB cases that often go undiagnosed.

The Solution

IHF and ACT For Health co-funded the development of Swaasa® - an AI Platform by Salcit Technologies that records cough sounds from patients using a phone's microphone and analyzes them to decode unique cough signatures to detect the possible presence of pulmonary tuberculosis using a proprietary AI algorithm and gives a report in just a few seconds. Salcit's non-invasive innovation can run on any smartphone, requires no additional equipment and offers the key advantage of being used by patients themselves in the confines of their households, reducing the risk of infection spread or the need for trained staff. It can also be easily used by frontline health workers in low-resource and remote settings and thus, promises to be easily scalable to enable early detection of the disease.



¹⁴ Annual TB Report 2022 – Central TB Division
¹⁵ National TB Prevalence Survey 2019 – 2021

Funding by IHF and ACT For Health will aid Salcit Technologies in the technical validation of the Swaasa®'s AI algorithm. The project will include the collection of cough sounds from about 5700 subjects (TB and Non-TB), the technical validation of the platform across 6 public health centers and the enhancement of the platform to reach an accuracy of 90% for detecting the likely presence of TB. Unlike other cough screening algorithms coming to the market, Swaasa® is a multi-focus platform that can be used for screening of various lung ailments.



Partners

The project is co-funded by IHF and the non-profit venture philanthropy platform ACT for Health. Salcit Technologies has partnered with Google Health with the aim to enhance Swaasa's algorithm for TB detection. Additionally, Salcit Technologies is working closely with AIIMS Delhi, to develop a protocol for pulmonary TB detection through Swaasa, and to clinically validate it at various AIIMS institutes across the country.

The Problem

In India alone, there were 3.37 lakh cases of malaria and 1.30 lakh cases of dengue between April 2020 and March 2021. Widely used vector control practices like fogging and anti-larvae operations are only partially effective as these methods do not consider the specific treatment requirements for different species of mosquitoes owing to the lack of species-specific data from surveillance. Currently, vector surveillance, which is integral to vector control, depends on manual processes for sample collection and requires entomologists for analysis and reporting. The time required for this, and the shortage of entomologists makes timely vector control activities difficult to implement.

The Solution

IHF engaged with TrakitNow to develop Moskeet, which is the world's first commercially available smart mosquito trap that can autonomously identify and measure concentrations of different species of infected mosquitoes in real time and enable effective vector surveillance and control activities for Malaria, Dengue, Chikungunya, Japanese Encephalitis and Zika Virus. The smart device includes a trap that captures a broad spectrum of mosquito species using multiple attractants and sensors. Light and audio sensors then capture wing beat frequencies, that are used to decipher mosquito species and gender using artificial intelligence. Internet of things is then



deployed to send the collected data in real time. Owing to its autonomous operation and real-time data transmission capabilities, Moskeet overcomes the challenges of slow manual data collection and the shortage of epidemiologists to analyse & interpret data.

Our Impact

Moskeet is being used by several communities across five cities in India (Hyderabad, Thiruvananthapuram, Panjim Smart city, Vijaywada, Yanam-Puducherry), touching lives of 3,25,000 people so far.

The innovation has already shown:

- It gathers and interprets disease surveillance data 20 times faster, 3 times more accurately, and at 15% of the current cost of manual methods
- Nearly 85% savings on surveillance with value addition of real-time data;
- Reduction in fumigation costs by 20% through identification of more effective pesticides; and
- Helped focus resources on high-risk areas, thereby reducing the mosquito populations by 60% and decreasing the disease burden by 40%
- On the global stage, Moskeet was listed in the United Nations Development Program (UNDP) Solution Catalog, which is accessible by 170 country offices, where it can be considered for adoption and scaling up.
- Moskeet's pilot project has just been initiated in G South ward in Mumbai in collaboration with Municipal Corporation of Greater Mumbai. This pilot will aim at mosquito management and monitor insecticide susceptibility.
- Machine learning data sets completed for a total of 10 species of mosquitoes. The data sets have also completed field validation at Regional Medical Research Centre (ICMR affiliate), Bhubaneswar.

Our Partners

IHF has enabled partnerships through Tata Trusts (Collectives for Integrated Livelihood Initiatives (CInI)), for the pilot deployment of TraktItNow's surveillance technology Moskeet in Bhopal and Balaghat in the state of Madhya Pradesh in coordination with the State Nodal Officer, NVBDCP and the district malaria officer.



Using AI for strong disease surveillance and for tackling the impact of climate change

Climate change is hastening the global resurgence and redistribution of infectious diseases. As pathogens mutate and evolve to adjust to rising temperatures and shifting rainfall patterns, the world is witnessing emergence of new diseases and altered epidemiology of existing diseases.

Vector-borne diseases like Malaria and dengue are reacting quickly too with instances of malaria at higher altitudes, where previously low temperatures offered protection from mosquitoes⁸. Increased occurrences of extreme weather events like cyclones and unforeseen floods are causing malaria spikes due to waterlogging. These environmental changes are also altering mosquito breeding sites and life cycles. For example, *Anopheles stephensi*, which was until recently found largely in Asia, has now been identified across Africa¹⁶. In India too, dengue and malaria cases are witnessing unusual trends¹⁷.

All these climate-related changes are catching people off the guard, leading to increased disease occurrence and mortality.

Strong vector surveillance, a key pillar of IHF's work, along with climate, environmental and human data is the need of the hour if we are to understand disease patterns, predict outbreaks and support data-backed public health decision making to mitigate the impact of climate change on vector-borne diseases. AI is one such technology that can better vector-borne disease surveillance.

¹⁶ Felled By A Warming World: Will Malaria Be The Next Pandemic? (forbes.com)

¹⁷ The resurgence of dengue epidemic and climate change in India - The Lancet

The Problem

The side effects of TB medication often lead to a lack of treatment adherence by patients. Patients do not always complete a prescribed course of treatment, leading to the emergence of drug-resistant forms of TB and disease recurrence by 6-fold. Ensuring proper adherence to medication can significantly reduce these risks, and this practice currently depends on healthcare workers following up manually with patients.

The Solution

IHF engaged with SenseDose Technologies on TMEAD (Tuberculosis Monitoring Encouragement Adherence Drive), which is a physical reusable device that helps TB patients successfully complete their treatment using digital adherence technology. The device is pre-filled with medicines as prescribed for the patient, which are also pre-sorted by dose. The device uses Internet of Things & cellular network technology to remind patients, dispense medicines, monitor their uptake and rings a physical alarm as well as sends digital reminders when patients miss their medication. It also notifies health workers in real time about patients' adherence to treatment, thereby easing their workload, enabling remote patient monitoring and improving case tracking. It also helps them keep a track of patient prescription, which reduces the time a certain patient has to spend at primary healthcare center, thus reducing the risk of spreading the disease.

TMEAD is a Platform technology that can be used for any illness that has long treatment duration.



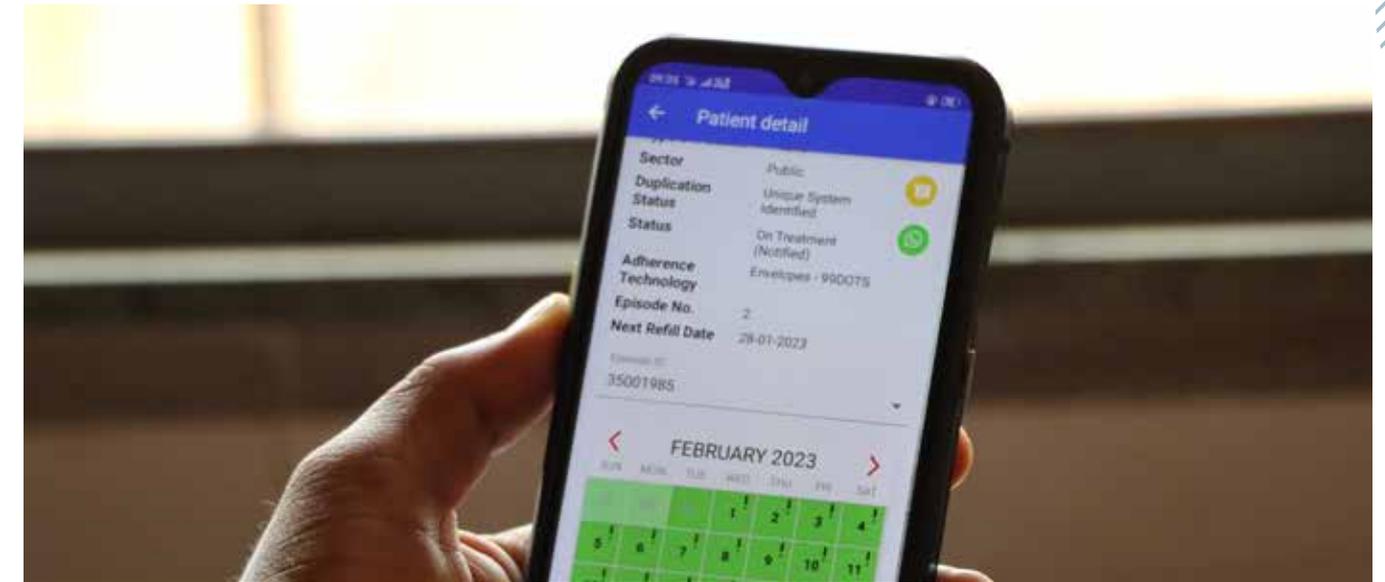
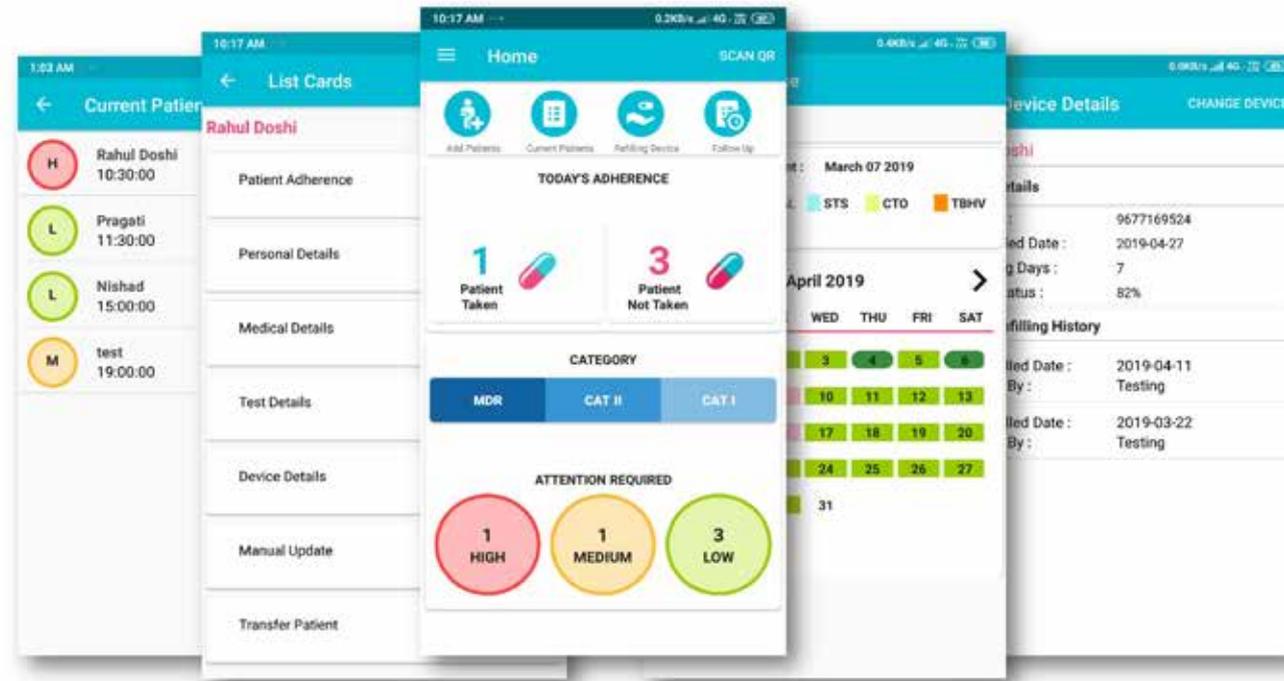
Our Impact

- The device has been used by more than 800 patients undergoing treatment for drug-sensitive and drug-resistant TB till date in Maharashtra & Gujarat.
- TMEAD's health technology assessment was completed by IIPHG, Gandhinagar, showing high levels of treatment adherence in the TMEAD intervention group (99%) as compared to the control group (90%).
- The health technology assessment of TMEAD by Dept. of Health Research (DHR) revealed that treatment adherence is high with TMEAD

compared to standard therapy of care for DS-TB patients and the intervention is cost-effective. The results have led the device being recommended to the Central TB Division (CTD) for use in the NTEP. Based on DHR's presentation to CTD, TMEAD will be required to be integrated in the Nikshay platform, which will allow reporting of patient treatment adherence on the platform and supplement TB case notification and monitoring efforts. Based on these positive outcomes, TMEAD is currently being recommended by CTD to the states.

Our Partners

Sensedose Technologies, along with IIPHG have engaged with the Govt. of Gujarat, and municipal corporations of Nashik and Thane to pilot the use of TMEAD, the digital adherence device for patients suspected with DS-TB and DR-TB.



Internet of Things, AI and treatment adherence

According to the National Strategic Plan 2017 to 2025 published by the Central TB Division, there can be multiple barriers to TB treatment adherence such as stigma associated with the disease, challenges in accessing health facilities, and shortage of healthcare workers to support with treatment.

Digital adherence technologies based on AI and Internet of Things offer user-friendly, accessible, and affordable ways to support patients in their disease treatment journey. Keeping people's needs, preferences, and experiences at

the centre, these digital tools hold the potential to improve patient outcomes, enhance patient experience, increase engagement, and promote the overall effectiveness of the innovation.

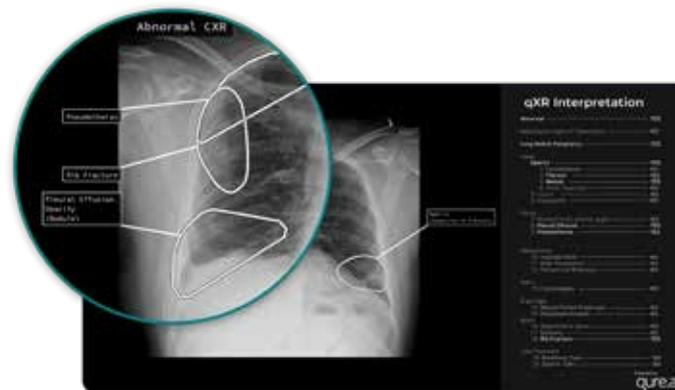
The Problem

The widespread use of analog X-rays for the diagnosis of TB in low-resource settings results in long lead times for diagnosis & initiation of treatment, and several cases going undiagnosed due to the lack of trained radiologists & clinicians at many locations. In the absence of an effective screening tool, the burden on confirmatory tests is higher leading to increased costs of testing and turnaround time and more false positives.

The Solution

IHF and Qure.ai identified this problem and developed a smartphone-based application, which uses novel AI algorithm qXR to screen patients for TB by analyzing chest X-ray of a patient, with minimal training required for a technician. A smartphone captures an analog chest X-ray and Qure.ai algorithms analyze the X-ray to allow faster screening and diagnosis of patients for TB. This is a breakthrough in improving the identification of missed cases of TB due to the non-availability of clinicians. It will also help to reduce the number of confirmatory microbiological tests required, enabling better resource utilization and also reduces the number of false positive tests. The algorithm has also been adapted to identify lung damage for other lung conditions including COVID-19. CE certified and WHO-recommended qXR is trained and tested on over 4.2 million chest X-rays using deep learning.

qure.ai



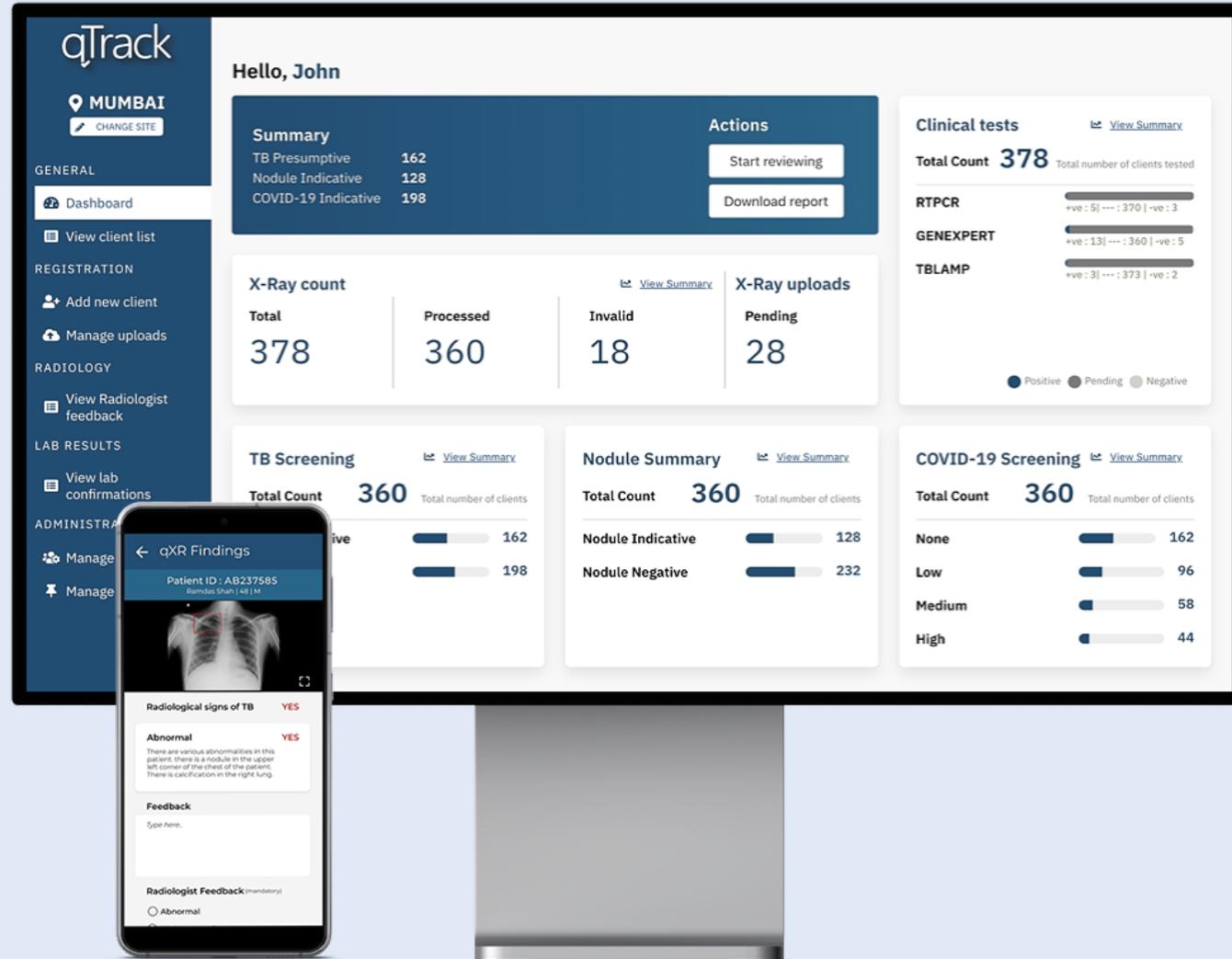
Our Impact

Since the launch in 2020, the IHF-supported pilot of qXR has scaled to more than 100 hospitals across 17 Indian states, a majority of which include primary and secondary government facilities and charitable trust/ mission run hospitals. Together, as of today, qXR has screened over 75,000 individuals for TB.

- With qXR, there has been a reduction in diagnosis turnaround time, with referral for confirmatory diagnosis becoming possible within 2 mins. A comparative analysis of the treatment enrolment time before and after the software was deployed in a tertiary care centre in Rajasthan showed a 2.5 day reduction in treatment enrolment time, from 5.7 days to 3.2 days after introduction of qXR¹⁸.
- Owing to its high sensitivity (more than 90%), the use of qXR has reduced the requirement of follow-on testing by 50%¹⁹.
- qXR's deployment has led to 20% increase in identification of incidental cases in Mumbai's seven peripheral hospitals.
- qXR has been independently evaluated by the WHO against a library of digital radiographs and associated clinical data, based on which it has been included as part of WHO's updated guidelines on TB screening.
- qXR was adapted for triaging COVID-19 along with TB. IHF facilitated the fundraising and deployment of the qXR solution for COVID-19 with the Municipal Corporation of Greater Mumbai (MCGM), bolstering its COVID-19 response efforts across 15 sites in Mumbai. This joint initiative resulted in processing of 25000 chest X-rays, and reduction in COVID-19 detection time to under a minute.

¹⁸ Case study template_Baran_Redesigned_20_07_2022 (qure.ai)

¹⁹ [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(21\)00116-3/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(21)00116-3/fulltext)



Partners

The IHF-Qure.ai partnership is strengthening TB screening across India in alliance with various implementers on the ground. Current deployments include:

- Seven civil hospitals in Punjab in collaboration with National Health Mission (NHM), Punjab and the State TB Officer; and five districts in Karnataka with NHM Karnataka and Karnataka Health Promotion Trust.
- Three underserved tribal districts in Chhattisgarh with Piramal Swasthya foundation; and tribal populations in Maharashtra with SEARCH Gadchiroli and State TB Control Centre, Nagpur.
- Comprehensive lung health coverage program in Tamil Nadu with Reach India and the Municipal Corporation of Chennai.
- Detection of household contacts of TB patients in Osmanabad district with Ashakalp.
- Harnessing the expertise of ASHA workers to further the reach of qXR-based TB screening in Rajasthan with Khushi Baby.

HOW AI IS BRINGING HEALTHCARE EQUITY IN A MINING TOWN



Bellary district, nestled in northern Karnataka, India, it is known for its iron ore mining. But, there is a public health side of the story calling for attention.

The 2012 audit report from the Controller and Auditor General (CAG) has highlighted that indiscriminate mining activities in the region have had negative impact on the health of Bellary's inhabitants²⁰. Diseases like tuberculosis (TB) & respiratory ailments surged in prevalence. Take in Sandur, for example: TB cases nearly doubled from 45 to 88 between 2006 & 2010, & respiratory disorder cases jumped from 14,902 to 20,251.

Bellary's healthcare faces a pressing challenge: a scarcity of radiologists. This places an immense strain on the handful of available clinicians. Yet, amidst adversity, healthcare workers showcase resilience, employing technology innovatively to bridge the gap.



²⁰ <https://www.newslaundry.com/2017/02/01/red-dust-and-slow-death-in-bellary>



Dr Indrani Vokuda, DTO Bellary reflects on this struggle in TB detection, stating, "We have a digital x-ray setup at Wellesley Hospital. We have a pulmonologist, and a full-fledged HR at Wellesley Hospital, except for a radiologist. We were finding it quite difficult to utilise the X-rays, promptly read the X-rays and diagnose whether the cases were abnormal or whether they needed intensive tests.



Dr Indrani Vokuda
District TB Officer, Bellary

Enters Qure's AI-driven Intervention. The escalating TB cases, compounded by the radiologist shortage, urgently needed a solution. That's when Qure's AI-driven X-ray screening tool, qXR, coupled with their disease management platform, qTrack app, took centre stage. Thanks to India Health Fund's support, qXR debuted at Government Wellesley Tuberculosis & Chest Diseases Hospital in November 2022. This tool rapidly became instrumental in detecting TB cases.

Over the last 8 months of operation, Wellesley Hospital processed 875 tests and identified 521 presumptive TB cases.

Encouraged by the success at Wellesley TB Hospital, the DTO has championed qXR's deployment across other regions of Bellary. Health teams from Tekkalkote, Kurugodu, and Moka have been trained and initiated, with Sandur, Kampli, and Sirugguppa soon to follow.



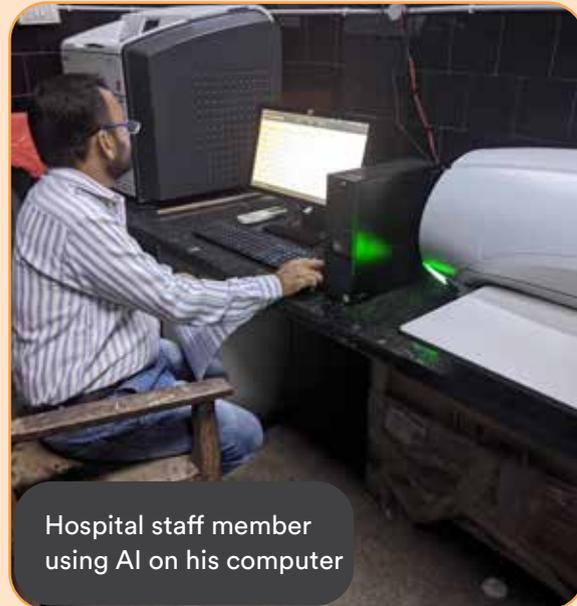


“Qure’s solutions will add immense value if installed in the periphery locations where several X-rays are taken but there is no one to read them.”

Dr Indrani Vokuda
District TB Officer, Bellary

Deploying Qure.ai’s solutions at Wellesley Hospital helped reduce the testing turnaround time to minutes, assisted with faster and more accurate detection and led to earlier diagnosis by doctors.

“X-rays are read on the spot through qXR/qTrack. Between November 2022 and April 2023, 752 CXRs uploaded, 480 were abnormal, 382 were sent for sputum sampling. 75 TB positive cases were detected among them i.e., 21% positivity. This is a huge breakthrough for NTEP in Bellary. It will save a lot of time in diagnosis, for the patient as well as the doctor as an immediate response can be given to the patient with this. An image has to be uploaded onto the mobile application which gives back results, whether abnormal or normal, almost immediately. Once the results are in, on-spot sputum samples can be collected from the patient and get a confirmed result. Patients are promptly put on treatment thereby reducing the delay. It spares a lot of time between diagnosis and testing and treating. Qure’s AI applications are the need of the hour.” – Dr. Vokuda, DTO, Bellary on the impact of qXR & qTrack



Hospital staff member using AI on his computer



Shashavali Nalband,
Senior Radiology Imaging Office



“In my 22 years of experience, I have come across such a useful tool for the first time. Once a picture of the X-ray film is uploaded, we get the report in 1 or 2 minutes which indirectly benefits the patient. In a government setup where radiologist is not available, there’s no facility to read the x-ray or get reports. But, with Qure AI’s software, we get the exact report within a minute. Seeing the clinical conditions and this report, we may be able to give justice to the patient with a clear treatment plan. According to me, installing this app will help patients in interior areas (talukas and villages) if every government hospital is equipped with Qure’s AI tools.” – Shashavali Nalband, Senior Radiology Imaging Officer in Bellary, says on usage of qXR and its impact.

Bellary is one of the many success stories in the Qure.ai – India Health Fund-led partnership to empower remote and resource-constrained hospitals in TB-burden areas in India to tackle the problem of missed cases and improving clinical decision-making.

The Problem

Effective monitoring and surveillance of vector-borne diseases like malaria is of paramount importance for the prevention of and timely response to outbreaks. One of the key aspects of surveillance is timely data/information collection and processing it forward for timely decision making, which goes through different steps from sub-centre level onwards. Current primary care-level surveillance and reporting is based on time-consuming and error-prone manual and paper-based methods that face several systemic and operational challenges such as slow speed and lack of real-time reporting, absence of consistency across different states, poor data back-up and storage possibilities, as well as lack of proper data analytics for identifying disease trends.

A robust real-time and complete surveillance system that addresses these bottlenecks has been identified as a core need in the National Framework of Malaria Elimination as well as Global Technology Strategy of the WHO.



The Solution

IHF collaborated with The Ministry of Health and Family Welfare's National Vector Borne Disease Control Program (NVBDCP), Government of India, to strengthen malaria surveillance by supporting the development of a digital dashboard with 10 years of retrospective data, which is useful for data analysis, and knowledge building as India gets closer to the elimination goal. The project was delivered in 2022. Today, the dashboard is being used to track key metrics such as total cases recorded, total positive cases, no. of rapid diagnostic tests being performed, no. of blood slides examined, distribution of cases by age, no. of severe cases and deaths at national, state and block/taluka level. In future, the dashboard holds potential to integrate malaria case data with climate and other data, and implement analytics to assess disease trends, outbreaks and determine the response, quantify, and forecast resource requirements, assess program performance, and adjust interventions.



State	Total Preset (in 1000)	BRU	API	ABR	Total Case	Mixed Cases	PF Case	PV Case	PF%	SPR	SPR	Deaths	Tribal Districts	Cross Border Districts	Aspirational Districts
India	1,211,500	128,044,798	0.88	9	1,067,024	8,525	524,370	534,129	48.98	0.49	0.06	519	0	0	3
Category 1															
Himachal Pradesh	8,397	405,511	0.04	7.44	216	0	3	218	1.88	0	0.08	0	3	2	1
Rajasthan	28,561	2,911,782	0.06	10.19	1,669	0	43	1,646	2.55	0	0.06	0	0	6	2
Chandigarh	1,060	86,991	0.19	8.21	201	0	3	198	1.49	0	0.23	0	0	0	0
Uttarakhand	10,191	287,013	0.19	2.62	1,948	0	111	1,837	5.7	0.04	0.73	0	0	3	2
Haryana	25,678	2,813,189	1.04	10.86	26,819	0	589	26,250	2.12	0.02	0.85	1	0	0	1
Delhi	16,753	350,515	0.02	2.27	382	0	1	381	0.28	0	0.1	0	0	0	0
Rajasthan	71,292	8,391,438	0.84	12.05	45,808	107	1,267	44,419	3.04	0.02	0.53	22	6	4	3
Sikkim	200	6,574	0.38	3.24	77	0	14	65	18.18	0.21	1.17	0	4	3	1
Manipur	2,728	115,257	0.09	4.23	235	0	83	172	32.55	0.07	0.22	0	5	3	1

Our Partnerships

Stronger together -- collective action is critical to the work of India Health Fund. Over the last five years since inception, India Health Fund has created a first-of-its-kind platform for collaboration between government, public and private sectors to come together in the development, validation, financing and scale-up of innovations to tackle infectious diseases.

Today, we have woven a network of 30 partners (and counting) so far. Together, what we have achieved is far greater than what any of us could have individually envisioned. From technical experts who have helped us sharpen the need gaps in infectious diseases and find the most promising innovations; to incubators and implementers who have supported in the development and validation of our portfolio innovations; to funders who have joined the cause and amplified the impact manifold; to scale-up partners including large-scale manufacturers as well as state and national governments, who have helped take the innovations to the masses – to all these partners we are very grateful.

Here is what some of our partners had to say about their collaboration with IHF

SINE and IHF have joined hands to support startups to strengthen the primary health care in the domain of communicable diseases. Both organizations are looking forward to working together to reduce the health, social and economic burden of communicable diseases in India. The work under this strategic partnership will focus on prevention, early diagnosis, treatment and eradication measures to combat communicable diseases that disproportionately affect poor and marginalized populations.

Dr. Poyani Bhatt,
CEO, SINE-IIT



AIC-CCMB is glad to be a core partner of India Health Fund. With our strength in incubation of early-stage technologies and IHF's expertise in supporting late-stage development and deployment of innovations, the two organizations are complimentary in ensuring that game-changing technologies don't fall into the valley of death and are able to realize their true potential in bettering public health.

Dr. N. Madhusudhana Rao,
CEO, AIC-CCMB



BCKIC congratulates IHF on celebrating 5 successful years in building comprehensive healthcare ecosystem through innovative solutions. It has been a great experience to collaborate with IHF on some of the neglected diseases for which effective solutions are much warranted. The well integrated IHF-BCKIC Foundation partnership is a conscious effort towards identifying and nurturing promising healthcare solutions focussed on country specific needs. Within a year, together we have evaluated 50+ technologies and promising ones are now being nurtured in association with network partners. These concerted efforts shall lead to added life-saving solutions for infectious disease diagnostics and management.

Dr. Mrutyunjay Suar,
Chairman, BCKIC





This past year, India Health Fund and ACT Grants aligned to support development and adoption of science and tech innovations to address unmet public health needs. The association holds the potential to be a catalytic instrument to advance healthcare accessibility and affordability in India and beyond. We have been very impressed with the panel of experts IHF has been able to corral and we learnt a lot from the round tables

Neetha Joy,
Director, Health, ACT Grants



To assist IHF that catalyses the country's mission, Google is collaborating with IHF and their Portfolio companies to rollout and expand Google's Open Health Stack (OHS) and HealthAI portfolio in India. This engagement enables deeper and more meaningful collaborations and unlocks further opportunities for other health-related collaborations in India between IHF and Google. The OHS stack will be evangelized with the IHF Portfolio companies to further accelerate adoption and deployment of Health AI technologies followed by exchange of best practises and infuse innovations within India and across the globe

Harsh Dhand
APAC Research, Health AI and
Core Partnerships Lead, Google



TATA TRUSTS



United Way Bengaluru



About IHF

India Health Fund (IHF), incorporated as Confluence for Health Action and Transformation Foundation (under Section 8 of Companies Act, 2013), was seeded by Tata Trusts in 2017 with strategic support from The Global Fund to fight AIDS, Tuberculosis, and Malaria. IHF was conceived to help accelerate India's progress towards the elimination of infectious diseases by funding de-risking of the development of science and technology-based innovations which have the potential to make a significant difference in achieving better outcomes in the diagnosis, treatment and prevention of infectious diseases. IHF supports the development of effective business models, enables collaborations, and develops financing mechanisms for the wide scale-up of these solutions.



www.indiahealthfund.org