Impact first.
Always

Annual
Impact Report
2024

Delft.care

Touched over
32 million people
in **85+ countries**

Paving
the way...

From our CEO
Guido Geerts

Health for all
Innovations for impact

Equitable healthcare for underserved and vulnerable communities is the core of Delft Imaging's mission. In 2024, we are proud to have collaborated with countries worldwide to strengthen healthcare systems, particularly in underserved regions.

Last year, the WHO Global END TB symposium highlighted the need to address asymptomatic TB, which is responsible for nearly two-thirds of global transmission. Timely detection, immediate treatment, and increased access to high-quality digital X-ray systems and computer-aided detection (CAD) solutions are essential in disrupting the transmission cycle. This year's case studies show that our integrated solutions are crucial in streamlining case-finding by rapidly triaging presumptive TB, reducing patient waiting times, and lowering molecular testing costs globally.

Sustainability remains central to our efforts. Our solar-powered screening solutions continue to ensure that our TB programs worldwide significantly reduce CO2 emissions and biomedical waste from molecular test savings.

Our contributions to maternal health are equally vital. BabyChecker, operational in over 10 countries with two more upcoming projects, addresses preventable maternal mortality by easing access to antenatal care in hard-to-reach regions. The latest update includes improved pregnancy risk prediction and multilingual support to ensure timely interventions for mothers and babies in diverse healthcare environments.

Looking ahead, we remain committed to driving innovation, collaboration, and impact. By leveraging AI solutions and data connectivity, we provide healthcare systems with solutions that enable active case-finding strategies, bridge critical gaps in TB and maternal care, and improve health outcomes for marginalized populations.

We invite you to read our 2024 Annual Impact Report to learn how our solutions, impact, and collaboration improve healthcare worldwide.

By working together, we build healthcare systems that leave no one behind.

Sincerely yours,
Guido Geerts

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01.

2024 highlights

01.1 Our impact at a glance

32M+

People reached
by our solutions.

85+

Countries
deployed our screening solutions.

34

Countries
in 2024.

2.6K+

Solutions
deployed at communities and health facilities.

810+

Solutions
in 2024.

2.8K+

Health professionals
participated in capacity building programmes.

1.6K+

Professionals
gained knowledge of medical imaging and AI solutions.

in 2024

1K+

Health professionals
received training from us for X-ray & AI use.

in 2024

100%

Solar-powered
ultra-portable X-rays.

in 2024

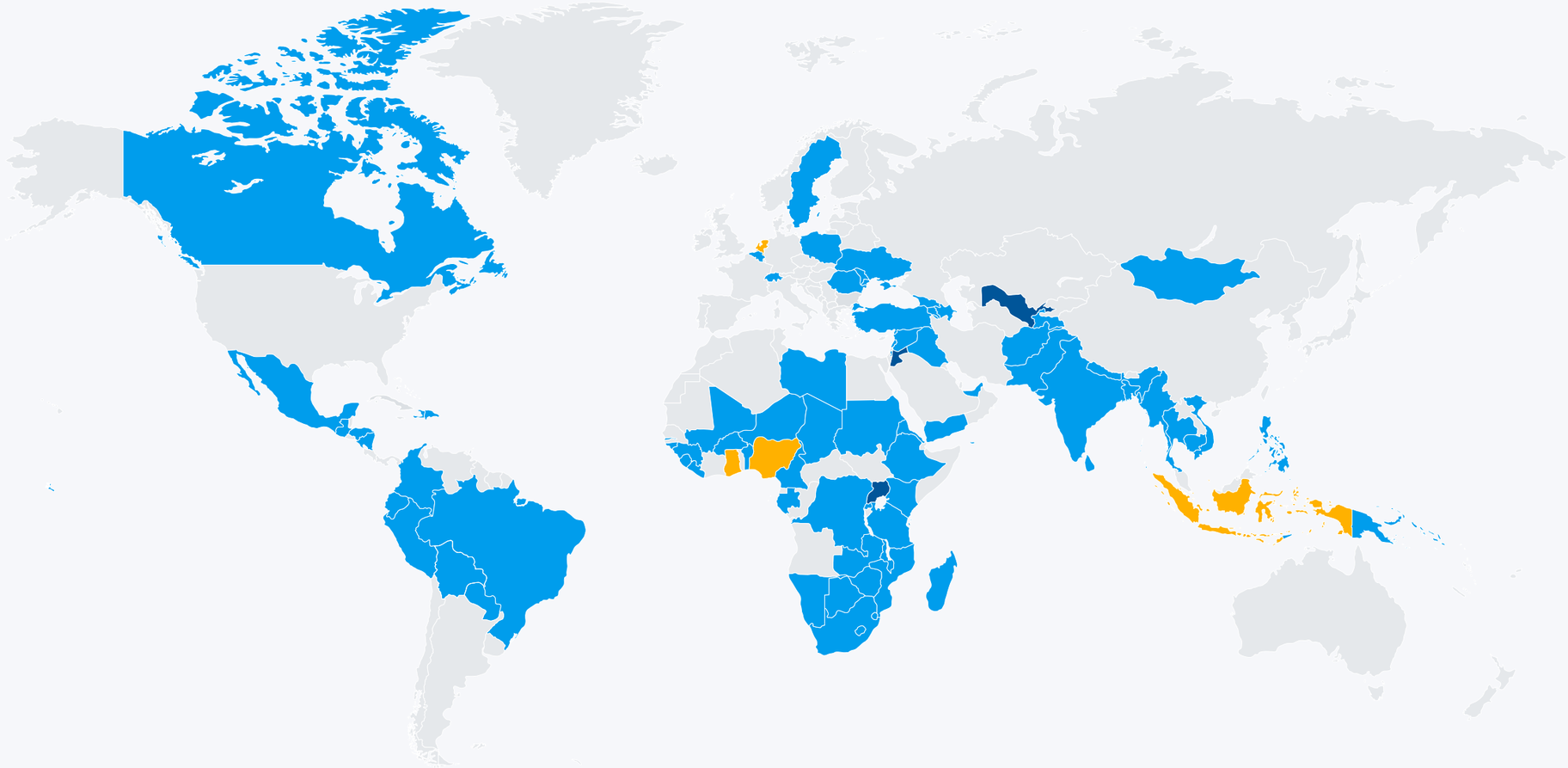
<20 min

Technical inquiries
average answer time.

in 2024

01.2 Where we made an impact

- Over 2,660 solutions are deployed across 85+ countries to support tuberculosis, lung health, and maternal health.
- Our headquarters is in the Netherlands, and with our regional training and technical support centers in Ghana, Nigeria, and Indonesia.
- 24/7 helpdesk and local partners in 55+ countries continuously support clients' operations with on-site and web-based technical support and services for high system uptime and sustainable health impact.



Solutions deployed

Offices
The Netherlands
Ghana
Indonesia
Nigeria

Hubs
Jordan
Uganda
Uzbekistan

01.3 Operations summary 2024

Global reach for TB impact and health systems strengthening

58 **Projects implemented**

in 2024

34 **Countries**

including challenging operating environments.

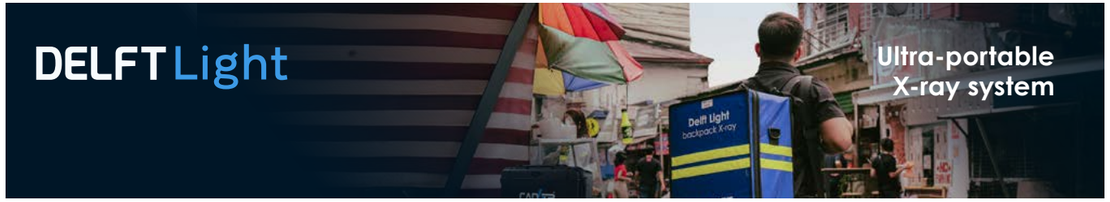
in 2024

96 % **On-time delivery rate**

responding to global high demand to scale up digital X-rays and CAD4TB.

Photo credit: Antonne Santiago // **Location:** The Philippines // **Organization:** Delft Imaging

Improved performance and usability



x2 **Exposure capacity**

from 200 exposures/day to 400 exposures/day.

15 % **Lighter**

for the total solution, enhancing ease of transportation.

Improved design for multifunctional X-ray examinations

of the chest and other body parts for adults and children.

01.3 Operations summary 2024

Improved performance and usability

Dynamic threshold

provides simpler access to an optimized threshold for screening projects in different settings.

12

In-platform languages

English, French, Arabic, Bahasa Indonesia, Bengali, Portuguese, Russian, Spanish, Tagalog, Thai, Urdu, and Vietnamese.

Enhanced diagnostics (next to TB score) and **people-centered approach** for **multi-disease impact:**

Abnormality score to detect general lung abnormalities.

Cardiothoracic ratio to help assess the presence of cardiomegaly.

Enhanced customer experience

< 20 min

Technical inquiries

average answer time.

in 2024

< 8 h

IT issues

average resolution time.

in 2024

Sustainable return and repair policy

to reduce environmental impact while maintaining high standards of service and sustainability.

4.8/5

Customer satisfaction

with helpdesk support.

in 2024

01.3 Operations summary 2024

Empowering users

1K+

Health professionals

trained in X-rays and CAD/AI use.

26

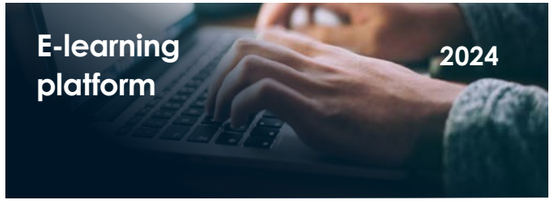
Countries

participated in our training programs.

92%

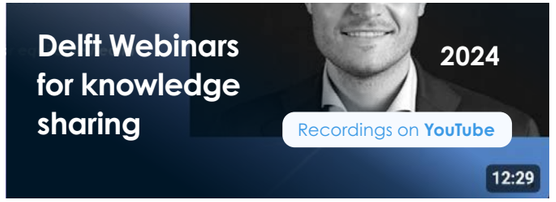
Excellent
Very Good
Good

rates for our trainings.



Continuous learning and re-training

on digital X-ray systems and CAD4TB.



Live webinars

to facilitate knowledge and best practices among health professionals leading the fight against TB and safer pregnancies.

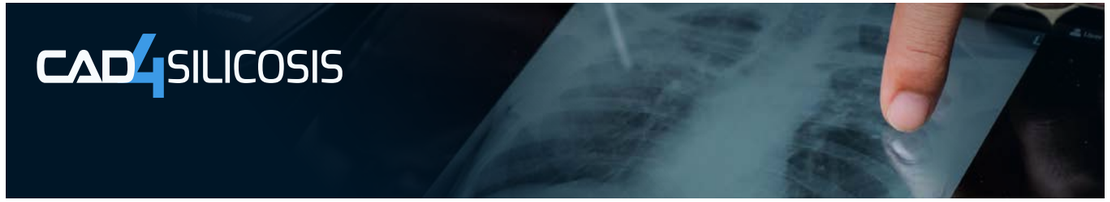
1.6K+

Health professionals

gained knowledge of medical imaging and AI solutions.

01.3 Operations summary 2024

Innovation in TB & lung health



AI-driven CAD pioneers for Silicosis detection in chest X-rays

Silicosis is an occupational lung disease common among miners and a major factor in TB. Leveraging our expertise in CAD4TB, we help partners integrate this innovative AI-powered solution into Silicosis/TB screening for key populations and communities, enabling early disease detection.

Studies in South Africa show promising results of CAD technology

with the potential to come close to human expert readers in identifying TB and Silicosis among miners.

Ehrlich, R. et al. 2022, Int. J. Environ. Res. Public Health)

Alternative/complementary to chest X-ray in high TB prevalence areas

especially where resources are limited. This AI-powered novel imaging solution is ultra-portable, bedside, cost-effective, and radiation-free, making it ideal for screening and triaging TB and other lung conditions, including in children.

Studies are currently being conducted in Africa and Latin America.

POCUS can aid diagnosis in children in low-resource settings

At the Union Conference, it was highlighted that POCUS may play a role in supporting diagnosis in children in resource-limited settings where access to X-ray and microbiological confirmation is limited, and pediatric TB is often diagnosed based on clinical grounds.

01.3 Operations summary 2024

Global recognitions

- The **Oryx Prize**, awarded by Het Financieele Dagblad (the Dutch Financial Times), recognizes the fastest-growing companies in the Netherlands that demonstrate a strong commitment to social and environmental impact. This prestigious award highlights our dedication to sustainable innovation and the mission to address critical global health challenges.
- **Impact Scaler Award 2024** from the **Erasmus Centre for Entrepreneurship**. This award recognizes our achievements in combining sustainable growth with positive social impact.
- Nomination for **King Willem I Awards** (*Koning Willem I Stichting*) in Small-Medium Sized Enterprise and Sustainable Entrepreneurship categories. This esteemed recognition in the Netherlands honors Dutch organizations' quality of "courage, decisiveness, perseverance, sustainability, and innovation."
- **Health Tech Company of the Year Award** from Health Tech World.

Partnership and collaboration

TB & lung health

- Continuous collaboration with the **Stop TB Partnership's Global Drug Facility (GDF)** catalog for our Delft Light ultra-portable X-ray, CAD4TB AI software, and training and support services for fast-track procurement, supporting systematic TB screening globally.
- Active member of the **Stop TB Partnership's Private Sector Constituency** and the **International Union Against Tuberculosis and Lung Health.**

Maternal health

- In collaboration with the Centre for Economic Research in Pakistan (CERP), BabyChecker will be deployed across 25 health facilities at the Tehsil level and through community outreach programs in 8 districts of Pakistan.

Managing directors

Florent
Geerts

Mohammed
Harbiye

"Access to quality healthcare should not be a privilege, but a reality for all. In 2024, Delft Imaging continued to strengthen healthcare systems worldwide by providing solar-powered digital X-ray systems and AI-enabled solutions. Through local capacity-building, such as training for healthcare workers and ongoing service and maintenance support, we are working to create a lasting impact in underserved communities. Together with our global partners, we are dedicated to bridging critical gaps in lung health and maternal care, ensuring no one is left behind."

01.4 Impact of CAD4TB on TB screening yield and efficiency

Most rigorously validated
CAD technology globally.

Over 110 publications
in highly respected journals.

High accuracy

- Multiple studies confirm that **CAD4TB meets the WHO's Target Product Profile (TPP)**, demonstrating >90% sensitivity and >70% specificity.
- Multiple studies confirm that **CAD4TB performs better than human expert readers.**

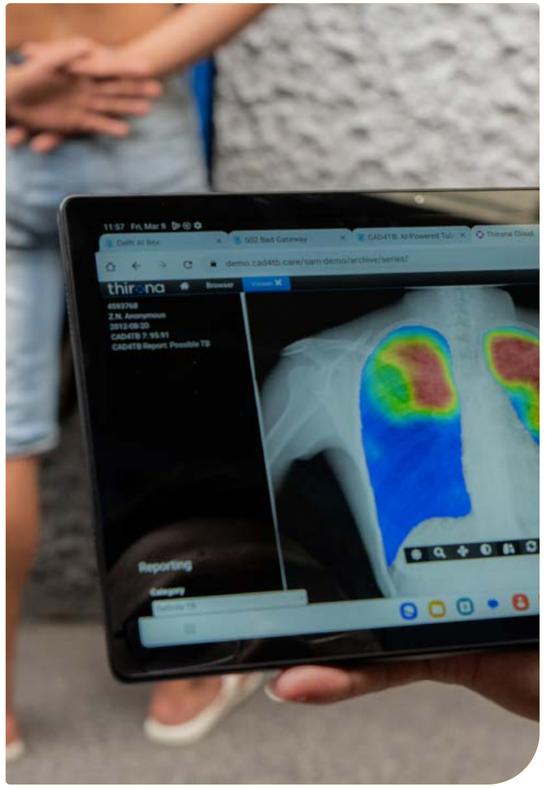


Photo credit: Antonne Santiago // **Location:** The Philippines // **Organization:** Delft Imaging

Operational efficiency

Nigeria

4 times more TB cases detected when combining W4SS with Delft Light and CAD4TB.

Babayi, AP. et al. 2023, Public Health Action.

Pakistan

Combining chest X-ray analysis by CAD4TB and symptomatology is of immense value in screening a large population at risk in a developing, high-burden country. It's cost-effective for screening and early active TB case finding in patients and their contacts, who would otherwise go undiagnosed.

Nishtar, T. et al. 2021, Pakistan Journal of Medical Science.

The Philippines

CAD4TB as a second reader showed a 22% increase in TB detection and could help detect additional TB-positive cases that were initially missed at limited additional costs.

Philipsen, R. H. H. M. et al. (2019). IJTLD

01.4 Impact of CAD4TB on TB screening yield and efficiency

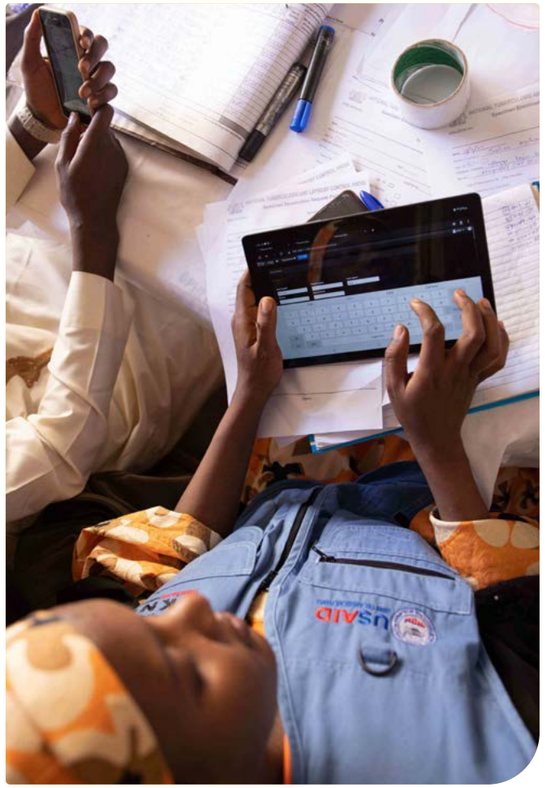
Cost-effectiveness

- **75% savings for Xpert tests** when using CAD4TB at a sensitivity of 79.7%. More than 50% saving at a sensitivity above 90%.
  Qin, ZZ. et al. 2021, The Lancet Digital Health.
- **73% lower per-screen cost for CAD4TB** than a radiologist for ACF and 61% lower cost for facility-based screening with high throughput scenarios.
  Bashir, S. et al. 2022, PLOS ONE.

Nigeria

The low NNT (number needed to test) in this study translated to a reduced need for Xpert evaluation, which suggests **a substantial cost saving for TB case diagnosis** during community-based ACF when Delft Light backpack X-ray with CAD4TB is deployed nationwide.

Odume, B. et al. 2022, Public Health Action.



Location: Nigeria // **Organization:** KNCV Nigeria, Delft Imaging

Added value of CAD4TB

- A wide range of non-TB abnormalities, both suspected communicable and NCDs, can be identified on digital CXRs among individuals with high CAD4TB scores but who had no bacteriologically confirmed TB.
  Ngosa, D. et al. 2023, BMC Infect Dis.
- Pediatric TB: CAD4TB can be a useful tool to identify TB in children (<13 years).
  Palmer, M. et al. 2023, PLOS Global Public Health.
- TB & Diabetes: High accuracy with CAD4TB as a TB screening tool among people with diabetes.
  Habib, S. S. et al. 2020, Nature Scientific Reports.
- TB & HIV: Added value with universal HIV screening increased timelines and completeness of HIV/TB diagnosis. MacPherson, *P. et al. 2021, PLOS Medicine.*

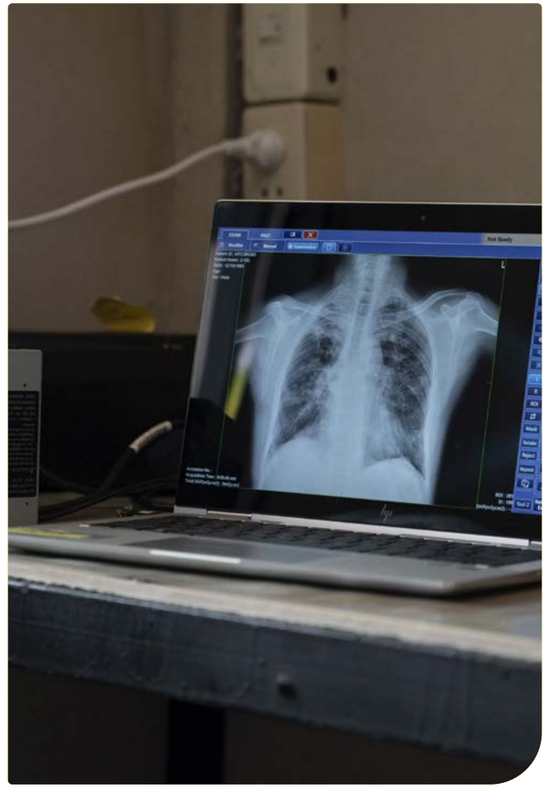


Photo credit: Schogn Lee // **Location:** Thailand // **Organization:** SMRU, Delft Imaging

01.4 Impact on TB screening yield and efficiency

X-ray and CAD: technical and clinical validation

2024 CAD4TB SCIENTIFIC PUBLICATIONS FOR EVIDENCE

National study

- Iterative adaptation in response to performance metrics fosters feasible, acceptable, and efficient TB case-finding in Nigeria.
- High CAD4TB scores can identify subclinical TB and those at risk of progression to bacteriologically confirmed TB disease in the near term.

Nigeria

Eneogu, RA et al. 2024, PLOS Global Public Health.

National study

- The combined use of digital X-ray and CAD4TB in population-wide systematic screening initiatives replaced the human processing and interpretation of X-rays, contributing to the high CXR coverage of 98.6%.
- Most of the TB cases detected (>80%) were asymptomatic, indicating the contribution of CXR.

Papua New Guinea

Dakulala, P et al. 2024, BMC Public Health.

National study

- Enhanced TB diagnostics, using dCXR with CAD4TB and 2 urine LAM antigen tests, identified more hospitalized people with HIV with TB than usual care.

Malawi

Burke, RM et al. 2024, Clinical Infectious Diseases.

National study

- CAD4TB significantly enhances TB case detection by quickly analyzing cases more efficiently than human radiologists. It also reduces costs by minimizing the need for the expensive GeneXpert test.

Tanzania

Mzurikwao, D et al. 2024

01.4 Impact on TB screening yield and efficiency

X-ray and CAD: technical and clinical validation

2024 CAD4TB SCIENTIFIC PUBLICATIONS FOR EVIDENCE

Multi-country study

- An independent, multi-country head-to-head accuracy comparison of automated chest x-ray algorithms for the triage of pulmonary tuberculosis concluded that CAD4TB had the highest overall accuracy (73.8% specificity at 90% sensitivity), was significantly more specific than other algorithms, and achieved the minimum WHO target accuracy for a TB triage test.

India
Madagascar
Philippines
South Africa
Tanzania
Vietnam

Worodria, W et al. 2024

Multi-country study

- CAD has the potential to be a useful and cost-effective screening tool for TB in a resource-poor HIV-endemic African setting, assisting active case finding strategies to break the TB transmission cycle.

Kenya
South Africa
Zambia

Scott, AJ et al. 2024, Open Forum Infectious Diseases.

Multi-country study

- CAD4TB was the most accurate TB triage test, met WHO TPP targets, and outperformed Xpert TB Host Response and CRP. Combining screening tests (CAD4TB and Xpert HR or CRP) further increased accuracy.

India
South Africa
Uganda
Philippines
Vietnam

Crowder, R et al. 2024, Clinical Infectious Diseases.

Multi-country study

- The AUC (95% CI) of CAD4TB against the microbiological reference standard (Xpert Ultra and/or sputum culture positivity) was 0.90 (0.82-0.97).
- In community-based ACF in endemic TB/HIV settings, using POC Xpert and X-ray screening with CAD4TB and CAD4COVID analysis is both feasible and had high diagnostic yield for TB and COVID-19.

South Africa
Zambia
Zimbabwe

Scott, AJ et al. 2024, International Journal of Infectious Diseases

01.4 Impact on TB screening yield and efficiency

CAD4TB Platform for TB data integration and management

Moving from paper-based to digitalized data-driven TB management and decision-making enables real-time, centralized TB data monitoring and management. The CAD4TB Platform provides modules for patient registration, customizable symptom screening, CAD4TB AI algorithm for CXR analysis, and confirmatory test results. It also allows the production of data-driven reports with programmatic insights.

Furthermore, the CAD4TB Platform allows seamless data connectivity and integration with other health data management systems. It can connect multiple locations, serving as a primary data entry point for health workers at community and primary care levels. It also facilitates data access from various sites, enabling National TB Programmes at the central level.

01.5 Voices of our partners

SEA Region

"CAD4TB enables early detection and treatment, hence stops transmission and spread of TB, prevents progression to active TB, improves treatment outcomes, reduces morbidity and mortality."

Dr. Richard Jones, the regional medical director at International SOS, Indonesia, SEA Region

Ghana

"[...] we use our digital x-rays (Delft Light) with CAD, and I must say that it came in handy. There were some trainings for GPs, general practitioners, on how to marry x-rays with the history, and also taking samples for testing, spitting samples for testing."

Dr. Yaw Adusi Poku, the program manager for National TB Control at the Ghana Health Service

South Africa

"There have been multiple publications, and it has been established that CAD has very high accuracy, but most of these have been done in passive case-finding, which, in other words, individuals who attend health care facilities, which is a very different population characteristics of a community-based setting, where we believe a large amount of transmission occurs."

Dr. Alex J. Scott, a research medical officer at the Center for Lung Infection and Immunity, University of Cape Town Lung Institute

Uganda

"These connectivity solutions would help us in sending, aggregating, and processing data from multiple instruments that are used in the laboratory. And this can help us in monitoring performance, instrument networks in real-time, troubleshooting the utilization of the instruments, looking at reagents and forecasting stock, and also looking at the results for patient management."

Julius Tumwine, the LabXpertsDS team lead and connectivity focal person at NTLP, Uganda

01.5 Voices of our partners

DR Congo

"[...] those different people trained during the installation of digital x-rays (Delft Light) had the support, the great support. The Delft team support was able to discuss with them the different elements put in place, how to use them."

Dr. Jean Pierre Kabuayi, an expert in TB epidemiological surveillance at the Ministry of Public Health, Hygiene, and Prevention, Democratic Republic of the Congo

Pakistan

"The best thing that CAD4TB has done is that the accuracy of diagnosis has been increased. When we use the score generated by CAD4TB, our physicians who are in the chest camps are quite comfortable and confident that ordering the sputum sample for these patients for GeneXpert would yield results. And the accuracy of the software is quite high."

Dr. Adeel Tahir, the director of the TB program at Mercy Corps, Pakistan

Sierra Leone

"Women love the BabyChecker. They love to be scanned; they are coming all the time, and they are coming earlier, which is very good because then they can also be assessed for other ANC issues. So there are no sociocultural issues and high community acceptance."

Amie Koroma, the program director at White Ribbon Alliance, Sierra Leone

Zambia

"With BabyChecker, [...] we were able to identify that this patient had a potentially low-lying placenta, [...] this is not a case you can manage at a low-level health clinic. So we referred this patient to a teaching hospital where they were able to be assisted, [...] you can see how in the real world a tool like BabyChecker is actually making a difference because we are able to identify some of these potentially high-risk patients who would otherwise maybe succumb to whatever undiagnosed conditions they have."

Tafadzwa Kalisto Munzwa, the co-founder and executive director of Dawa Health, Zambia

02.

Operating with integrity

02.1 About us

Delft Imaging, established in 2002, traces its roots to the first Dutch radiology equipment factory (ENRAF) established in the early 20th century. In the following decades, we accumulated extensive global medical imaging expertise.

We have revolutionized active TB case-finding through digital technologies, particularly in resource-constrained settings. We are at the forefront of pioneering AI-powered Computer-Aided Detection for Tuberculosis, CAD4TB, and were the first to deploy a wide range of solar-powered digital radiology systems.

We also developed the world's first AI for pregnancy risk screening using a smartphone-based ultrasound, BabyChecker.

As a long-standing partner, we are committed to providing reliable, sustainable, and cost-effective medical imaging solutions with AI to emerging countries and resource-constrained settings. We are actively engaged in public and private partnerships as well as international and local NGOs and research institutes.

Our state-of-the-art solutions include:

- **AI-enabled CAD** (Computer-Aided Detection) software,
- **Smartphone-based ultrasound with AI**
- **Digital X-ray systems**
- **Mobile Clinics**
- Turn-key **diagnostic centres**.

We take pride in our collaborative partnerships with Canon Medical Systems, Oldelft Benelux and Thirona.

Our headquarters is in 's-Hertogenbosch, the Netherlands, and our training and technical support offices are in Ghana, Nigeria, and Indonesia.

Our headquarters in the Netherlands holds ISO 13485:2016 Medical Devices certification, and our Ghana office has the ISO 9001:2015 Quality Management System certification.

02.1 About us

Mission & vision

Mission

We empower communities in resource-constrained settings with our digital imaging innovations that strengthen health systems.

Vision

We envision a world with health equity, where healthcare is affordable and accessible to all.

Core values

- **Innovation:** Driving progress through cutting-edge digital imaging solutions that make healthcare more accessible and efficient.
- **Equity:** Promoting health equity by ensuring everyone, everywhere, has access to affordable and high-quality healthcare.
- **Empowerment:** Empowering communities by providing them with the tools and technology to take control of their health and wellbeing.
- **Impact:** Creating positive change by strengthening healthcare systems and improving the lives of individuals in resource-constrained settings.
- **Reliability:** Ensuring dependable and consistent healthcare solutions that healthcare professionals and communities can trust.

02.2 Social enterprise pillars

Gender equality

The Delft Foundation supports partners that promote gender equality.

Quality education

The Delft Foundation supports partners that promote quality education.

Good health & well-being

We contribute to the global effort to end TB and reduce maternal mortality

End poverty

We support earlier TB detection and prevent catastrophic costs of treatment.

Partnerships for the goals

We partner with the public and private sectors to create impactful solutions that drive progress in health, technology, and sustainability.

Affordable & clean energy

We deploy solar-powered, consumable-free digital imaging solutions to enhance sustainability and reduce CO2 emissions in healthcare operations.

Decent work & economic growth

We support TB and Silicosis screening for safer workplaces and healthier, productive populations ensuring continuous participation in economic activities.

Industry, innovation & infrastructure

We provide high-quality, reliable, and sustainable medical imaging solutions that are affordable and accessible to all.

Reduced inequalities

We design our imaging solutions to reach key and vulnerable populations, including those in hard-to-reach areas and challenging operating environments.

Climate action

We deliver solar-powered diagnostics to resource-constrained settings, contributing to climate action by reducing carbon emissions while strengthening healthcare access.

02.2 Social enterprise pillars

Certified B Corporation

Since 2020, Delft Imaging has been an officially certified B Corporation.

This certification demonstrates our commitment to the highest social and environmental performance standards, public transparency, and legal accountability. The B Corp Certification provides legitimacy and credibility to our operation as a social enterprise while balancing purpose and profit.

In 2024, we were recertified as a B Corporation with a score of 120.7, significantly surpassing the median score of 50.9 for ordinary businesses.

More info

Million Lives Collective

Since 2020, Delft Imaging has been a Vanguard member of the Million Lives Collective for our CAD4TB.

The Million Lives Collective recognizes and raises awareness of innovative social entrepreneurs successfully tackling global development challenges. Supported by leading bilateral agencies, multilateral organizations, and foundations, the initiative celebrates pioneers reaching new horizons of impact and improving the lives of those living on less than $5.5 a day.

More info

02.3 Climate-resilient health technology

With our digital solutions & services

Climate change affects multiple aspects of health, including the spread and management of infectious diseases like tuberculosis. It influences the environmental and social factors related to TB, making it crucial to adapt our healthcare technologies and operations.

Our response: In alignment with the SDGs, the UN Global Compact, B-Corp, and the Million Lives Collective, we are committed to sustainability and environmental protection while leading technological advancements to support health equity for all.

Reduced chemical waste and carbon emissions

- **Digital X-rays significantly reduce the environmental impact** of traditional analog film-based systems, which often require a long supply chain and contribute to increased CO2 emissions.
- **By shifting to digital imaging, the carbon footprint is lowered**.
- Additionally, digital X-rays eliminate chemical processing, minimizing hazardous waste and environmental contamination. This transition enhances sustainability and provides a cleaner, more efficient solution for screening.

Photo by Yohan Marion on Unsplash

02.3 Climate-resilient health technology

With our digital solutions & services

Solar-powered X-ray systems

- Our digital X-ray systems and mobile clinics are designed to operate in low-resource settings and can be charged with **renewable solar energy with our power packs**. This allows for reliable and sustainable operations even in remote areas with limited or no access to electricity while reducing CO2 emissions.

Energy-efficient X-ray systems

- Our stationary digital X-ray systems, EasyDR and CompassDR, operate on **single-phase power and standard 220-volt outlets**, significantly reducing power consumption.
- Combined with our **solar-power pack solution**, these systems enable up to **six hours of continuous X-ray use**, when the national grid is not accessible, enhancing energy efficiency, lowering operational costs, and ensuring sustainable operations.

Sustainable return and repair policy

- We **locally repair and reuse components like solar panels**, thereby reducing waste, the need for new materials, and the carbon footprint from shipments.
- Other electronic components are returned to the Netherlands for proper handling and refurbishment. This approach ensures we **reduce our environmental impact** while maintaining high standards of service and sustainability.

Efficient screening and resource optimization

- **High-throughput screening with digital X-ray and AI-powered CAD software** enables **faster processing of screening results in large populations**. This reduces the resources required for follow-up visits and testing logistics. Early and accurate detection reduces the overall need for extensive medical interventions, **saving resources over time**.

02.3 Climate-resilient health technology

With our digital solutions & services

Reduction in use of confirmatory tests

- **Pre-screening with digital X-rays and CAD saves resources and reduces energy consumption** by optimizing the use of cartridges and reagents.
- This approach **reduces the need for consumables, lowers manufacturing demand**, and **decreases medical waste**. It also **minimizes the energy footprint** associated with sample transport and processing.

Sustainable office practices

- **Equipment:** We use Energy Star appliances, automatic sleep modes, and after-hour timers to cut energy consumption.
- **Lighting:** Includes natural light, compact fluorescent bulbs, occupancy sensors, dimmers, and task lighting to optimize energy use.
- **HVAC:** Our systems (heating, ventilation, and air conditioning) have programmable thermostats, timers, sensors, shaded walls, and double-paned windows to boost energy efficiency.
- **Energy sources:** Our gas comes from residual wood chips, and electricity from sustainable sources like wind and solar.

02.4 Delft Foundation and community engagement

Delft Webinars for knowledge sharing

1,600+ Gained knowledge of **AI & digital screening solutions** **in 2024**

Through Delft Community and quarterly webinars, healthcare professionals connect to exchange knowledge on TB screening and maternal health.

In 2024, four webinars covered digital X-rays, CAD4TB, and BabyChecker in remote and resource-constrained settings worldwide.

YouTube | Delft.care

Special thanks to the experts and organizations who shared their insights:

- **International SOS,** Indonesia
- **National TB Control,** Ghana
- **University of Cape Town,** South Africa
- **National Tuberculosis and Leprosy Control Programme,** Uganda
- **Ministry of Public Health, Hygiene, and Prevention,** DR Congo
- **Ministry of Health and Child Care,** Zimbabwe
- **Mercy Corps,** Pakistan
- **Omni Tech,** Pakistan
- **Global Fund Grant Program Management Unit Team, NTLP,** Nigeria
- **Kisumu County,** Kenya
- **White Ribbon Alliance,** Sierra Leone
- **Dawa Health,** Zambia

02.4 Delft Foundation and community engagement

Delft Foundation

Delft Imaging Coding Club

In 2024, we continued our support of the Sustainable Development Goals (SDGs) with the Delft Imaging Coding Club. After a successful launch at Covenant Presbyterian School in Accra, Ghana, in late 2023, nearly 300 children aged 7-14 learned coding.

The 37-week curriculum was designed for all learning levels, helping students gain important tech skills to drive innovation and sustainable growth.

Supporting UNRWA relief efforts in Gaza

In 2024, we supported the United Nations Relief and Works Agency (UNRWA) in response to the humanitarian crisis in Gaza. The ongoing conflict severely affected Palestinian refugees, and UNRWA's efforts to provide medical care, food, shelter, and education were essential. This contribution reflected our commitment to supporting vulnerable communities in rebuilding their lives and securing long-term stability.

Cycling for Shirati's healthcare needs

In the latter half of 2024, we contributed to Stichting Shirati for a 300 km charity cycling tour to raise funds for improving healthcare access in Shirati, Tanzania. The initiative highlighted the challenges faced by this remote community and helped provide essential medical care for its 100,000 residents.

At Delft Foundation, our work is driven by our commitment to the Sustainable Development Goals.

Photo credit: Delft Coding Club // **Location:** Dzorwulu Primary School, Accra, Ghana

03.

Innovation, co-creation and impact

03.1 Our innovation journey for healthcare impact

We envision **a world where everyone benefits from modern healthcare advancements**. We are specifically dedicated to improving people's quality of life, aligning with the SDGs and global efforts towards achieving universal health coverage (UHC). We achieve this through **affordable, user-friendly AI-enabled medical imaging solutions** powered by clean solar energy.

This vision drives our commitment to developing innovative solutions tailored to the specific needs of Ministries of Health and frontline health professionals, ensuring equitable health services for all, including key and vulnerable populations.

Through extensive collaboration with medical specialists worldwide, we have gained a deep understanding of their practical needs. This insight has inspired our demand-driven approach to co-create innovative solutions and offer services that truly address local needs.

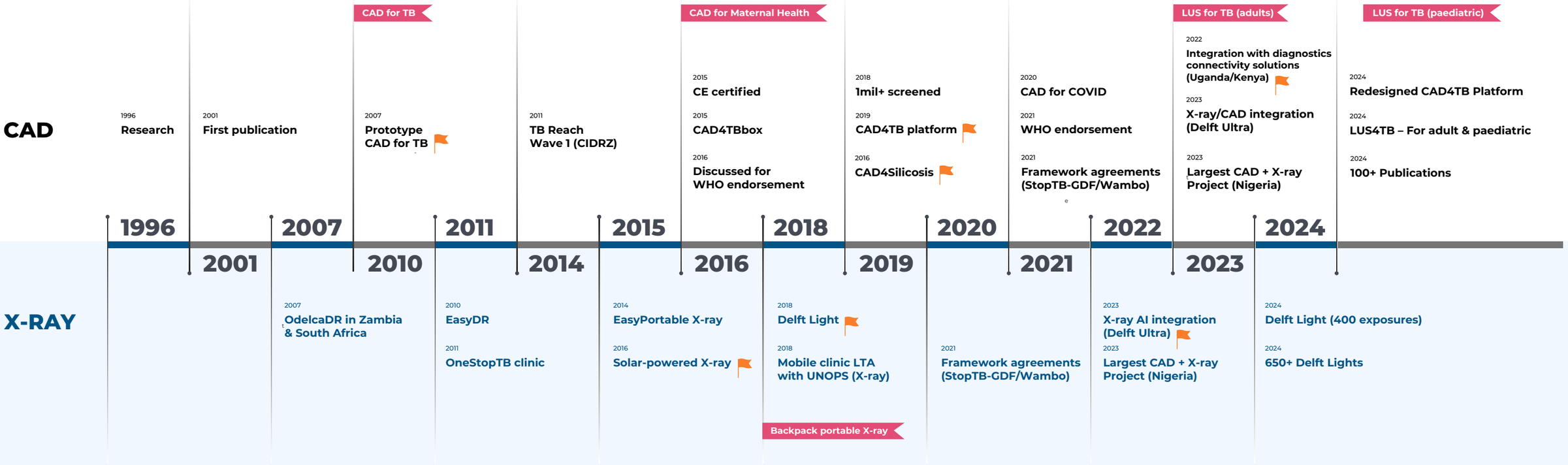
Location: Nepal // **Organization:** Save the Children, Delft Imaging

Delft's result chain and health challenges:

Lung health (TB & other lung abnormalitie)		Eye Health	Maternal Health
Digital X-rays	LUS4TB	RetCAD	BabyChecker
CAD4TB	CAD4Silicosis		
Mobile Clinics	General lung abnormalities		

03.1 Our innovation journey for healthcare impact

Legend: Company innovations



03.2 Approach to end TB and strengthen health systems

TB remains one of the world's deadliest infectious diseases and a major global health security threat. The WHO Global Tuberculosis Report 2024 estimates 1.25 million TB-related deaths in 2023, with 10.8 million people falling ill. Despite progress, millions remain undiagnosed and untreated, increasing transmission risks.

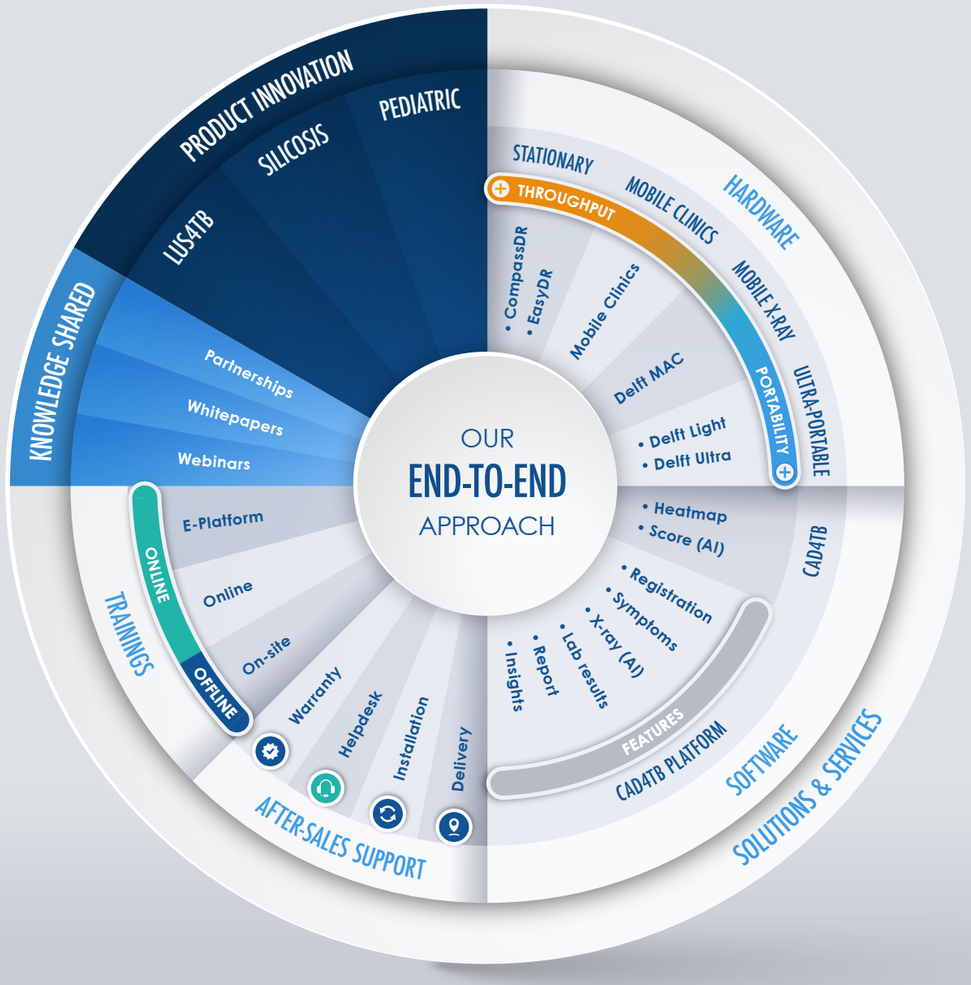
The gap between estimated and notified TB cases has narrowed, suggesting improvements in TB detection and reporting. However, challenges such as drug-resistant TB and funding shortages persist, highlighting the need for continued global efforts to fight the disease.

As a long-standing partner, we support TB programs worldwide through cutting-edge solutions, capacity building, and services, ensuring accurate, cost-effective, and people-centered TB screening.

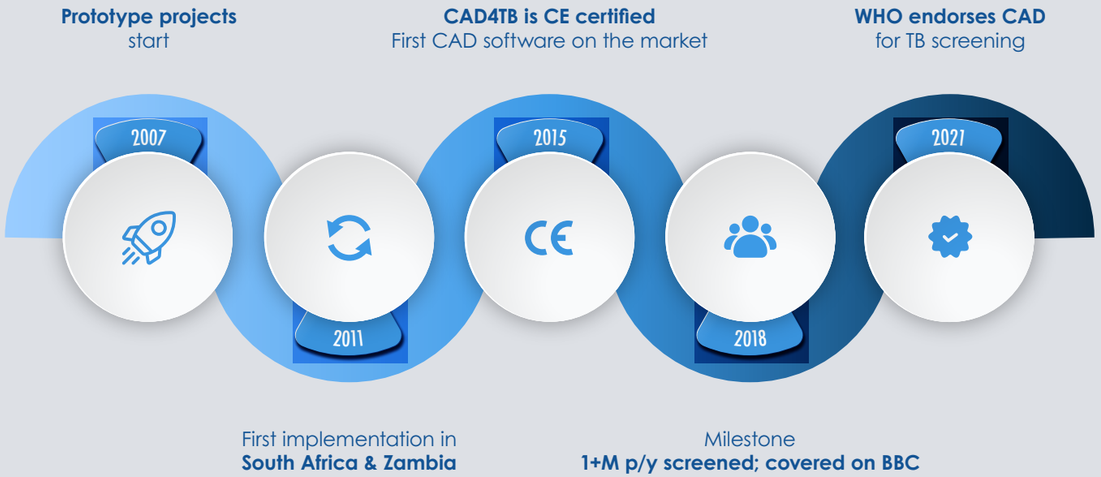
The total solution provider for TB screening

We provide integrated digital solutions that strengthen TB case-finding, making screening more accessible, efficient, and cost-effective. Our solutions ensure uninterrupted screening, even in the most resource-constrained settings.

By combining technical expertise, field experience, and the evolving needs of the TB community, we continue to develop innovative solutions that boost the global TB response.



PIONEER IN TB SCREENING WITH AI
SINCE 1996



03.4 Approach to end TB and strengthen health systems

Strengthening real-time TB data management, connectivity and integration

Digital solutions enable the shift from paper-based to digitized, real-time TB management, facilitating data-driven decision-making. Our CAD4TB Platform offers modules for patient registration, customizable symptom screening, the CAD4TB AI algorithm for chest X-ray analysis, and confirmatory test results. It also generates data-driven reports for programmatic insights.

We support seamless connectivity and data integration between digital X-rays/CAD4TB and national TB data management systems. The platform can connect multiple locations and serve as a primary data entry point for health workers at community and primary care levels.

This integration enables the centralization of TB screening and diagnostic data from various locations where digital X-ray systems and CAD4TB are utilized. It allows authorized users to remotely access chest X-ray images, CAD4TB results, and laboratory test results in real-time with just a few clicks. Consequently, Ministries of Health and their National TB Programs at the central level can effectively access and monitor information through dashboards.

Delft Imaging's innovation journey for TB and lung health

Chest X-ray (CXR) is a sensitive screening solution that has a vital role in early TB detection and is essential for achieving the WHO End TB Strategy targets.

However, two major barriers have obstructed its widespread use: a shortage of radiologists and limited access to high-quality digital CXR imaging, especially in resource-constrained settings.

We addressed these barriers with innovative solutions, such as Computer-Aided Detection for TB (CAD4TB) and solar-powered digital X-ray systems, including the battery-operated, ultra-portable digital X-ray system in a backpack (Delft Light). With these novel solutions, we have revolutionized systematic TB screening, supporting the WHO's goal of finding the missing people with TB.

Location: South Africa // **Organization:** Delft Imaging.

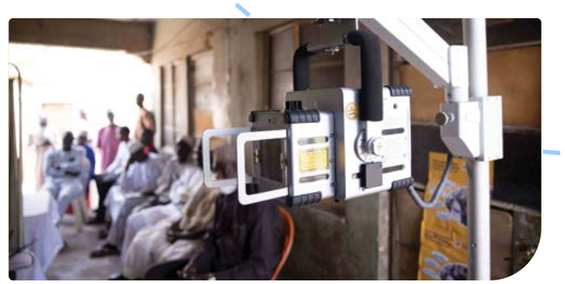
Our research on CAD4TB began in 1996, with prototype projects starting in 2007. Since 2008, we have collaborated with the Diagnostic Image Analysis Group at Radboud University Medical Centre, the Netherlands, to develop a solution addressing the limitations of human interpretation of chest X-ray images. This collaboration resulted in the development of CAD4TB, an AI-enabled software for TB detection.

First implemented in South Africa and Zambia in 2011, CAD4TB became the first CAD software to obtain CE certification in 2015. Since then, early users in Africa and Asia have adopted CAD4TB for TB prevalence surveys and screening programs.

Photo credit: Andrei Shibkov // **Location:** Uzbekistan // **Organization:** Delft Imaging.

In parallel, we envisioned a robust, affordable, user-friendly X-ray system that could be easily transported to hard-to-reach locations while producing high-quality images. We believed that ultra-portable digital X-rays combined with CAD4TB could significantly improve the value of diagnostic imaging in outreach settings and at community and primary healthcare levels.

Advances in digital imaging and software technologies led to the innovation of Delft Light, a battery-operated, ultra-portable X-ray in a backpack.



Location: Nigeria // **Organization:** KNCV Nigeria, Delft Imaging.

We collaborated with Canon Medical Systems, Oldelft Benelux, and local partners to introduce Delft Light to TB programs. Since the first installation in Eritrea in 2018, Delft Light and CAD4TB have expanded their installations across Africa, Asia Pacific, Latin America, and the Middle East.

These breakthroughs and supporting evidence of CAD led to the WHO's recommendation for digital chest X-rays and CAD for TB screening and triage in 2021. National TB Programs and implementing partners worldwide are scaling up these solutions with support from the Global Fund, USAID, EU, and the World Bank.

Combining digital X-ray systems and CAD4TB has been proven to enhance TB screening access, accuracy, speed, and cost-effectiveness. This represents immense opportunities to accelerate community-based, decentralized active TB case finding.

In 2023, we introduced LUS4TB, a smartphone-based point-of-care ultrasound with AI. This novel solution can be another game-changer for screening and triaging for TB and other lung conditions, including in children.

03.3 Approach to making pregnancies safer

Leapfrogging maternal health challenges with AI-enabled ultrasound

Every day, about 800 women die from preventable causes related to pregnancy and childbirth. Maternal mortality remains a global challenge, with nearly 95% of deaths occurring in low- and middle-income countries (LMICs).

Ultrasound can detect pregnancy-related risks such as fetal malposition, placenta previa, and undiagnosed multiple pregnancies, among other anomalies. However, challenges such as the need for trained sonographers, high initial investment costs, and infrastructure constraints often hinder the deployment of ultrasound in resource-constrained and rural settings.

BabyChecker

BabyChecker is an artificial intelligence (AI) that analyzes obstetric ultrasound scans to identify risks in pregnancy.

Scans can be easily acquired with a handheld ultrasound device by any frontline health worker within two minutes. Any frontline healthcare worker with no prior experience in ultrasound can use BabyChecker after watching the three-minute training video. The BabyChecker mobile application guides the user in performing a scan consisting of standard sweeps across the abdomen.

Once the sweeps are completed, the AI analyses the scan and provides outputs for gestational age, fetal presentation, and placenta localization. After the scan is analyzed remotely, outputs for multiple gestations and a 2D fetal image are displayed on the app. BabyChecker helps identify potential risks to improve maternal and antenatal care and facilitate timely referrals from primary healthcare facilities.

BabyChecker is well-regarded for its user-friendliness and diagnostic output. In a 2023 study from Sierra Leone, healthcare workers found it simple to integrate due to clear training, which boosted their efficiency. This mirrors findings from a 2019 study in Ethiopia, where BabyChecker received high acceptance for improving maternal and neonatal health at healthcare facilities.

Progress

BabyChecker is steadily expanding its reach in Sub-Saharan Africa, Latin America, and other regions. Currently used across 12 countries, with two projects underway, it contributes to strengthening maternal care in primary health facilities. More than 8,000 scans have been completed, with over 200 frontline healthcare workers operating the technology. This growing presence facilitates greater access to maternal and antenatal care, particularly in resource-constrained settings.

BabyChecker has been presented at key international events, where it gained attention from maternal health experts, healthcare policymakers, and innovators. It has been showcased at the Geneva Health Hub (gdhub) in Geneva, the International Conference on Population and Development (ICPD30) in New York, and the Tanzania Health Summit (TSH) in Zanzibar. These events have offered valuable opportunities to discuss BabyChecker's potential to improve maternal and antenatal health services in resource-constrained settings worldwide.

Location: Zambia // **Organization:** Dawa Health, Delft Imaging

02.4 Approach to making pregnancies safer

Leapfrogging maternal health challenges with AI-enabled ultrasound

Sierra Leone

- Lion Heart Foundation
- Jericho Road Community Health Centre
- Tonkolili District
- The Mansaray Foundation
- Initiative for Global Perinatal Care

Ethiopia

- CUAMM
- St. Luke Hospital
- Federal Ministry of Health
- EngenderHealth
- DKT

Pakistan

- Centre for Economic Research in Pakistan

Tanzania

- Misingi
- Karatu District

Kenya

- PharmAccess
- Kisumu County
- Hatch Technology

Honduras

- UNFPA
- Ministry of Health

Zambia

- Dawa Health

Malawi

- St. Gabriel Mission Hospital
- Madisi Mission Hospital

Ghana

- TREATS Association

Guatemala

- Fundación EHAS

Uganda

- VIYA Health
- Population Service International

The Netherlands

- Netherlands Enterprise Agency (RVO)
- Cordaid
- Radboud University Medical Centre
- KIT Royal Tropical Institute
- Invest International

ON-SITE WITH BABYCHECKER

Source: Collaboration with Lion Heart Foundation and Tonkolili District //
Location: Sierra Leone

03.4 Co-creation for innovative approaches

LUS4TB

Collaboration and co-creation are the fundamentals of Delft Imaging. Innovation scales up with the support of early adopters who believe in its potential and demonstrate its values. We seek partners to maximize the novel solutions' impact and contribute to attaining the End TB strategy goal and Universal Health Coverage (UHC).

If you see the potential of our innovations and are interested in applying them in the field, please get in touch with us at info@delft.care

As a long-standing partner, we support Ministries of Health and TB programs with cutting-edge AI-driven imaging solutions, capacity building, and comprehensive services.

Our integrated end-to-end solutions improve early TB case finding by making it more accurate, accessible, efficient, and cost-effective. We promote a data-driven, people-centered approach with a multi-disease impact. This enables our clients and partners to maintain uninterrupted screening services, even in the hardest-to-reach areas, ensuring long-term sustainability.

We are committed to developing innovative solutions combining our technical expertise, field knowledge, and the needs of the TB community as well as health systems.

Location: The Union World Confrence on Lung Health 2024, Bali

04.

Case studies

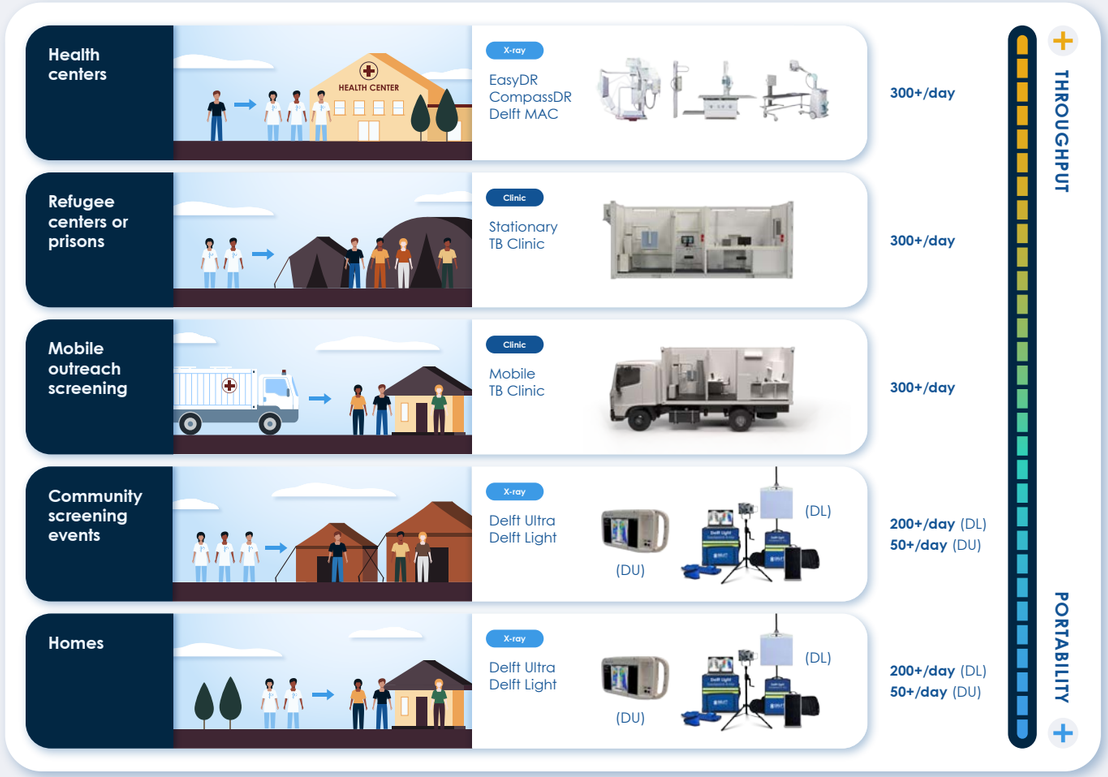
Overview: end-to-end solutions for TB screening and beyond

We offer end-to-end diagnostic imaging solutions and AI-powered CAD. Our latest CAD detects not only abnormalities suggestive of TB but also **general lung abnormalities, silicosis, and cardiomegaly.**

Our solutions are available through procurement channels, including the Stop TB Partnership's GDF catalog and the Global Fund's Wambo e-procurement platform.

Photo credit: Andrei Shibkov // **Location:** Uzbekistan // **Organization:** Delft Imaging.

Optimized digital X-ray systems for different settings



04.1 Flagship projects

Introducing New Tools Project (iNTP)

The Introducing New Tools Project (iNTP), supported by USAID and the Stop TB Partnership, is the largest multi-country roll-out of ultra-portable X-ray systems and Computer-Aided Detection (CAD) software to support TB screening programs.

The full report is available here

Since 2021, the project has supported upscaling 55 Delft Light portable backpack X-ray and 63 offline CAD4TB in 7 countries to facilitate TB screening among high-risk and hard-to-reach populations. **The Stop TB Partnership highlights the following key results:**

4.17%
Increase
in number of people screened for TB.

100x
Increase
in number of people detected with TB.
in 2024

Connectivity & integration
in streamlined screening and diagnostic data into the platform.

100x
Compelling evidence
The majority of countries to scale up the technology.

Feasibility & effectiveness
using Delft Light and CAD4TB in community settings.

04.1 Flagship projects

Implementing projects around the world

Delft Imaging supports TB programs in 85+ countries for systematic TB screening. Our project book, Global Impact 2024, showcases each country's approach to advancing early TB case finding using digital X-ray systems with artificial Intelligence.

Image: Delft Imaging's project book "Global Impact 2024"

04.2 Active TB case-finding

Kenya

Enhancing TB case detection in community outreach using Delft Light & CAD4TB

Introduction:

The National TB Program of Kenya received eight Delft Light ultra-portable X-ray machines with CAD4TB through USAID's iNTP. These were deployed in seven counties and integrated into Kenya's TB-targeted outreach programs.

Intervention

- In 2022-2023, the outreach program reached 15,916 people: 55% were male, and 56% had TB symptoms.
- People with CAD4TB scores >60 were sent for GeneXpert testing (5% or 793 individuals). An additional 5% with CAD4TB scores between 40-59 were tested based on clinician judgment.

Result

- TB positivity was high among those with high CAD4TB scores: 28% (163) had TB confirmed by GeneXpert, and nearly 30% (47) were asymptomatic.
- TB positivity was 6% for CAD4TB scores of 40-60.
- Before introducing CAD/AI-enabled X-rays, the TB positivity rate was low (5-10%).

Conclusion

- Using Delft Light and CAD4TB proved to be a more cost-effective approach for reducing GeneXpert tests in outreach settings.
- These tools effectively identified individuals for further testing, showing high positivity among those with high CAD4TB scores. This underscores the effectiveness of AI-enhanced CXR in early TB detection through community-based screening.
- We recommend expanding this technology to improve TB detection in Kenya.

Karisa, R. et al. (2024, November 12-16). Enhancing TB detection through integrating computer-aided detection (CAD) software in chest radiography: Findings from targeted outreach programs in Kenya [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Source: Centre for Health Solutions – Kenya (CHS) // **Location:** Kenya

04.2 Active TB case-finding

Vietnam

ACF campaign in hard-to-reach hotspot areas with Delft Light & CAD4TB

Introduction

Vietnam is a high-burden country for TB, with notification rates 43% lower than the WHO's estimated incidence. To address this, the National TB Program has implemented various approaches, including active case finding (ACF) campaigns aimed at early TB detection through community-level screening, particularly targeting household contacts and key vulnerable populations (KVPs).

Intervention

- Two ACF community campaign strategies were used with the same algorithm:
  - Routine ACF Campaign aims to expand coverage to all communes in the selected districts.
  - Hotspot ACF Campaign focuses on reaching remote areas within selected districts, bringing services closer to the people.
- Hotspots were selected among numerous villages based on high TB notification rates from the national TB surveillance system and the reachability of these areas.
- For the Hotspot ACF, battery-powered, ultra-portable Delft Light X-rays with pre-installed CAD4TB software were deployed to remote villages without the need for a power supply.
- For the Routine ACF, mobile vans equipped with X-ray machines and AI were used.

Conclusion

- Utilizing hotspot identification for ACF campaign site selection is effective when resources are limited.
- Using ultra-portable X-ray machines makes the strategy feasible for reaching villages that have never had TB screening services in their communities.

Dang, DC. Et al. (2024, November 12-16). Targeting village hotpot sites for active case finding in Vietnam: Comparative results in two rural high-burden provinces [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

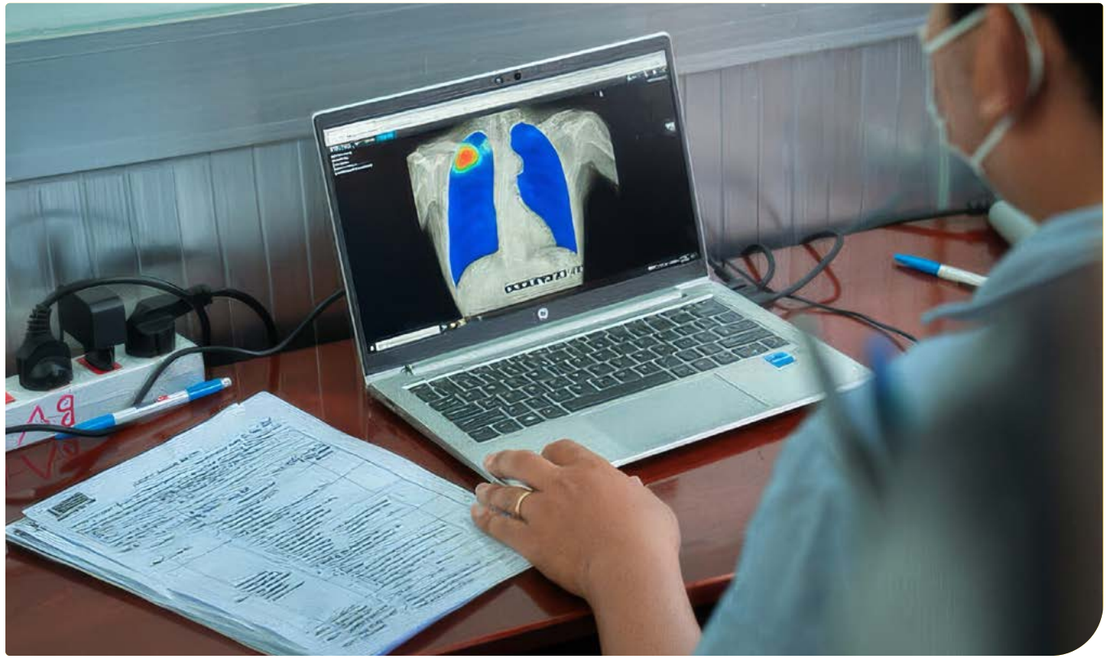


Photo credit: Tran Dinh Khang // **Source:** FHI 360 // **Location:** Vietnam

04.3 High TB yield and efficiency

Malawi

High TB cases yield with W4SS and X-ray & CAD4TB

Introduction

The latest TB survey revealed that 35% of active TB cases did not seek care, with urban areas having a much higher prevalence than rural areas. Since 2018, Malawi has used Delft Imaging's Mobile Clinics with digital X-ray, CAD4TB, and GeneXpert for urban community-based active case finding.

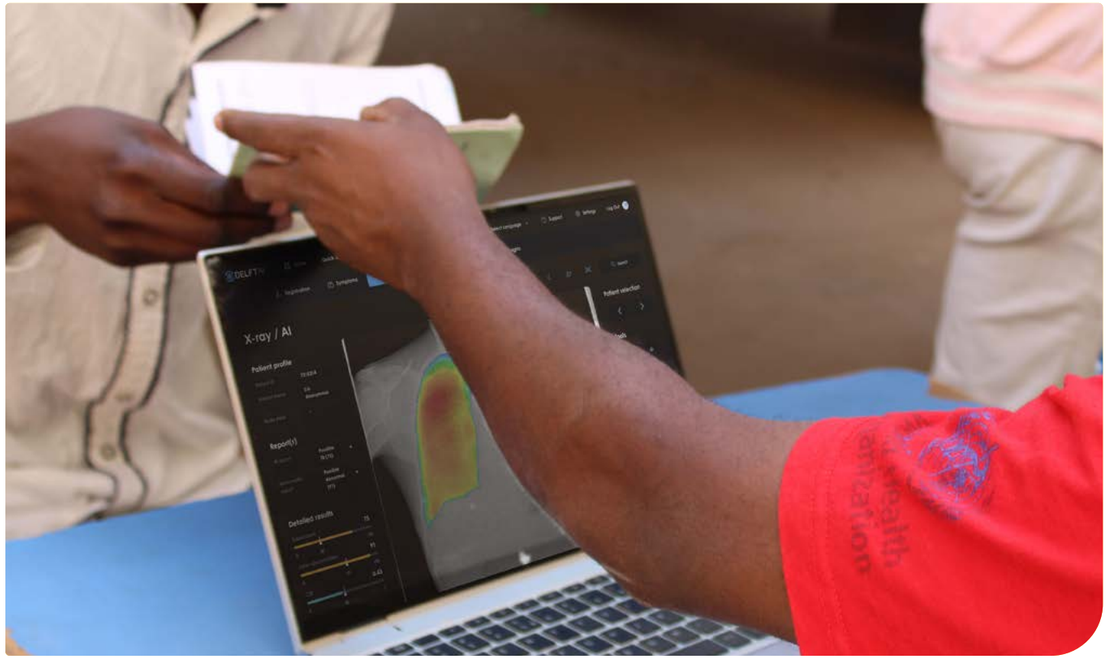
Intervention

- While the rates of presumptive TB cases were comparable (6.3% vs. 6.1%), parallel screening had a higher Xpert testing uptake (94% vs. 75%) and a greater Xpert positivity rate (9.3% vs. 3.5%) compared to W4S screening only.
- A total of 1,164 TB cases were diagnosed, with 52% (600) Bac+ TB and 48% (559) clinically diagnosed. This represents 6% of all notified TB cases nationally in 2023.
- When compared to W4S screening only, parallel screening yielded 4.4 times more TB cases of all forms (1,089/100k vs 247/100k) and 3.4 times more Bac+ TB cases (552/100k vs 161/100k).

Conclusion

- Combining digital chest X-ray with CAD/AI and symptom screening has significantly increased the yield of TB cases by 4.4 times compared to symptom screening alone, as evidenced over the past 5 to 6 years in Malawi.
- Mobile Clinics continuously screen over 100 people daily, contributing to up to 6% of all notified TB cases. Scaling this intervention at facilities and including X-rays with CAD/AI as screening tools is essential.

Gondol, B. et al. (2024, November 12-16). Bridging the gap: Enhanced TB detection using mobile digital X-ray and AI as screening tool surpasses W4S-based screening in community-based intervention – Insights from Malawi [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.



Location: Malawi // **Organization:** Delft Imaging

04.3 High TB yield and efficiency

Nigeria

High TB yield using parallel screening with W4SS and Delft Light & CAD4TB

Introduction

KNCV Nigeria has adopted a parallel screening algorithm that combines the WHO 4-symptom screen and portable digital X-ray (PDX) with CAD4TB to help close the gap in missing TB cases.

Intervention

- Seven PDX units with CAD4TB were deployed across six states in Nigeria.
- Presumptive TB cases were identified when clients answered "yes" to one or more symptoms or had a CAD4TB score of ≥50. All the presumptive TB were evaluated with GeneXpert, Truenat, or TB lamp, and those with negative results were further reviewed by radiologists.

Conclusion

- The parallel screening algorithm using the WHO symptom screen and PDX with AI demonstrates a strategic approach to optimizing TB case finding, ensuring that gaps in missing TB cases are closed.
- This suggests that countries should consider adopting this algorithm when implementing PDX with AI to enhance TB case-finding interventions.

Chukwu, E. et al. (2024, November 12-16). Parallel Screening Algorithm using WHO symptom screen and portable Digital Xray (PDX) with Artificial Intelligence (AI): A strategic approach to optimize TB case finding [Poster Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Photo credit: Onyinye Genevieve Kene-Eneh // **Source:** The 2023 USAID Climatelinks // **Location:** Nigeria // **Organization:** KNCV Nigeria

04.3 High TB yield and efficiency

Uganda

Optimal threshold to improve TB diagnostic yield with Delft Light & CAD4TB

Introduction

The Uganda National TB and Leprosy Program adopted WHO's recommendation to use digital X-rays with CAD for systematic TB screening. This study aims to determine the optimal CAD4TB threshold score to improve TB diagnostic yield.

Intervention

- Twelve portable digital X-rays Delft Light with CAD4TB were deployed at health facilities and communities. Health workers were trained on X-ray use and the screening algorithm.
- Sputum samples were collected from individuals with any CXR abnormalities for X-pert testing. Those confirmed with TB were started on standard TB treatment.

Conclusion

- High TB diagnostic yield can be achieved with a CAD4TB threshold score of 50 or more, potentially saving X-pert tests.
- The national TB program should strengthen sputum testing for individuals with a CAD4TB score of 50 or more and consider a lower threshold for PLHIV to improve TB case detection.

Burua, A. et al. (2024, November 12-16). Improving the diagnostic yield of TB from screening using digital X-ray fitted with computer-aided detection software: Lessons from programmatic implementation in Uganda [Poster Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Photo credit: Lisa Gerwing // **Location:** Uganda // **Organization:** DAHW

04.3 High TB yield and efficiency

Ukraine

Optimal threshold to improve TB diagnostic yield with CAD4TB

Introduction

The ongoing war has severely impacted TB diagnostics, leading to destroyed health infrastructure, a shortage of healthcare workers, and under-detection of TB among at-risk populations, particularly in rural areas.

Intervention

- CAD4TB was introduced at the end of 2024 to automate the interpretation of chest radiographs (CXRs), aiming to increase TB case detection, reduce diagnosis time, and improve access to care in remote and underserved areas.
- Mobile vans equipped with portable X-ray machines and AI were deployed to screen high-risk groups, particularly in rural areas.

Conclusion

- In challenging circumstances, innovative technologies like AI have become crucial in continuing the fight against TB, especially among key and vulnerable populations.

Terleiva, Y. et al. (2024, November 12-16). Applying innovative solutions for TB diagnosis through artificial intelligence in services disruption situation in Ukraine [Poster Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Photo credit: Abul Kashem Khan // **Organization:** Delft Imaging

04.3 High TB yield and efficiency

Zambia

Schaap, A. et al. (2024, November 12-16). Triage or no triage: Use of CXR-CAD in community-wide TB screening in an urban community in Zambia [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Detecting more TB cases effectively with CAD4TB

Introduction

Zambia offers three TB screening algorithms: 1) symptom screening only, 2) triage, and 3) parallel screening. The Ubumi Bwandi (My Health, My Choice) project, supported by Stop TB Partnership's TB REACH Wave 10, aims to increase TB screening and case finding in Copperbelt, the province with significant mining activities.

Intervention

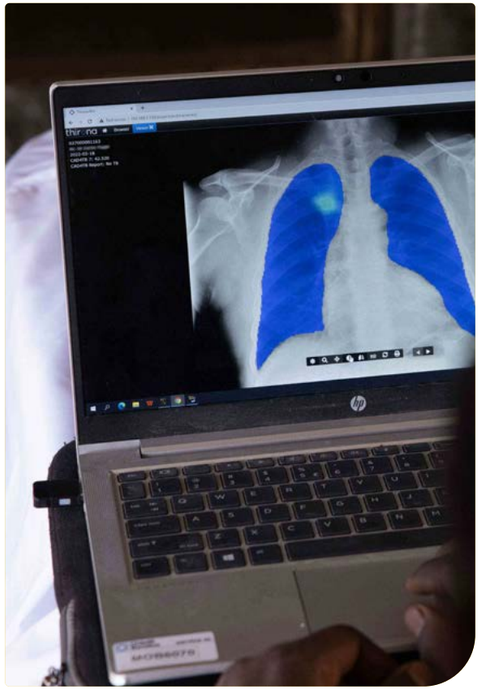
- The project offers services to individuals aged 15 and above at two locations: a health facility equipped with a container clinic featuring X-ray and CAD4TB technology; and a Community Hub utilizing an ultra-portable X-ray system with CAD4TB. The Community Hub provides TB and multi-disease screenings for all individuals.
- A stricter definition was used for Presumptive TB:
  - CAD4TB score ≥ 50, OR
  - Cough ≥ 2 weeks, OR
  - Any cough, fever, chest pain, or night sweats ≥ 2 weeks, or unintended weight loss last 1 month

Result

- From July 2023 to July 2024, the health facility detected a higher percentage of presumptive TB cases (13%) than the Community Hub (8%). Of those with MTB detected, 95% had high CAD4TB scores (≥50), and many were clinically diagnosed with TB.
- "Triage" significantly reduced both presumptive cases and tests performed compared to parallel screening, leading to a 30-40% decrease in TB diagnoses and treatments.
- The cascade analysis shows that 45% of individuals with presumptive TB (based on symptoms) but low CAD4TB scores accounted for only 6% of MTB detected, indicating that 94% of MTB cases had high CAD4TB scores (≥50). Additionally, 26% of MTB detected were asymptomatic with high CAD4TB scores.
- The Number Needed to Test (NNT) showed that 39.2 tests were required to find one bac+ TB case among those with low CAD4TB scores, while the NNT was 3.3 for symptomatic individuals with high CAD4TB scores and 6.5 for asymptomatic individuals with high CAD4TB scores.

Conclusion

- In challenging circumstances, innovative technologies like AI have become crucial in continuing the fight against TB, especially among key and vulnerable populations.



04.4 Key and vulnerable populations

Indonesia

TB prevalence in correctional centers with CAD4TB

Introduction

Incarcerated individuals represent a high-risk group for TB, with significant detection gaps. This study aims to assess the prevalence of TB among inmates in Indonesia using active TB case-finding as an integral part of the national TB program.

Intervention

- From July to November 2023, a total of 206,345 inmates across 376 prisons in 33 provinces underwent a comprehensive TB screening protocol that integrated symptom screenings, chest X-rays with CAD4TB, and Xpert testing.
- Those exhibiting TB symptoms, a CAD4TB score greater than 40, or other risk factors underwent Xpert testing. Individuals diagnosed with bacteriologically confirmed or clinically diagnosed TB received anti-TB treatment.

Conclusion

- TB prevalence in Indonesian prisons surpasses WHO South-East Asia region estimates.
- Regular comprehensive TB screening with X-rays and Xpert testing upon admission and throughout detention is crucial for early detection and ending TB in this vulnerable population.

Hilal, M. et al. (2024, November 12-16). Prevalence of TB among prisoners in incarcerated populations in Indonesia [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

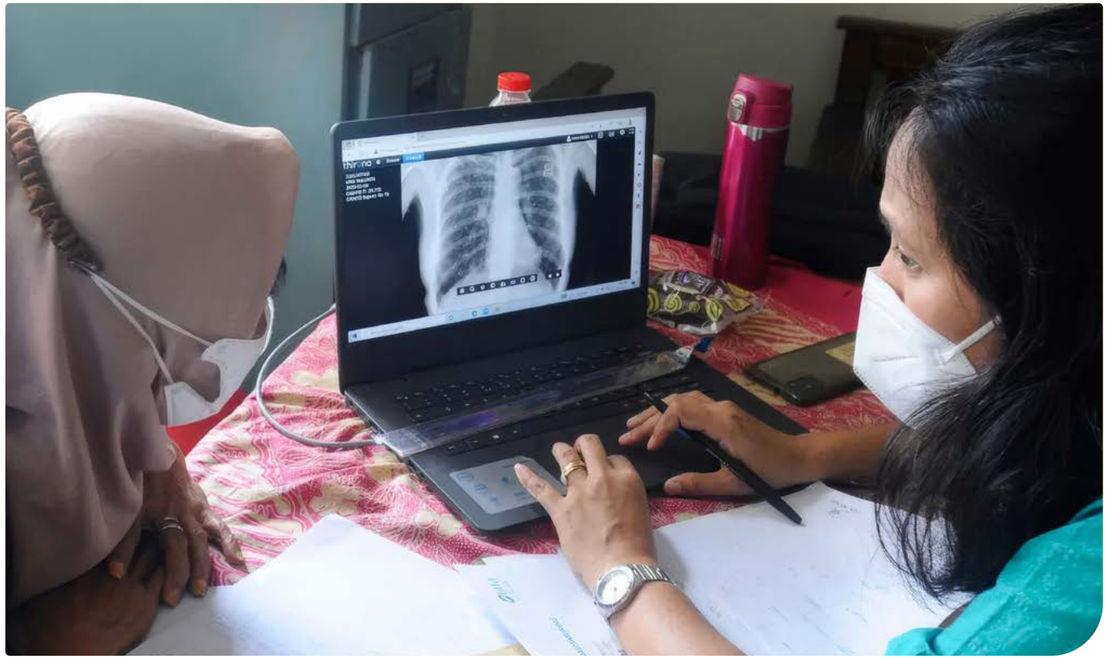


Photo credit: merdeka.com/Arie Basuki // **Location: Indonesia**

04.4 Key and vulnerable populations

Malawi

TB Services to mining and construction workers through Mobile Clinics

Introduction

Malawi faces a significant burden of TB, particularly among miners, who account for 14% of the TB prevalence. Despite this, efforts to address TB among key populations have been limited. In 2023, the National TB and Leprosy Elimination Program collaborated with mining and construction companies to conduct targeted TB screening in 48 companies.

Intervention

- Delft's Mobile Clinics, equipped with EasyDR stationary X-ray, CAD4TB, and GeneXpert, were deployed to screen workers and host communities.
- The program conducted parallel screening of symptoms and digital X-rays using CAD4TB to identify presumptive TB cases, which were then further evaluated by Xpert.

Result

- A total of 5,461 individuals were screened, with 342 (6.1%) showing presumptive TB. 51 (14.9%) were diagnosed with active TB: 31 (60.8%) were bacteriologically confirmed, and 20 (39.2%) were clinically diagnosed.
- The data highlighted a significant occupational risk, with a substantial number of TB cases among mine workers.

Conclusion

- Targeted TB screening yielded a high number of TB cases, underscoring the urgent need for expanded efforts among key populations.
- The program needs to conduct regular TB screening in mining and construction companies and include more sites across the country.

Mbendera, K. et al. (2024, November 12-16). Scaling up targeted TB screening among miners and construction workers in Malawi: A collaborative approach towards TB elimination [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Malawi // **Organization:** Delft Imaging

04.4 Key and vulnerable populations

Nigeria

TB Detection in correctional centers with Delft Light & CAD4TB

Introduction

The combined maximum capacity of two major correctional centers in Oyo State is 590 inmates. However, the actual inmate population has exceeded 1,500, significantly increasing the risk of TB spread among inmates. Consequently, the project introduced the shift from passive to active case-finding in these correctional centers.

Intervention

- From January 2019 to December 2021 (36 months), passive case-finding was conducted in two correctional centers.
- Starting January 2022 and continuing until December 2023 (24 months), routine TB screening was implemented using both the WHO 4-symptom screen (W4SS) and portable digital X-ray machines Delft Light equipped with AI-powered CAD4TB.
- Presumptive TB cases were further tested using GeneXpert. X-ray images with high CAD4TB scores but bacteriologically negative were reviewed by a radiologist.

Result

- During the period from 2019 to 2021 (36 months), 4,500 inmates were screened, leading to the identification of 71 TB cases.
- In the subsequent period from 2022 to 2023 (24 months), 3,200 inmates were screened using both W4SS and Delft Light with CAD4TB, identifying 239 TB cases.
- This indicates a 237% increase in TB case detection when combining symptom screening with X-ray and AI, despite the shorter time frame.

Conclusion

- Active case-finding through combining W4SS and portable X-ray machines with CAD4TB significantly enhanced TB case detection in correctional centers.
- These results underscore the importance of addressing the challenges associated with TB spread among inmates.

Ajayi, O. et al. (2024, November 12-16). Role of active case finding and artificial intelligence in significantly increased TB case finding numbers in correctional centers: USAID TB-LONG3 project experience in Oyo State [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Nigeria // **Organization:** KNCV Nigeria

04.5 Asymptomatic TB

Mozambique

Manhica, I. et al. (2024, November 12-16). Prevalence of subclinical pulmonary TB in Mozambique: Implications for TB screening [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Prevalence of asymptomatic TB with CAD4TB

Introduction

The study investigates the prevalence of subclinical TB based on three case definitions and suggests implications for TB control in Mozambique.

Intervention

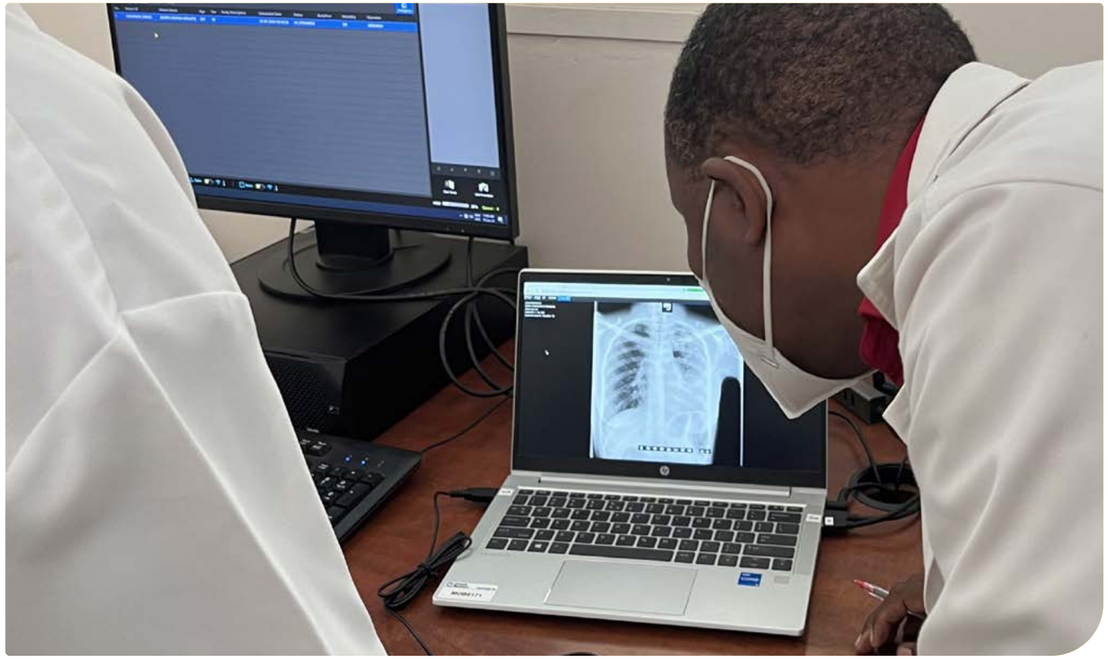
- A nationwide cross-sectional, secondary analysis of data from a previously completed TB prevalence survey was used.
- Adults (≥15 years) were screened for symptoms and underwent chest X-rays (CXR) with CAD4TB. Those who screened positive were asked to submit sputum samples.
- Out of 70,114 individuals, 32,445 (74.9%) participated in the survey. 10,831 were eligible for sputum collection, and 121 had MTB detected. 89 were classified as survey TB cases.

Result

- Among 89 survey TB cases, 59.5% had no persistent cough, 51.5% had no cough, and 43.8% had no TB suggestive symptoms.
- TB was more frequent among male, individuals between 25 and 44 years old in urban settings. More than 80% of CXR show some abnormalities.

Conclusion

- The study found a high prevalence of subclinical pulmonary TB in Mozambique and high TB burden countries.
- The results suggest that TB may need to review the screening guidelines to identify subclinical cases effectively.



Location: Mozambique // **Organization:** Delft Imaging

04.5 Asymptomatic TB

Namibia

Occurrence of asymptomatic TB in active case finding campaign with CAD4TB

Ruswa, N. et al. (2024, November 12-16). Occurrence of subclinical TB in a community active case finding campaign [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Introduction

Asymptomatic TB is rapidly emerging as a state that warrants attention. The study aimed to determine the proportion of subclinical TB among newly bacteriologically positive TB patients using three definitions.

Intervention

- Conducted voluntary TB screening campaigns in hard-to-reach and underserved communities.
- Each participant was asked about symptoms and had a chest radiograph read by CAD4TB with a threshold of 50. Those with positive screen were offered sputum testing with Xpert MTB/RIF Ultra.

Result

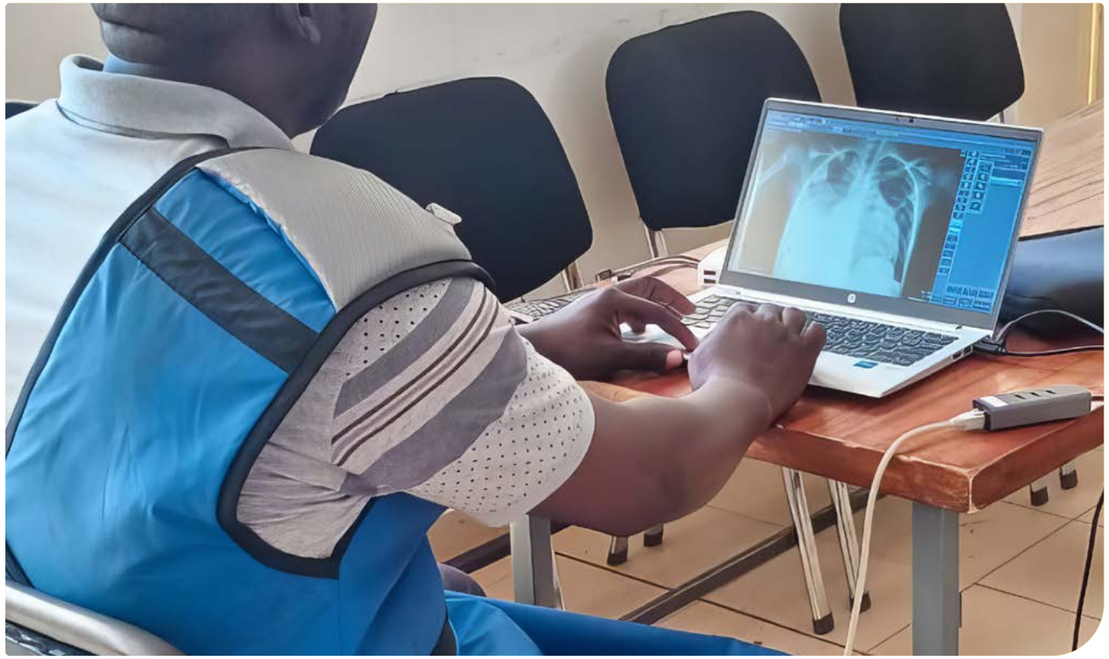
- Among 18,662 participants, 15,047 (81%) had radiographs, and 2,806 had sputum results. 97 new bacteriologically positive TB cases were detected (prevalence is 520/100k). 14.4% of patients were negative for any of the four symptoms.

Proportion of subclinical TB was:

- Screening negative for any cough: 18.5%
- Negative for prolonged cough: 41.2%
- Negative for any W4SS: 14.4%

Conclusion

- Subclinical TB is a significant issue. Using prolonged cough to screen for symptoms misses almost half of TB cases.
- Using the W4SS or a more inclusive screening regimen defines subclinical TB that misses the least number of cases.



Location: Namibia // **Organization:** Delft Imaging

04.5 Asymptomatic TB

Nigeria

Detecting asymptomatic TB with Delft Light & CAD4TB

Introduction

Over the past decade, finding the missing cases of TB has been a huge challenge, with around 75% of TB incidence remaining undetected. However, Nigeria has significantly improved in the last 4 to 5 years, reducing this gap to 25%. Intensive TB case-finding in hotspot communities has been implemented, screening all individuals irrespective of symptoms, using both W4SS and portable digital X-rays Delft Light with AI-powered CAD4TB.

Intervention

- A cross-sectional retrospective review of data from Chest X-rays processed with CAD4TB from January 2022 to January 2024 was conducted.
- Individuals with presumptive TB (CAD4TB score >50) were subjected to GeneXpert testing. For those unable to produce sputum, Chest X-ray images were reviewed by qualified radiologists for possible clinical diagnosis using XMAP.

Result

- A total of 25,993 individuals were screened, including 659 without TB symptoms. Among these non-symptomatic individuals, X-ray screening with CAD4TB identified 39 presumptive TB cases.
- 11 individuals were diagnosed with TB: 1 was bacteriologically confirmed, and 10 were clinically diagnosed by radiologists.
- The Number Needed to Screen (NNS) was 60, and the Number Needed to Treat (NNT) was 4.

Conclusion

- The use of CXR with AI has proven to be a game changer in diagnosing TB among non-symptomatic individuals in Nigeria.
- The deployment of more systems targeting high-risk groups is essential to find all TB cases actively.

Oyawale, M. et al. (2024, November 12-16). Closing the TB case finding gap through artificial intelligence (AI)-aided screening of non-symptomatic population: Katsina State experience [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Nigeria // **Organization:** Delft Imaging

04.5 Asymptomatic TB

South Africa, Zambia, Zimbabwe

Finding asymptomatic TB in high-risk groups with Delft Ultra & CAD4TB

Introduction

Community-based Active Case Finding (ACF) is crucial for identifying undiagnosed TB cases, including those without symptoms who may contribute to community-based transmission. The XACT-19 project incorporates ultra-portable X-rays with CAD/AI to enhance TB detection in the community.

Intervention

- The study employed an ultra-portable X-ray, Delft Ultra, with CAD4TB v7 in South Africa, Zambia, and Zimbabwe. It targeted high-risk groups, including symptomatic individuals, PLWH, those with previous TB, diabetics, and contacts of TB patients.
- Participants were divided into two arms: CAD4TB + Xpert (Arm 1) and Xpert only (Arm 2).

Result

- The interim results showed a 3.8% yield of total TB-positive cases (118/3,102), with 50.8% (60/118) asymptomatic. Among the Bac+ cases, 20% of asymptomatic individuals were found to be infectious.
- The study highlighted an instance of a relatively healthy, asymptomatic individual who was TB-positive, suggesting this person could be unknowingly transmitting the disease in the community.

Conclusion

- The XACT-19 project demonstrated the effectiveness of using Delft Ultra with CAD4TB in detecting high TB burden settings, suggesting a significant minority (~20%) was probably infectious, with a large proportion asymptomatic.
- These findings inform future ACF strategies in high TB burden settings, which is key for implementing strategies to detect TB in the community using these tools.

Scott, A. et al. (2024, November 12-16). Can AI-driven computer-aided detection optimize X-pert-oriented community-based active case finding for TB? An interim trial progress report [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Source: Dr Alex Scott's presentation "Can AI-driven computer-aided detection optimize X-pert-oriented community-based active case finding for TB? An interim trial progress report" **// Location:** South Africa **// Organization:** The Union World Conference 2024

04.5 Asymptomatic TB

Timor-Leste

National TB prevalence survey and asymptomatic TB detection with Delft Light & CAD4TB

Introduction

A national TB prevalence survey was conducted from 2020 to 2023 to determine the burden of TB, including subclinical TB cases.

Intervention

- In this nationally representative random cluster survey, participants aged 15 and older underwent symptom screening (cough >2 weeks, fever, weight loss, or night sweats) and Chest X-rays (CXRs) using Delft Light ultra-portable X-rays with CAD4TB (threshold ≥60).
- Participants with abnormal CXRs and/or any TB symptoms underwent two GeneXpert tests, and liquid culture was performed on those who tested Xpert positive.

Result

- Out of 15,267 participants, 7.4% (1,125) were symptom screen positive, and 4.4% (675) were CXR/CAD4TB screen positive.
- Among those with high CAD4TB scores, 36% had no TB symptoms. This resulted in 22% of bacteriologically confirmed TB cases being subclinical.
- A total of 162 participants were confirmed with Bac+ TB. Notably, 22% of Bac+ TB cases would have been missed without using Chest X-rays with CAD4TB.

Conclusion

- The survey revealed a substantial burden of subclinical TB in Timor-Leste.
- These findings underscore the importance of active case finding and the use of CXRs to enhance the sensitivity of TB screening algorithms.

Atok, L. et al. (2024, November 12-16). Sub-clinical TB in participants of a national prevalence survey in Timor-Leste [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Timor-Leste // **Organization:** Delft Imaging

04.6 Case finding in the private sector

Nigeria

Finding TB cases at private health facilities using CAD4TB

Introduction

Lagos accounts for approximately 10% of Nigeria's TB burden. It has piloted first-of-its-kind facility-based TB case finding using digital X-ray and AI-powered CAD4TB to close the TB notification gap.

Intervention

- With the support of the Global Fund, 18 CAD4TB systems were deployed to 18 public and private facilities in Lagos, including general hospitals, tertiary hospitals, primary healthcare centers, and private health facilities.
- All the facilities have existing CXR infrastructure and human resources.

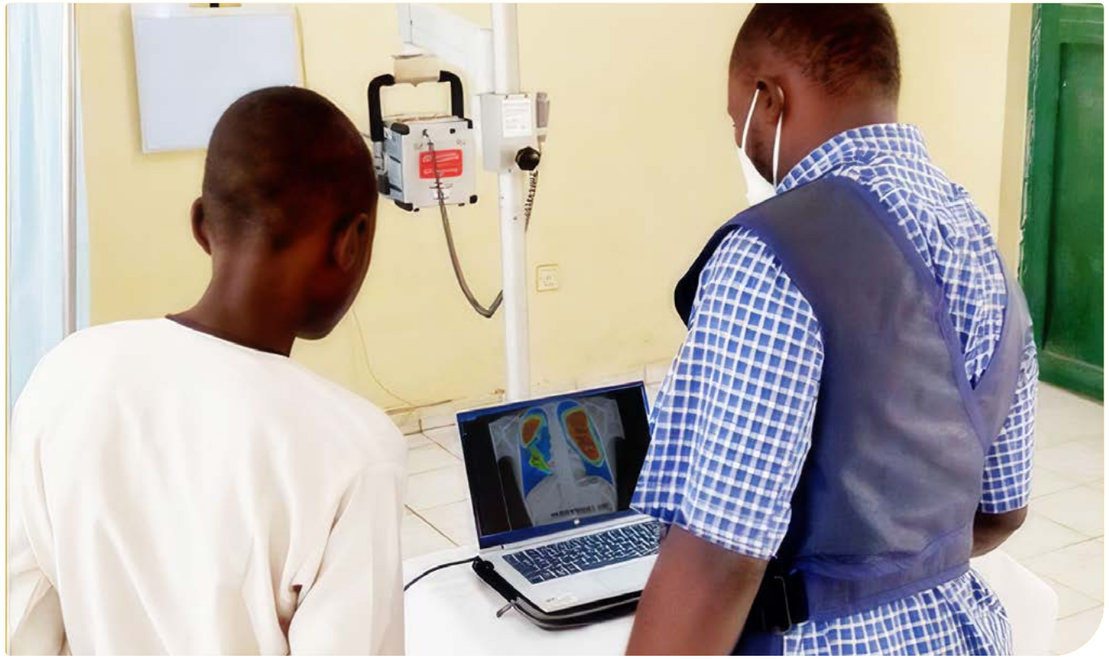
Result

- Between January 2022 and December 2023, a total of 95,770 individuals were screened by CAD4TB, and 17% (16,572) were identified as presumptive TB cases (CAD4TB score ≥45).
- A further evaluation was conducted on 16,023 individuals, resulting in the diagnosis of 4,969 TB cases, yielding a 5% TB rate.
- The number needed to screen (NNS) was 19, and the number needed to test (NNT) was 3.

Conclusion

- The assessment indicates that using AI-enabled CAD4TB for facility-based TB screening enables quality presumptive identification with a high TB yield and good NNS/NNT.
- The intervention has significantly contributed to the overall increase in TB case finding in Lagos. Scaling up this approach to bridge the TB case notification gap is recommended.

Sokoya, O. et al. (2024, November 12-16). Implementing facility-based artificial intelligence enabled chest X-ray screening as innovative strategy to improving TB case finding in Lagos, Nigeria [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.



Source: Innovative TB Screening Tools: The Roll-Out of Ultra-Portable Digital X-Ray and Computer-Aided Detection Software in Nigeria Report // **Organization:** Stop TB Partnership

04.7 Pediatric TB

Nigeria

TB detection among children with Delft Light & CAD4TB

Introduction

Children aged 5-14 account for 12% of Nigeria's TB burden. Underdiagnosis and low treatment coverage in children are significant challenges. Intervention

Intervention

- The Delft Light and CAD4TB were deployed to eight states for active TB case finding during community outreaches.
- At-risk children (5 years and above) were screened using the ultra-portable X-ray with CAD4TB. A parallel screening algorithm using the WHO four-symptom screen and a CAD4TB score of >50 was used to identify presumptive TB cases.
- Children with presumptive TB were evaluated bacteriologically using sputum or stool samples.

Result

- Between January 2022 and December 2023, 35,636 children were screened. Of these, 2970 (8%) were presumptive for TB, and 202 (8%) were diagnosed with TB, out of which 123 (60%) were bacteriologically confirmed. 98% of the diagnosed children started treatment.
- When comparing the diagnosed TB cases between children and adults, the presumptive yield and testing rate were similar. In contrast, the adult population had a much higher TB positivity rate with clinical diagnosis.

Conclusion

- The PDX with CAD4TB presents a valuable opportunity for diagnosing TB in children.
- There is a need to validate the performance of CAD systems in children for effective TB detection.

Eneogu, R. et al. (2024, November 12-16). Exploring opportunities for TB diagnosis in children aged 5-14 years in Nigeria using ultra-portable X-ray with computer-aided detection [Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Nigeria // **Organization:** USAID, IHV Nigeria

04.7 Pediatric TB

Nigeria

Child TB detection in Nigeria: a five-day screening initiative using Delft Light & CAD4TB

Introduction

Child TB notification has been a critical gap in programmatic efforts, with only 35% of the estimated 58,000 children with TB being notified in Nigeria in 2022. To address this, a five-day screening initiative was conducted across 36 states to enhance child TB detection through facility- and community-based screening of high-risk children (0-14 years).

Intervention

- A preliminary mapping was conducted to identify targeted sites for high-risk groups, including malnourished and HIV-positive children, as well as street children and those in hard-to-reach communities.
- Ultra-portable X-ray units (Delft Light) equipped with CAD4TB were deployed to facilitate these services.

Result

- Over 5 days, a total of 331,595 children were screened. 91,406 were identified as presumptive TB cases, and 82,086 were further evaluated, resulting in 4,054 children being diagnosed with TB.
- This corresponds to a yield of 4.9% among the presumptive TB cases evaluated.

Conclusion

- The findings suggest that targeted active case finding among children can significantly bridge the gap in child TB detection.

Urhioke, O. et al. (2024, November 12-16). Bridging Gaps in Child TB Detection through Innovative Testing Week in Nigeria [Poster Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Source: Image by Freepik

04.8 Connectivity and integration

Kenya

Integration of CAD4TB and national TB data system (TIBULIMS)

Introduction

With the introduction of Delft Light portable X-rays with CAD4TB, Kenya NTP needed to integrate screening data onto TIBULIMS, the national data repository for all diagnostic data, to facilitate reporting, disease surveillance, and monitoring.

Intervention

- The needs of various users were collected through a multi-stakeholder workshop. Use cases, dashboard features, and reports were then scoped for development.
- A software code was developed to facilitate data exchange between the eight devices and TIBULIMs, along with user interfaces.
- Stakeholders, including radiologists, radiographers, and clinicians, had hands-on experience with the CXR module and validated its features in a workshop. The code was successfully tested, raised user awareness, and provided remote support through a dedicated help desk.

Result

- The API fetches data from the primary storage devices (CAD4TBboxes) to the CAD4TB cloud and subsequently sends them to TIBULIMS.
- The TIBULIMS dashboard provides comprehensive statistics regarding the usage of each integrated device, including the total number of CXR images taken, disaggregated by CAD4TB score, age, lab results, and specific CXR sites.
- Radiologists access and report the images with a turnaround time of less than an hour.
- At the point of care, clinicians can view the images, CAD4TB/AI report, radiologist report, and laboratory results on a single platform.

Conclusion

- The integration offered streamlined access to comprehensive screening and diagnostic data for clinical decision-making.
- Detailed statistics on device usage and screening outcomes offer valuable insights for program evaluation and resource allocation.

Gichanga, K. et al. (2024, November 12-16). Innovative integration: Digital CXR screening data on national LIMS for TB surveillance in Kenya [Poster Presentation]. The Union World Conference on Lung Health, Bali, Indonesia.

Location: Kenya // **Organization:** Delft Imaging

05.

Working as one

05.1 Meet our team

Netherlands office

Embracing a culture of belonging

Our team's diverse backgrounds and multicultural experiences fuel creativity, foster collaborations, and broaden our perspective. We are committed to building an inclusive society within our organization and through our solutions.

We are happy to communicate with you in:

- **Afrikaans**
- **Akan**
- **Arabic**
- **Bahasa**
- **Dutch**
- **English**
- **French**
- **Greek**
- **Hindi**
- **Indonesian**
- **Irish**
- **Italian**
- **Japanese**
- **Malayalam**
- **Polish**
- **Portuguese**
- **Spanish**
- **Turkish**
- **Urdu**
- **Vietnamese**

05.1 Meet our team

Indonesia office

Ghana office

05.2 Acknowledgments

Collaboration is at the heart of everything we do, and this report is a reflection of that commitment and our dedication to the fight against tuberculosis and to making pregnancies safer. In particular, we are grateful to the funding agencies that support the projects we implement. We express our gratitude to the various technical agencies involved for their expertise and support. We greatly appreciate all our clients and partners around the world, including Ministries of Health, National TB Programmes, NGOs, and others. Your trust in us and our solutions drives us to continue innovating and supporting your programs. Most importantly, we are thankful to all those who work diligently every day, on the ground, to find missing TB cases early and to support women around the world in delivering their babies safely. Your dedication inspires us. **Let's keep working together to make the world healthier for everyone.**

Finally, **thank you** to all who chose **Delft Imaging** as a **trusted partner.**

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Toward a
healthier future