VALIDATING THE USE OF ARTIFICIAL INTELLIGENCE TO DETECT TB IN CAMEROON

PROJECT DETAILS

Bamenda, Cameroon

Sep 2015 – April 2016

CAD4TB (Delft Imaging Systems)

Bamenda Center for Health Promotion and Research

AI INTERVENTION

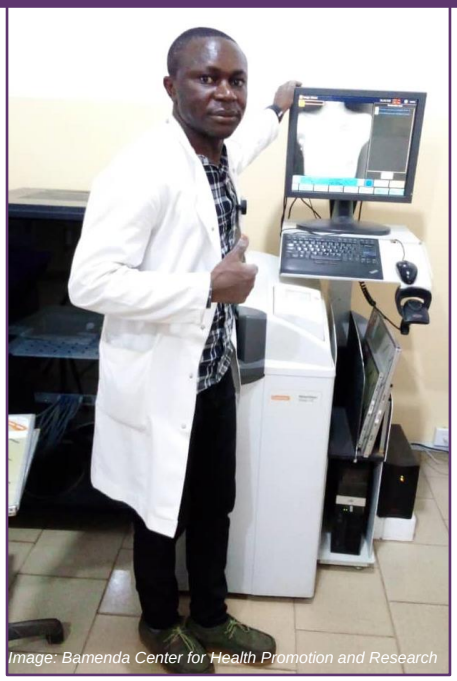


Image: Bamenda Center for Health Promotion and Research

In 2020, an estimated 46,000 people in Cameroon had TB, but roughly half of them were not diagnosed and notified.[1] The health system in Cameroon lacks the resources to cope with such a high burden of disease, including a high burden of HIV/TB co-infections. Only 18% of health facilities offer TB services, and these typically use relatively unreliable tests for diagnosis and only 5% offer a chest X-ray. Consequently, **almost half the cases of TB are routinely missed.**[1,2]

Stop TB Partnership's TB REACH initiative supported the Bamenda Center for Health Promotion and Research to evaluate the relative value of different screening strategies for TB in hospital outpatient departments.

In the Bamenda Regional Hospital, the project screened the first 20-25 people arriving at the outpatient department for symptoms of TB and then provided them with a chest X-ray that was read by a radiologist. Chest X-rays were also read by artificial intelligence (AI) (CAD4TB) and the resulting performance recorded. People

thought to have TB (because of symptoms, chest X-ray or both) were further examined for TB bacteria using more sensitive molecular tests than those typically used in Cameroon.

Patient enrolment. Image: Bamenda Center for Health Promotion and Research

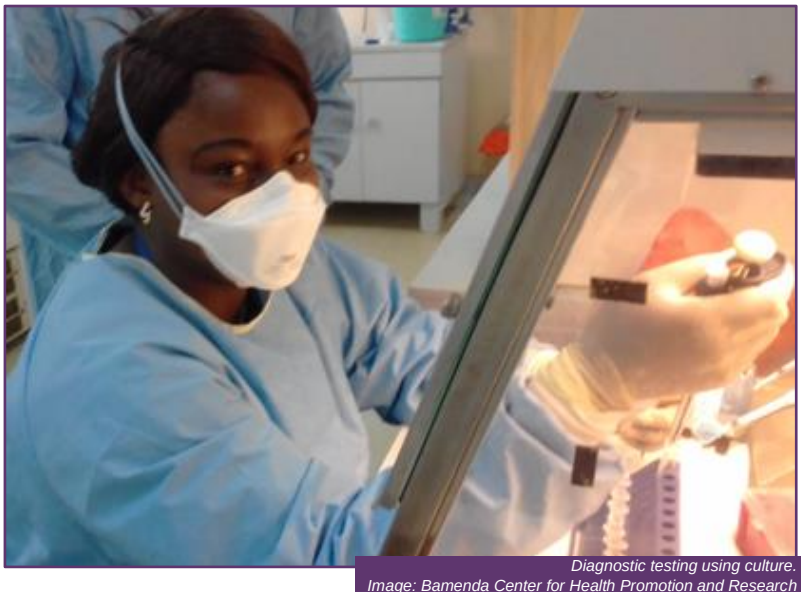
Diagnostic testing (Gene Xpert). Image: Bamenda Center for Health Promotion and Research

Later, two additional AI software- Lunit INSIGHT CXR (Lunit), and qXR (Qure.ai)- also interpreted the X-ray images. Although AI was not used for clinical decisions in the hospital, the readings collected by the project provided data for the **first ever impartial validation of multiple AI products for TB,** featuring three AI products: CAD4TB, Lunit INSIGHT CXR, and qXR. Two of the products – Lunit INSIGHT CXR and qXR – had **never been impartially validated** before this study.

The noteworthy results were published in Nature Scentific Report in 2019 and had important implications for future use of AI. AI performed **as well as radiologists** when identifying TB from chest X-rays. Interestingly, the research also provided some of the first evidence that AI performance varies between populations.

PROJECT IMPACT

- ✓ **2,051 hospital outpatients screened for TB**
- ✓ **19% had an abnormal chest X-ray (possibly indicating TB)**
- ✓ **AI's ability to detect TB was found to be comparable to radiologist's**
- ✓ **First independent evaluation of qXR and Lunit INSIGHT AI tools.**



Diagnostic testing using culture. Image: Bamenda Center for Health Promotion and Research

Seeing how accurate AI was, the team in Cameroon felt that it was a **very good tool for community screening,** especially in rural areas without any access to X-ray equipment or radiologists**.** AI added value in more ways than one – **facilitating clinical collaboration** by enabling easy access at any time or place to X-rays uploaded to the online AI platform through internet browsers. However, despite promising results, AI's future use in Cameroon is currently limited due to the price of AI and the availability of suitable X-ray equipment and operators.

> ***IN CAMEROON, MANY PEOPLE WITH TB LIVE IN RURAL AREAS WITHOUT ANY ACCESS TO X-RAY EQUIPMENT OR RADIOLOGISTS. FOR US, IMPLEMENTING AI WOULD HELP TO IMPROVE THE USEFULNESS OF X-RAY IN THE SCREENING OF TB, ESPECIALLY IN THE AREAS WHERE RADIOLOGISTS ARE NOT AVAILABLE. HOWEVER, THE MAIN BARRIER IS THAT WE JUST DON'T HAVE THE X-RAY CAPABILITY AT THE MOMENT.***
>
> **– SYLVAIN LAAH**
> **CO-PRINCIPAL INVESTIGATOR**

FURTHER READING

Using artificial intelligence to read chest radiographs for tuberculosis detection: a multi-site evaluation of the diagnostic accuracy of three deep learning systems.

Systematic screening for tuberculosis among hospital outpatients in Cameroon: The role of screening and testing algorithms to improve case detection.

REFERENCES

1. WHO TB profile Cameroon. Accessed November 29, 2021. https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&entity_type=%22country%22&lan=%22EN%22&iso2=%22CM%22
2. Enquête sur les indicateurs de prestations des services de santé – health facility assessment (sdi/hfa) 2018. Centre de Documentation Numérique du Secteur Santé. Accessed November 29, 2021. http://cdnss.minsante.cm/?q=en/content/enquete-sur-les-indicateurs-de-prestations-des-services-de-sante-%E2%80%93-health-facility

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.