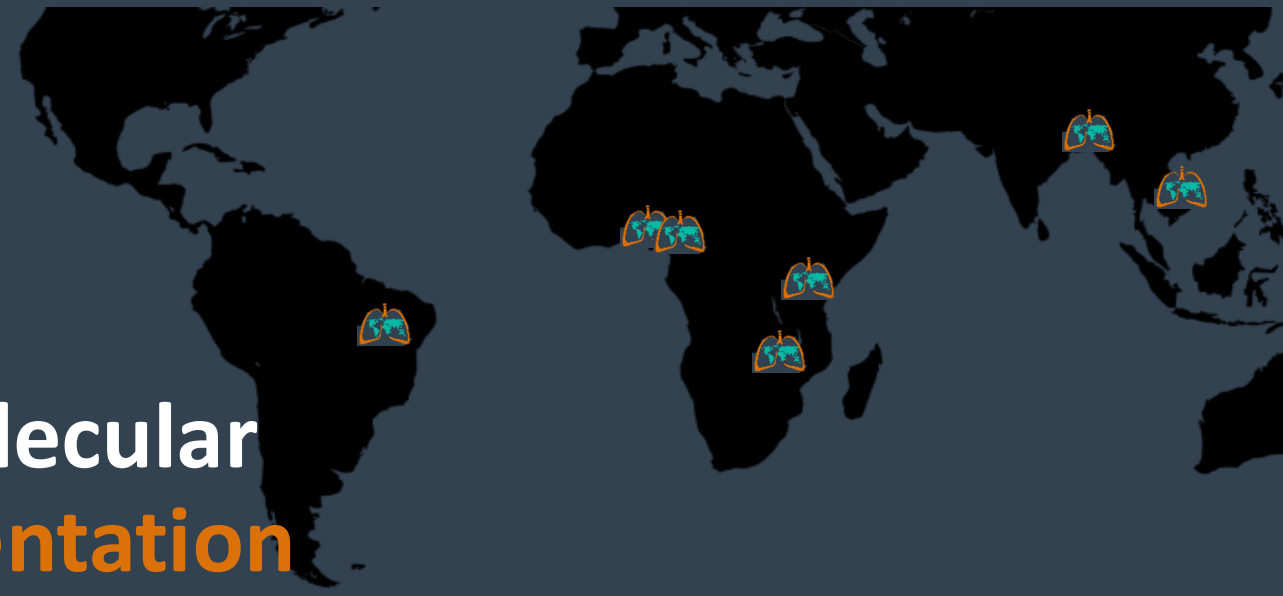

Pooled sputum testing for molecular TB diagnosis-Practical implementation lessons from Cameroon's experience

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Scenario + Why Pooling in Cameroon?

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In 2020, Ngono, age 14, from a village in Cameroon. She coughed for 3 months. Our lab with the nearest GeneXpert was 16km away. At that time, GeneXpert was the only WHO-recommended molecular test for initial TB diagnosis in children. When her sample finally arrived, there were limited cartridge with many samples because of COVID 19. She was diagnosed very late, only after we started pooling with Gene Xpert. She survived, but barely. Not because TB is untreatable; but because of limited access to diagnosis due to cartridges shortages.

Why Pooling? – The need in Cameroon BEFORE we started

- ❑ **Low molecular coverage:** Only 38% of diagnosed TB patients received a WHO-recommended rapid molecular test as initial test (NTP 2020).
- ❑ **Cartridge cost & shortages**: Each Xpert Ultra cartridge = ~$8–$10. Severe stockouts
- ❑ **48% notification coverage:** That year, due to cost and supply limits, we could only notify 48% of estimated TB cases (WHO 2020)

Our Journey – What We Did in Implementation

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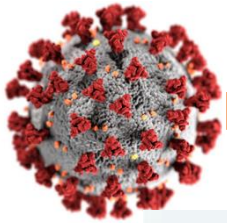
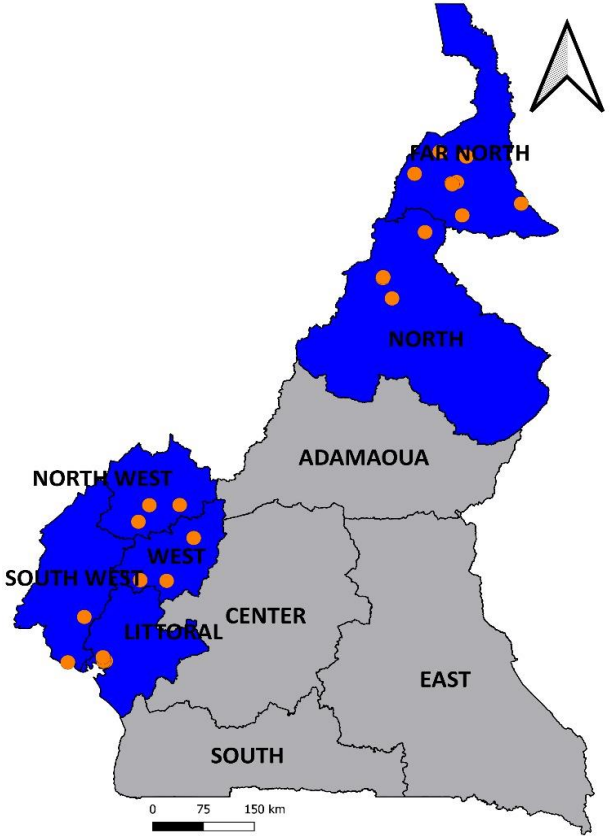


COVID19 (Cartridge shortages)

PILOT (2020–2022)	**SCALE-UP** (2023–2025)
• 2 reference laboratories	• 25 GeneXpert laboratories
• Fixed pool size: 3	• Flexible pool size: 2–6
• Daily volume: 8–15 specimens	• Daily volume: 8–30 specimens
• Manual data recording	• Digital + WhatsApp tracking
• Training: intensive, 2 sites	• Training: expanded to 25 other GeneXpert laboratories
• No national policy yet	• Policy advocacy in parallel
• Focus: feasibility & safety	• Focus: scalability & efficiency



Map of Cameroon, with GX labs (orange); intervention regions (blue)

IMPLEMENTATION LESSONS FROM PILOT (2020–2022)

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WHAT WE DID	IMPACT	IMPLEMENTATION LESSON
Started during cartridge shortage	Sustained molecular testing when supply chains broke	In times of crisis, it is the best time to think innovatively
Used pools of 3 only	48% cartridge savings	Small pools are safest for first 6 months.
Trained 2 reference labs intensively	10,117 specimens tested	In addition to normal Xpert lab indicators, ensure that you track false positive pool rate (expected rate of 3-10% due to assay variability).
Entered pools in Xpert instrument but without standardised system	Functional but slow	Lesson learned: Developed standard procedure for creating pool ID and entering specimen IDs in notes field,

IMPLEMENTATION LESSONS-SCALE-UP (2023–2025)

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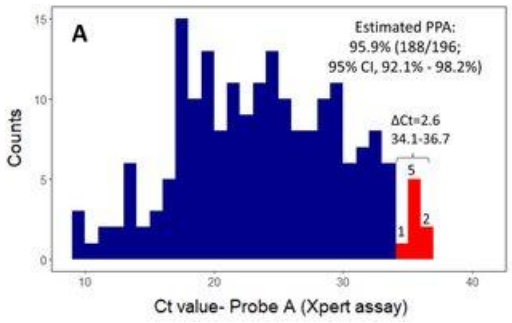
WHAT WE DID	IMPACT	IMPLEMENTATION LESSON
Expanded to 25 GeneXpert labs	60,325+ specimens tested	Decentralization works IF you have a central communication channel (e,g WhatsApp group) for daily troubleshooting.
Flexible pools (2–6) based on lab positivity	65% cartridge saved overall	One size does not fit all. Labs with 3% positivity can pool 4-6; labs with 13% should pool 2.
Trained 25 Xpert labs on pooled testing	39,191 additional people tested	Pooling fails if sample transport is broken. Fix logistics first.
Used in silico analysis for accuracy	99.4% PPA vs individual Ultra	You don't always need a new study. Use existing data to model accuracy before scaling.



Analysis of pooled testing (pools of 3) conducted from July 2020 to February 2022, the **PPA compared to individual testing was estimated at 99.4% (95% CI, 96.6% to 100%)** for the Xpert MTB/RIF Ultra assay.

HARD LESSONS

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CHALLENGE	WHAT HAPPENED	IMPLEMENTATION LESSON
Missed trace positives	Sensitivity 89% (pooled) vs 91% (individual). 5 false negatives per ~215 true positives.	**Be transparent**: “Negative pool does not 100% rule out low-bacillary TB.” Counsel clinicians.
No national policy for 18 months	Labs operated in grey zone.	Start policy advocacy on day 1 of pilot. Don’t wait for final data.
Staff turnover	Some trained technicians left, so we had to do refresher trainings	Laminated job aids + 5-min refresher videos + WhatsApp group
Cartridge stockouts still happen	Pooling reduces but does not eliminate stockouts.	Pooling buys time, not immunity. Keep buffer stock.
Reagent waste if done wrong	Individual test used 1 sample reagent per patient sample. If performed the same way with a pool; cartridges will be saved but reagents lost; a hidden cost.	Use 1 sample reagent for the entire pool (3–4 samples). Pooling saves cartridges only if one reagent is used for multiple samples.

The Start4All Partnership

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For more information, see our online Acknowledgements page:
www.lstmed.ac.uk/start4all/acknowledgements

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