CLOSING THE GAP ON CHILDHOOD TB IN ZAMBIA

Image: CIDRZ

PROJECT DETAILS

Lusaka, Zambia

July 2020–present

CAD4TB (Delft Imaging Systems)

Centre for Infectious Disease Research in Zambia (CIDRZ)

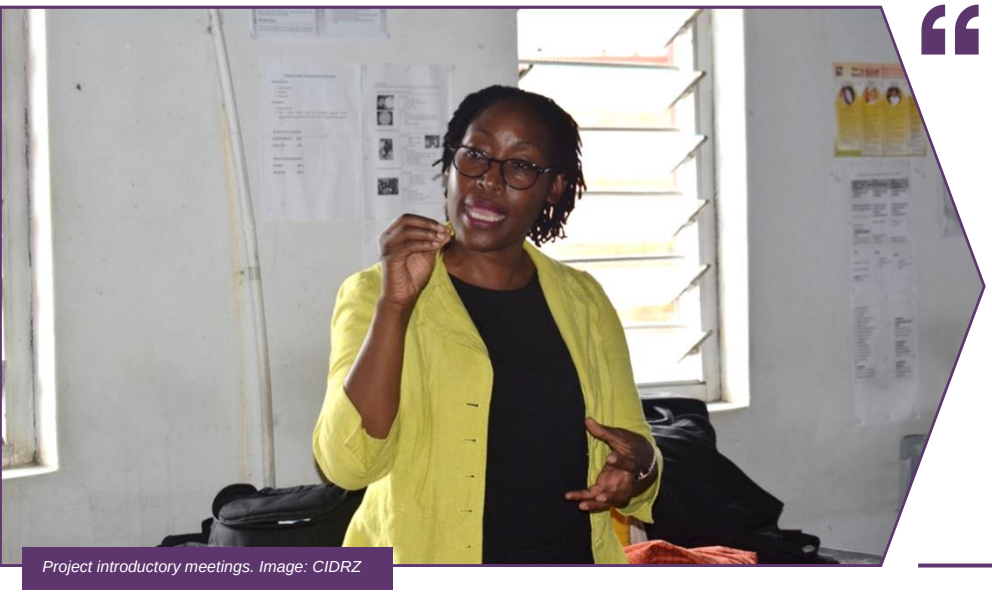
AI INTERVENTION

Zambia has one of the highest burdens of tuberculosis (TB), drug-resistant TB, and HIV/TB coinfection in the world.[1] Large numbers of people with TB in Zambia are simply not diagnosed or reported. Of the estimated 59,000 people with the disease in 2020, only 40,726 were diagnosed and notified in the country.[2] Sadly, underdiagnosis and reporting is especially true in children. **The prevalence of TB in children in Zambia remains largely unknown,** making up only 6% of national notifications despite childhood TB contributing 12% of the global TB disease burden.[3,4]

TB REACH funded the Centre for Infectious Disease Research in Zambia (CIDRZ) to revolutionize provision of TB services to children in a peri-urban area of Lusaka – a region home to the country's capital city and reporting the second highest number of TB cases nationwide.[5] Here, CIDRZ pioneered the use of two cutting-edge tools – an ultra-portable X-ray system (Fujifilm Xair) connected to artificial intelligence (AI) TB detection software (CAD4TB) – to screen **children and their families attending two health facilities**.

Baby Sam was treated for TB at Kanyama Hospital by the project. Image: CIDRZ

In Kanyama and Chawama hospitals, CIDRZ worked hard to **raise awareness of the signs and symptoms of childhood TB among people in outpatient departments.** With this new knowledge, people attending departments across the hospital were able to come to a project focal point where free TB testing was available. Every weekday, children (from newborns to adolescents) and accompanying adults were screened for TB symptoms and given a digital chest X-ray using the ultra-portable equipment. The X-ray image was then read by both radiologists and AI, and the results were used by clinicians to decide whether further testing was necessary. If a child was diagnosed with TB, appropriate treatment was provided alongside supplementary nutritional support, and close family members were also screened.



Project introductory meetings. Image: CIDRZ

> ***I THINK ULTRA-PORTABLE X-RAY IS THE WAY TO GO. IT'S VERY EFFICIENT, EASY TO HANDLE, AND YOU CAN TAKE IT ANYWHERE.***
>
> **– PROJECT CLINICIAN,**
> **CIDRZ**

Ultra-portable X-ray systems are substantially easier to transport than alternatives. It is even possible for a small team to transport them by hand. CIDRZ took advantage of this to respond to a request for help from a clinic with no X-ray resources over 15km from the Lusaka district. For one month, the project team **routinely transported the entire X-ray system and AI** to provide screening services at this third facility on weekends.

Since screening began, the project has resulted in a steady increase in the number of people diagnosed and reported with TB in the project areas.

PROJECT IMPACT

- **5,077 children screened, 490 of which were diagnosed with TB**
- **4,625 adults diagnosed with TB**
- **254% increase in TB cases notified in project areas**

AI helped to identify TB in individuals who were asymptomatic or not yet showing symptoms, and so **may not have otherwise been detected**. Clinicians also felt the tool was helpful for enabling colleagues to consult on images remotely, as images uploaded to the online AI platform could be accessed by permitted colleagues from web browsers anywhere.

The data from this project will be important for shedding much-needed light on how well AI is able to detect TB in X-rays from children and could justify the much-needed deployment of AI for tackling the global TB burden in children.

Baby Jack and his grandmother. Image: CIDRZ

PROJECT IMPACT – NOT JUST NUMBERS

Living with his grandmother, baby Jack, a 2-year-old boy, had been sick for a long time with cough, fever and night sweats. This ill health persisted despite completing courses of various medications from different hospitals. Rapidly losing weight, Jack's milestones were regressing; he stopped walking and playing.

Everything changed when Jack was referred to an HIV clinic in Kanyama hospital. While in the queue at the HIV clinic, his grandmother listened to an information session about childhood TB and decided to take him to be screened by CIDRZ. His X-ray results, symptoms and diagnostic tests unanimously indicated that Jack had childhood TB.

CIDRZ provided him with treatment that sparked a remarkable recovery: Jack's symptoms subsided, and he returned to his playful self and began walking again. Jack's grandmother is grateful for the care her grandson received from the project.

REFERENCES

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3. Kapata N, Chanda-Kapata P, O'Grady J, et al. Trends of Zambia's tuberculosis burden over the past two decades. Trop Med Int Health. 2011;16(11):1404–9. doi:10.1111/J.1365-3156.2011.02849.X.
4. Global tuberculosis report 2021. Geneva: World Health Organization; 2021 (https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2021, accessed 5 November 2021).
5. Zambia national tuberculosis prevalence survey 2013–2014. Lusaka: Republic of Zambia, Ministry of Health; 2015 (https://www.moh.gov.zm/docs/tbsurvey.pdf, accessed 22 December 2021).

ABOUT THIS DOCUMENT

This document is one of a series spotlighting the experiences of these early implementers when using artificial intelligence (AI) / computer-aided detection (CAD), to highlight the added value of CAD for TB programmes and inspire prospective implementers to innovate. Funding of this project was provided by the Stop TB Partnership's TB REACH initiative, launched in 2010 by Global Affairs Canada. In 2012, TB REACH first worked with implementing partners to pilot CAD software. Since then, it has implemented 3 different CAD products in 13 different countries in Sub-Saharan Africa, Latin America, Eastern Europe, and South and South-East Asia.