

TB diagnostics: from R&D to policy to practice and the impact of COVID-19

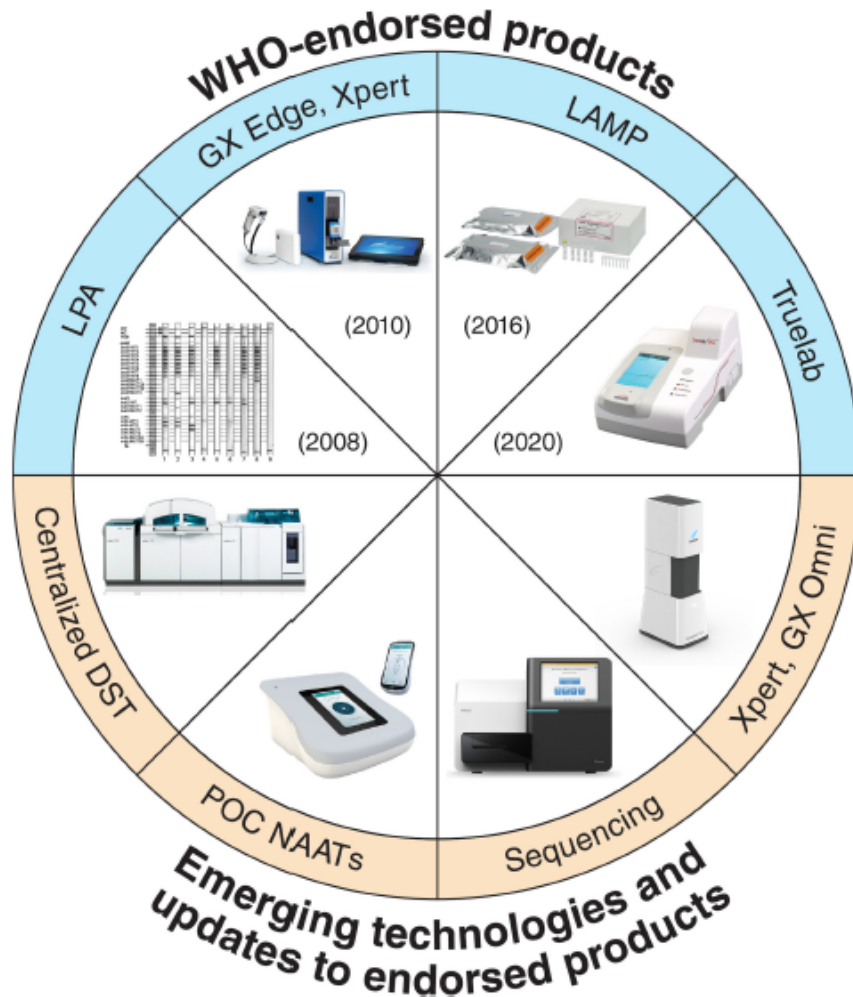
TBEC webinar – 2 October

STIJN DEBORGGRAEVE
MSF Access campaign



TB diagnostics

Central to district



MacLean et al. 2020 J Clin Microbiol 58: e01582-19

Point of care

MSF Access Campaign Technical Brief

June 2019
(Updated March 2020)



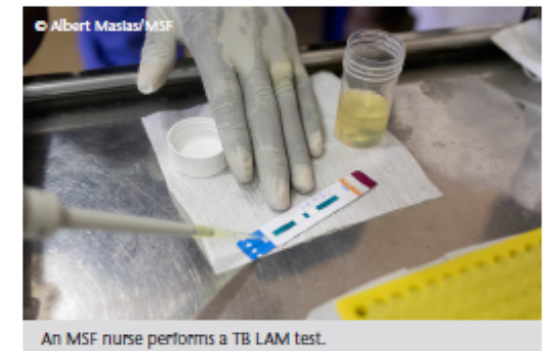
A RAPID TB TEST FOR PEOPLE LIVING WITH HIV

TB LAM can help close the deadly TB testing gap

INTRODUCTION

Médecins Sans Frontières (MSF) has been treating tuberculosis (TB) for more than 30 years and HIV for nearly 20. Our teams currently support treatment for more than 250,000 people living with HIV (PLHIV) in 19 countries, primarily in sub-Saharan Africa. We have many projects in these countries to address TB/HIV co-infection.

This technical brief analyses gaps in the diagnosis of TB for people living with HIV, describes the critical role TB LAM testing can play in saving lives, and provides recommendations for governments to implement and rapidly scale up access to testing.



3.5\$

<https://msfaccess.org/rapid-tb-test-people-living-hiv>

TB diagnostics R&D

R&D PIPELINE



Catalyse Development

Concept	Feasibility	Development
Pathogen-specific typhoid RDT (typhus, leptos)	LAM sputum monitoring (Otsuka)	Centralized use: Fluorotype XDR (Hain/Bruker)
High-priority malaria RDT	Triage POC test	GeneXpert OMNI (Cepheid)
Gonorrhoea DR test	Centralized use: NGS	eHealth solutions: DX in a BX
Near-POC MDx for VHF detection (incl. Lassa)	POC molecular test (BLINK DX)	Multiplexed immunoassay (Chembio)
	2 nd Gen LAM for broad use cases	Highly sensitive combo RDTs (SD/Abbott)
	Host & pathogen marker screening	Buruli: LAMP (DITM, NMIMR)
	<i>P. vivax</i> serology (WEHI, Mologic)	Buruli: Ag capture (SD/Abbott, Swiss TPH)
	Bacterial/non-bacterial triage test	HAT: malaria combo RDT (SD/Abbott)
	Schistosoma: RDT (Mologic)	cAg RDT format (DCN, Mologic)
	Buruli: mycolactone RDT (DOTD)	
	HCV self-test (Orasure, Access Bio)	
	Xpert Carba-R v2 (Cepheid)	
	RDT reader for connected Dx	
	Gonorrhoea Dx (CT/NG detection)	
	Substandard & falsified medicine screening	
	Semi-open molecular platform for Lassa (aitona, Cepheid)	
	POC multi-analyte, polyvalent (BLINK DX)	
	Zika-dengue-chikungunya flex assay	

Guide Use and Policy

Evaluation	Demonstration
TrueNAT (Molbio)	hsRDT in maternal & child health
Centralized DST (Roche, Abbott, BD, Hain/Bruker)	CRP + malaria test (SD BIOSENSOR)
Host biomarker and phenotypic ID tool landscaping	HAT: 2nd Gen RDT (SD/Abbott)
Paediatric TB stool kit (Rutgers)	Xpert HCV VL Fingerstick test (Cepheid)
Radiology: CAD4TB (Delft), Qure.ai	Multiplexed fever panel (BioFire)
Breath test (Enose, RBS)	
1 st Gen LAM (Fujifilm)	
Decentralized use: Xpert XDR (Cepheid)	
Biomarker-based product validation	
CRP + malaria test (SD BIOSENSOR)	
Buruli: iTLC (Harvard, WHO)	
Leishmania: Rk28 RDT for WHO (CTK Biotech)	
RNA (genedrive)	
Serology RDTs for WHO PQ	
RNA DBS for WHO	
cAg test of cure (Abbott)	
RDA Truenat (Molbio)	
Lassa RealStar 2.0 ERPD for WHO (aitona)	



Pipeline Report

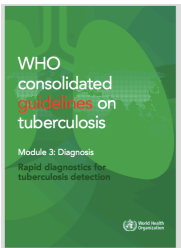
Overview of Innovations for Diagnosing, Preventing, Treating, and Curing HIV, HCV, and TB

<https://www.finddx.org/tb/>

<https://www.treatmentactiongroup.org/resources/pipeline-report/2020-pipeline-report/>

WHO recommendations (2020)

WHO consolidated guidelines on TB: Module 3



**Xpert MTB/RIF
Xpert MTB/RIF Ultra**

Should be used
Initial test for all
Signs of TB and EPTB

9.98\$
*



**Truenat MTB (Plus)
Truenat MTB/RIF Dx**

May be used
Initial test for all
Signs of TB

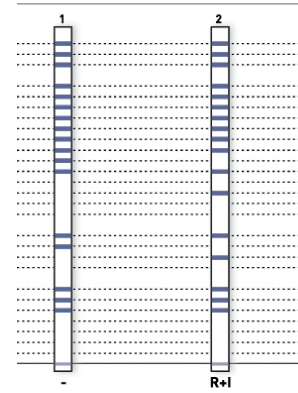
9.0\$



LAMP

May be used
Replace microscopy
Signs of TB

6\$



LPA

May be used
**Initial test to replace
phenotypic DST**
First line: RIF and INH
resistance
Second line: FLQ & SLIDs

7.5\$
*



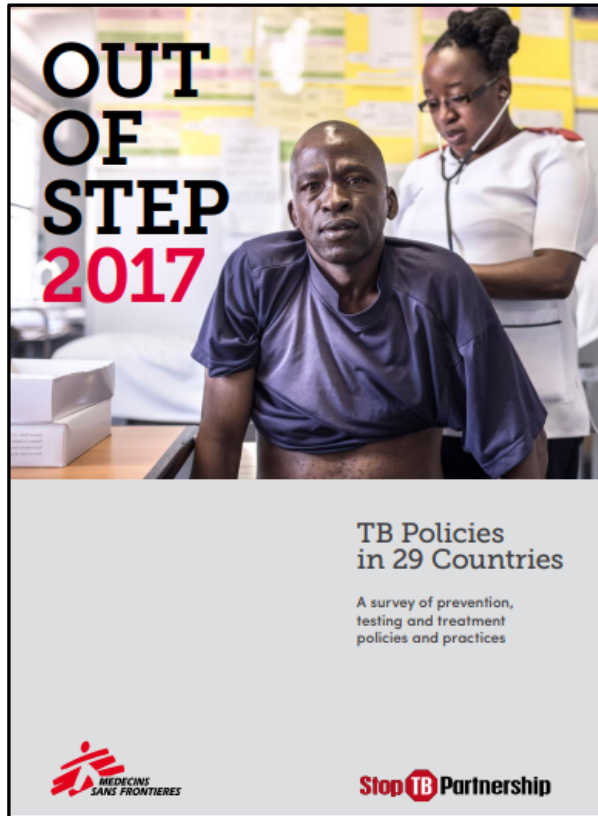
TB LAM

**Recommended
PLWHA
Inpatients**
- Signs of TB/EPTB
- AHD
- CD4 <200
&
Outpatients
- Signs of TB/EPTB
- CD4 <100

3.5\$

* FIND negotiated prices: <https://www.finddx.org/pricing/>

TB diagnostics: national policy adoption



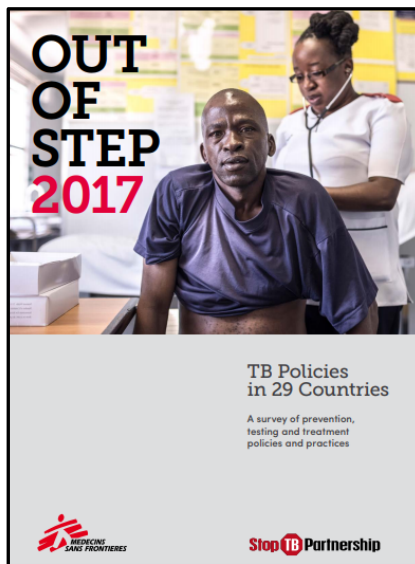
- **STEP UP FOR TB 2020**
- TB Policies in 37 countries
- ***Will be released soon***

KEY POLICIES DASHBOARD

COUNTRY	DIAGNOSIS				MODELS OF CARE				
	Expert HTR/HR in the initial TB diagnostic test for adults and children having investigated for TB	TB-LAM is used to diagnose TB in PLHIV with CD4 < 100 µL or seriously ill	Fast-flow TBFT (chromogenic and isoniazid) is done for all DR-TB cases or for people at risk of DR-TB	Second-line DR-TB (fluoroquinolones & second-line injectable agents) is done for all DR-TB cases	DS-TB treatment is started at the primary health care level ¹	DR-TB treatment is started at the district level ²	Hospitalisation is NOT required for DS-TB treatment ³	Hospitalisation is NOT required for DR-TB treatment ³	ART treatment is offered to all PLHIV (Test and start) ⁴
Afghanistan	●	●	●	●	●	●	●	●	●
Armenia	● ^a	●	●	●	● ^a	● ^a	●	● ^a	●
Bangladesh	●	●	●	●	●	●	●	●	●
Belarus	● ^a	●	●	●	●	●	● ^a	● ^a	●
Brazil	●	●	●	●	●	●	●	●	●
Cameroon	●	●	●	● ^a	●	●	●	●	● ^a
CAR	●	● ^a	●	●	●	●	●	●	●
China	●	●	●	●	●	●	●	●	●
DRC	●	●	●	● ^a	●	●	●	●	●
Ethiopia	●	●	●	●	●	●	●	●	●
Georgia	●	●	●	●	● ^a	● ^a	●	●	●
India	●	●	●	●	●	●	●	●	●
Indonesia	●	●	●	●	●	●	●	●	●
Kazakhstan	●	●	●	●	●	●	●	●	●
Kenya	●	●	●	●	●	●	●	●	●
Kyrgyzstan	● ^a	●	●	●	●	●	●	●	●
Mozambique	●	●	●	● ^a	●	●	●	●	● ^a
Myanmar	●	●	● ^a	● ^a	●	●	●	●	●
Nigeria	●	●	●	● ^a	●	●	●	●	●
Pakistan	●	●	●	●	●	●	●	●	●
PHG	●	●	●	●	●	●	●	●	●
Philippines	●	●	●	●	●	●	●	●	●
Russian Fed.	● ^a	●	●	●	●	●	●	●	●
South Africa	●	●	●	●	●	●	●	●	●
Sweden	●	●	●	●	●	●	●	●	●
Tajikistan	●	●	●	●	●	●	●	●	●
Ukraine	●	●	●	●	●	● ^a	●	●	●
Viet Nam	●	●	●	●	●	●	●	●	● ^a
Zimbabwe	●	● ^a	●	●	●	●	●	●	●

¹Excluding smear-negative individuals. In some countries, exceptions are made for people who are smear-negative and on access to care basis. ²The inclusion of the patient

https://msfaccess.org/sites/default/files/MSF_assets/TB/Docs/TB_Report_OutOfStep_3rdEd_ENG_2017.pdf



52% countries recommend Xpert MTB/RIF as initial test for all

40% countries with Xpert for all policy have made the test widely available

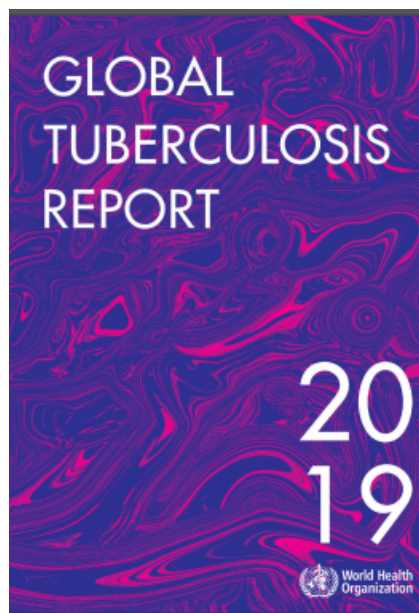
7% countries recommend TB LAM for PLWHA

0% have made the test available

Singhroy et al. 2020

46% recommend TB LAM for PLWHA

less than half make the test available



Percentage of new and relapse^a pulmonary TB cases with bacteriological confirmation, globally and for WHO regions, 2000–2018

TB GeneXpert : time for \$5 per test

TECHNICAL BRIEF | 02 DECEMBER 2019

Time for \$5: GeneXpert diagnostic tests

TUBERCULOSIS

Download



MSF_Access_TechnicalBrief...

Annexes:

Download detailed methodology and findings from the cost analyses conducted for MSF by Cambridge Consultants and referenced in the 'Time for \$5' technical brief.

- [2018 COGS analysis of Xpert MTB/RIF Ultra cartridges](#)
- [2015 COGS analysis of Xpert HIV-1 Viral Load cartridges](#)
- [2012 COGS analysis of Xpert MTB/RIF cartridges](#)

<https://www.msfaccess.org/time-for-5>

MSF Access Campaign
Technical Brief
DECEMBER 2019



TIME FOR \$5: GENEXPERT DIAGNOSTIC TESTS

MSF and others call on Cepheid for \$5 all-inclusive price for Xpert tests for TB and HIV, and price reductions across all assays

KEY MESSAGES:

1. The Xpert MTB/RIF (standard and Ultra) test run on Cepheid's GeneXpert platform is the best test for rapidly diagnosing tuberculosis (TB) and rifampicin-resistant TB in one step.
2. The 2012 donor-negotiated price of US\$9.98 per cartridge helped with uptake in many countries but is still too high for use as the initial TB test for everyone who needs it.
3. Given high sales volumes and public investments for GeneXpert product development and commercialization, further price reductions are feasible and long overdue.
4. Xpert cartridges for other diseases (HIV, hepatitis, sexually transmitted diseases, cervical cancer) use the same technology and, by extension, with pooled upstream manufacturing costs, need price reductions.
5. Cepheid's existing service and maintenance package is too costly and ineffective for most countries. Changes in service provision are needed, with costs either included within an all-inclusive cartridge price (US\$5) or through a reasonable standardised global surcharge per cartridge (US\$1) per any assay.
6. It's time for a single, lower, all-inclusive price of US\$5 for all Xpert MTB/RIF (Ultra) cartridges in all settings for all people who need testing.
7. It's time for Cepheid to include lower pricing options for all assays used for high-burden diseases to maximise the feasibility of introducing other tests on the same platform.



Testing a sample from a person with suspected TB in a GeneXpert machine, Bangassou Hospital, Central African Republic.

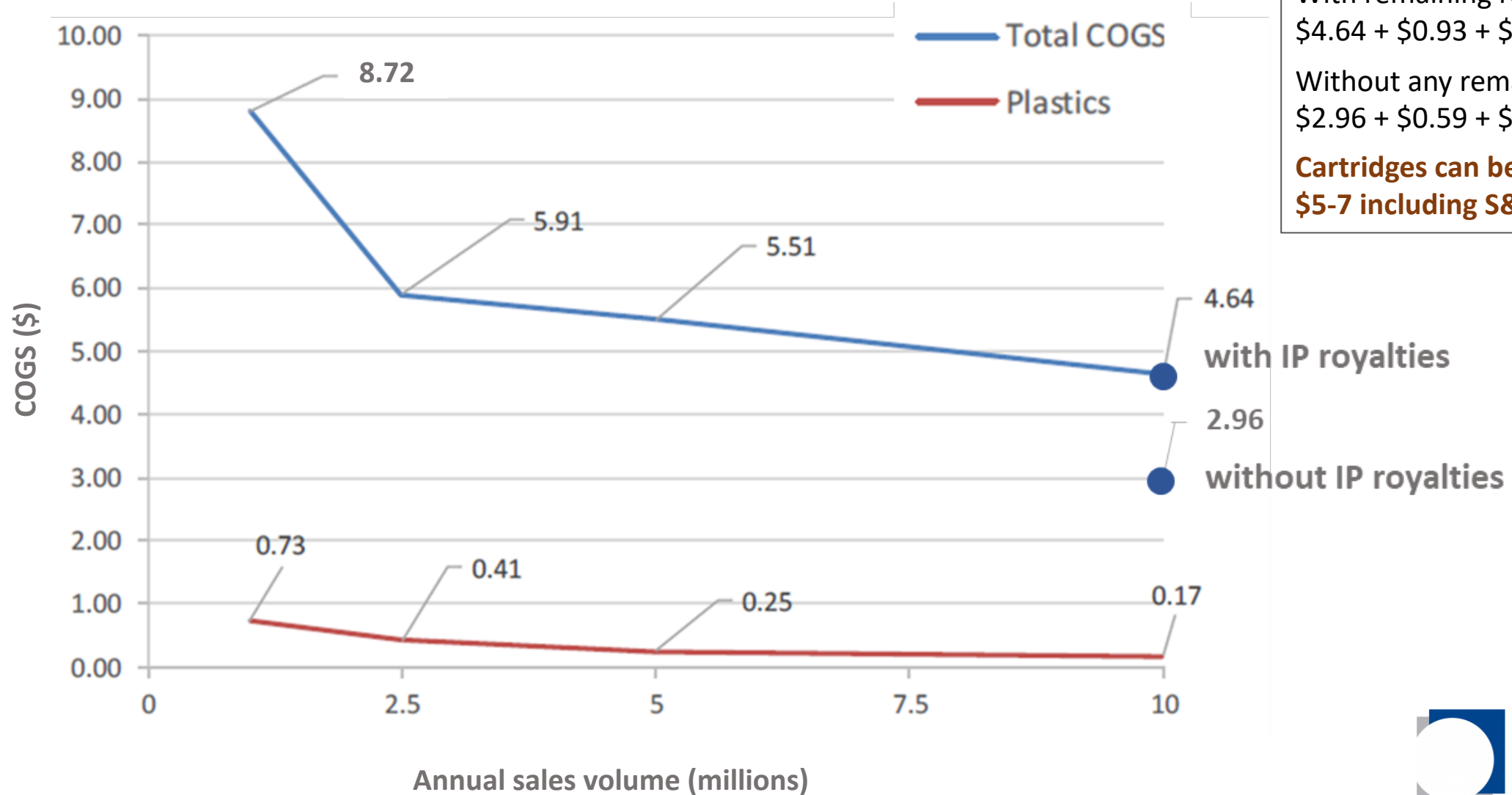
EXECUTIVE SUMMARY

The GeneXpert diagnostic testing technology has revolutionised rapid, accurate diagnosis of tuberculosis (TB) since entering the market in 2010. The World Health Organization (WHO) recommends the Xpert MTB/RIF assays (standard and Ultra) as the initial test for all people with signs and symptoms of TB. Yet, due to the high cost of the GeneXpert instrument and its assays, most high TB-burden countries are not able to scale up testing for all people who need diagnosis.^{1,2} Instead, TB care providers continue to rely on cheaper, less accurate sputum smear microscopy.

To scale up testing and close the gap in diagnosis for people with TB, Médecins Sans Frontières (MSF) calls on Cepheid to reduce the price of Xpert MTB/RIF (Ultra) cartridges to US\$5, inclusive of service and maintenance.³

In addition to TB, several other Xpert assays have been developed to tackle other challenging diseases, which have been added to Cepheid's concessional pricing program for high burden developing countries (HBDC). These diseases

TB GeneXpert : Cost of goods sold (COGS) analysis



COGS at 10 M/y + 20% profit + S&M

With remaining royalties:

$\$4.64 + \$0.93 + \$1 = \6.57

Without any remaining royalties:

$\$2.96 + \$0.59 + \$1 = \4.55

Cartridges can be sold with profit at \$5-7 including S&M

Impact of COVID on TB diagnosis and R&D



THE POTENTIAL IMPACT OF THE COVID-19 RESPONSE ON TUBERCULOSIS IN HIGH-BURDEN COUNTRIES: A MODELLING ANALYSIS

Country	Excess TB cases from 2020 - 2025		Excess TB deaths from 2020 - 2025	
	For every month of lockdown	For every month of restoration	For every month of lockdown	For every month of restoration
India	232,665	144,795	71,290	40,685
Kenya	3,980	3,133	1,747	1,157
Ukraine	1,058	625	270	137
Global	608,400	420,400	126,100	83,200

Table 2. Estimates for incremental impact on TB burden by each additional month of lockdown or restoration

http://stoptb.org/assets/documents/news/Modeling%20Report_1%20May%202020_FINAL.pdf

Impact of COVID on TB diagnosis and R&D

- Per 3-month lockdown and 10-month restoration: 6.3 additional TB cases 2020-2025
- COVID-19 could setback the fight against TB at least 5 to 8 years
- Integration of COVID and TB testing needed
- Bi-directional TB-COVID testing: do not delay TB testing
- Significant expansion of molecular testing capacity needed
- Diagnostic companies should not de-prioritize TB test production nor R&D over COVID



9.98\$

MTB RIF



19.8\$

SARS-CoV-2

Optimal TB diagnostic service delivery

- **Adopt all WHO recommendations in national policies and translate into practice**
- **RMD for all TB suspects and at all health care levels, including specimen referral**
- **TB LAM in both inpatient and outpatient settings, and a PHC level**
- **TB LAM adoption in TB & HIV policies, GF & PEPFAR proposals when eligible**
- **Prevent TB in prisons: screening for TB on entry - mass screening - contact screening**
- **Community advocacy to demand governments to scale up RMD and TB LAM**



TB diagnostic pipeline and opportunities arising from COVID
Morten Ruhwald, MD, PhD
Head of TB programme

www.finddx.org

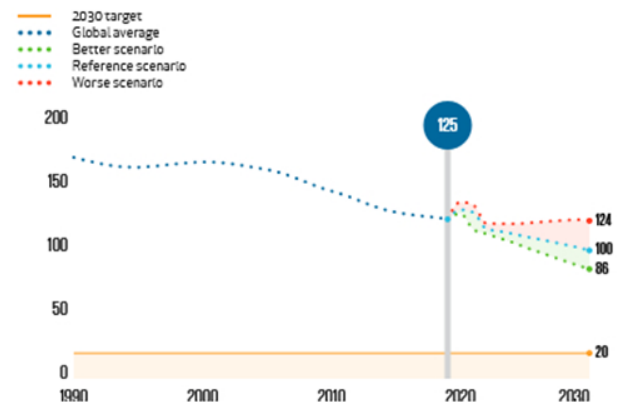
COVID-19 HAS CHANGED THINGS...



GLOBAL PROGRESS AND PROJECTIONS FOR TUBERCULOSIS

SDG target: End the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases.

New cases of tuberculosis per 100,000 people

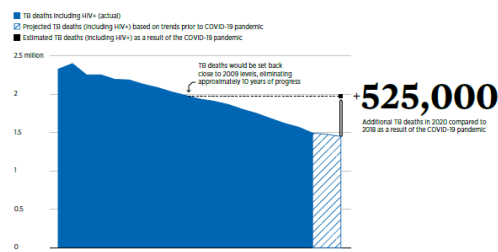


Source: Bill & Melinda Gates Foundation, 2020 Goalkeepers Report. Data from IHME. <http://gates.ly/GK20Tuberculosis>



Tuberculosis deaths: impact of COVID-19

POTENTIAL INCREASE IN TB DEATHS DUE TO TB SERVICE DISRUPTION IN THE CONTEXT OF THE COVID-19 PANDEMIC GLOBALLY



COVID-19 related disruptions to TB services could lead to

6.3
million
additional people
developing TB

1.4
million
additional
TB deaths

by 2025



IN INDIA

36% OF PEOPLE WITH TB
reported health facilities
they normally visit closed

*GFIC= Global Fund implementing countries

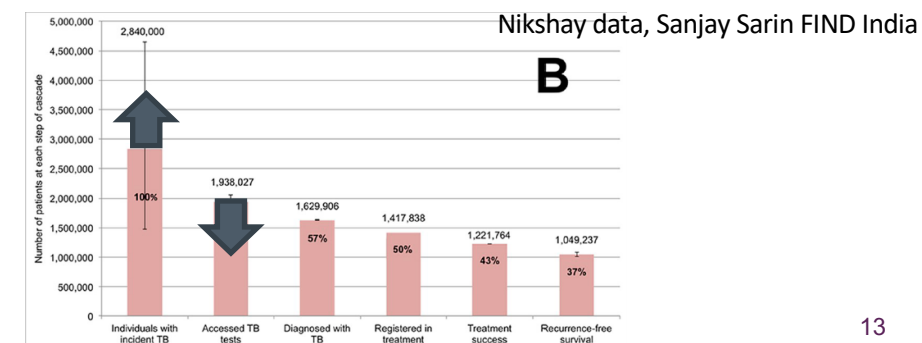
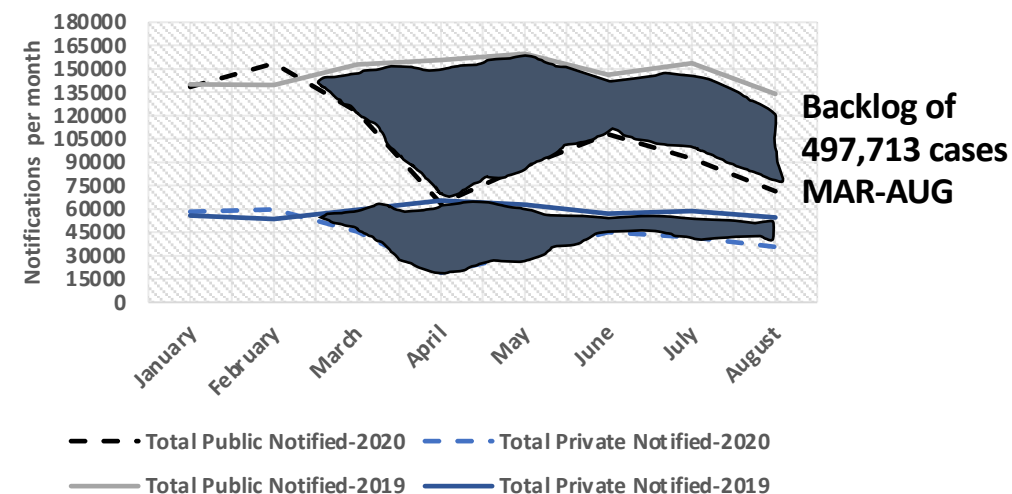
GLOBALLY

70%+ HEALTHCARE WORKERS

reported a decrease in the number of people coming to health facilities for TB testing.



Notifications India - 2020 vs 2019





COVID-19 HAS CHANGED THINGS...

COVID-19

WHO WE ARE

WHAT WE DO

NEWSROOM

PARTNERS & DONORS

CALLS FOR PARTNERS

COVID-19 A GLOBAL PERSPECTIVE

SARS-COV-2 DIAGNOSTIC PIPELINE

Home > Diagnostics & testing > SARS-CoV-2 diagnostic pipeline

FIND is collating an overview of SARS-CoV-2 tests that are commercially available or in development for the diagnosis of COVID-19. We do not guarantee that this is a comprehensive list, since the information below has been submitted voluntarily by test suppliers and is not independently verified. If you have any queries or wish for us to make updates in the pipeline, please [contact us](#).

If you would like your test to be included in the pipeline, please click on this button to download the form. [SUBMISSION FORM](#)

To know more about the ongoing test evaluations, please click on these buttons. [MOLECULAR ASSAY EVALUATIONS](#) [IMMUNOASSAY EVALUATIONS](#)

EUA: Emergency Use Authorization — HSA: Health & Safety/Sciences Authority — MFDS: Ministry of Food & Drug Safety — MoH: Ministry of Health — MHRA: Medicines & Health Care Products Regulatory Agency — NRA: National Regulatory Authority — RUO: Research Use Only — TGA: Therapeutic Goods Administration — WHO EUL: World Health Organization Emergency Use Listing

SHOW ALL	IMMUNOASSAYS	MOLECULAR ASSAYS	SAMPLE COLLECTION / INACTIVATION	DIGITAL SOLUTIONS	OTHER DIAGNOSTICS
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Status

Test format

Test target

Regulatory

FILTER

EXPORT TO XLS

799 RESULT(S)

- [1drop Inc. 1copy™ COVID-19 qPCR Multi Kit](#) (Korea MFDS EUA - US FDA EUA - Health Canada - Saudi FDA - Sri Lanka NMRA - CE-IVD) [Contact](#)
- [3B BlackBio Biotech India Ltd](#) TRUPCR® SARS-CoV-2 RT qPCR Kit (India CDSCO - US FDA EUA) [Contact](#)
- [3D Medicines](#) ANDiS® SARS-CoV-2 RT-qPCR Detection Kit (US FDA EUA - CE-IVD) [Contact](#)
- [3D Medicines](#) 3DMed 2019-nCoV RT-qPCR Detection Kit (CE-IVD) [Contact](#)
- [A*ccelerate Technology](#) A*STAR Fortitude Kit 2.0 (Singapore HSA) [Contact](#)
- [AAZ-LMB](#) COVID-PRESTO® (CE-IVD) [Contact](#)

IN INDIA
36% OF PEOPLE WITH TB
 reported health facilities they normally visit closed

*GFIC= Global Fund implementing countries

GLOBALLY

70%+ HEALTHCARE WORKERS
 reported a decrease in the number of people coming to health facilities for TB testing.

Notifications India - 2020 vs 2019

Notifications per month

Backlog of 497,713 cases MAR-AUG

Legend:
 - - • Total Public Notified-2020
 - - • Total Private Notified-2020
 — Total Public Notified-2019
 — Total Private Notified-2019

Nikshay data, Sanjay Sarin FIND India

B

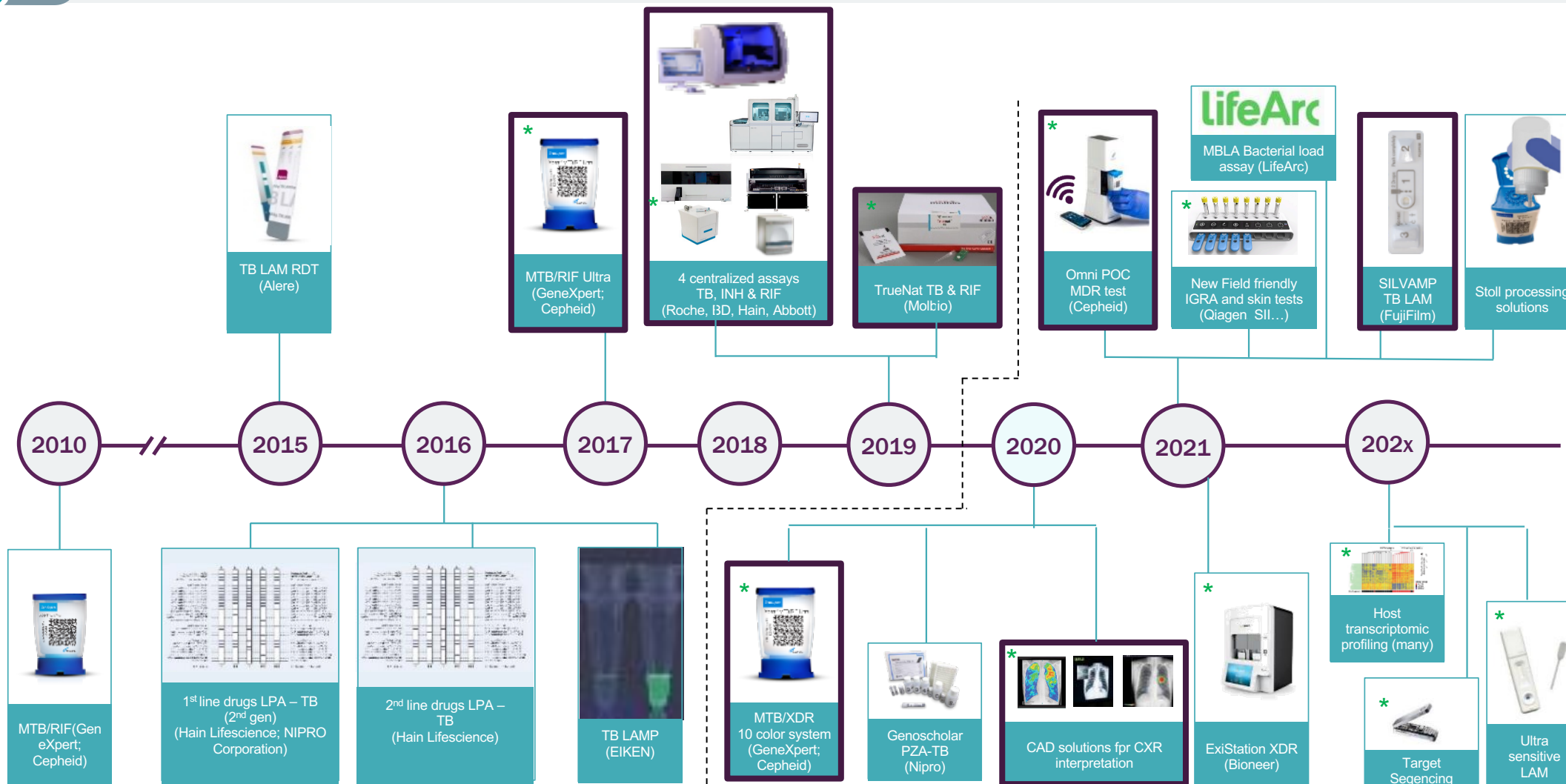
Step	Number of patients	Percentage
Individuals with incident TB	2,840,000	100%
Accessed TB tests	1,938,027	
Diagnosed with TB	1,629,906	57%
Registered in treatment	1,417,838	50%
Treatment success	1,221,764	43%
Recurrence-free survival	1,049,237	37%

<https://www.finddx.org/covid-19/pipeline>

14



A rich pipeline of connected TB diagnostics

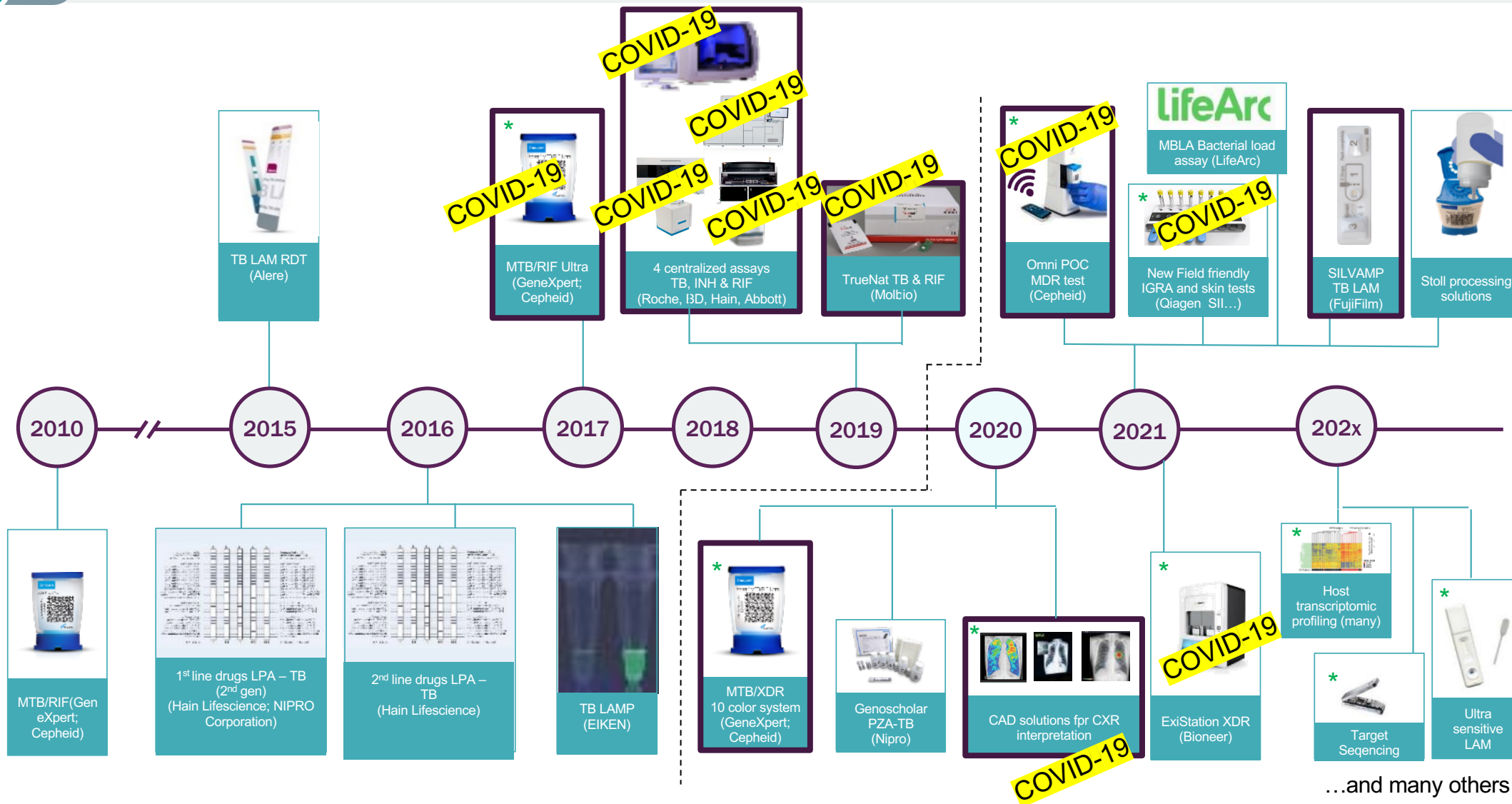


...and many others

* Connectivity enabled



A rich pipeline of connected TB diagnostics

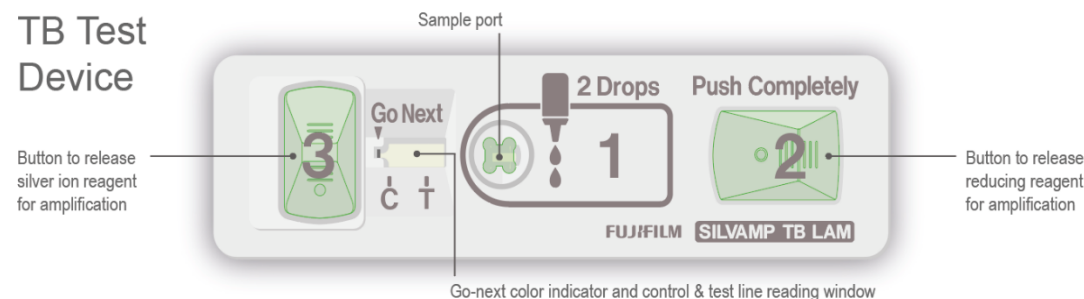


* Connectivity enabled



Fujifilm SILVAMP TB LAM

First in a new generation of highly sensitive LAM assays



Additional emerging data

- Children
- Extrapulmonary TB
- HIV-negative TB
- Mortality

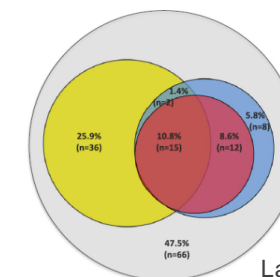
POC Designed for the POC in LMIC's where patients seek care
Urine-based, rapid time-to-result, instrument-free and safe

Enhanced sensitivity to detect TB in all PLHIV
Around twice as sensitive compared to existing POC LAM assay

High Specificity for Immediate Treatment Initiation

High diagnostic yield
LAM based assays pick up patients faster and is complementary to sputum-based assays

Planned to support WHO review in 2021



Lawn *et al.* 2017



FujiLAM twice as sensitive as AlereLAM in PLHIV, first data on HIV negative

PLHIV (5 cohorts, n=1595)

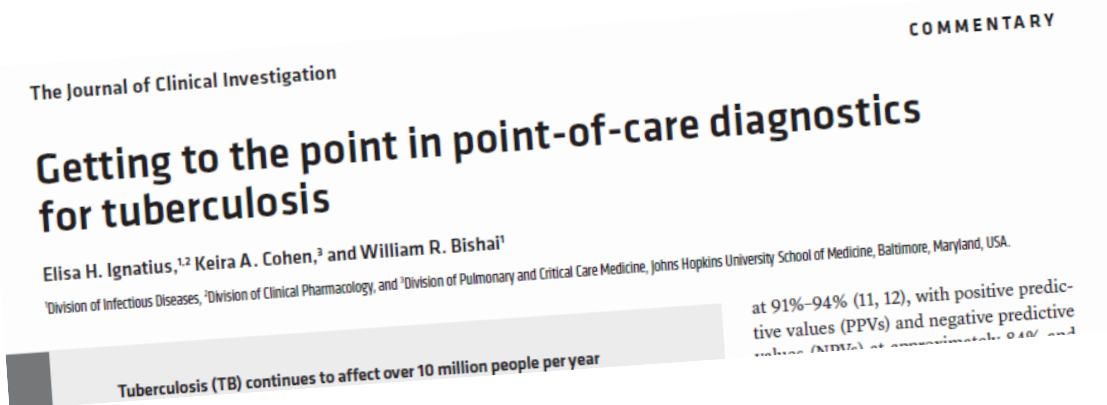
	N	Sn	[95% CI]	Sp	[95% CI]
FujiLAM	1595	70.7	[59.0 – 80.8]	90.9	[87.2 – 93.7]
AlereLAM	1595	34.9	[19.5 – 50.9]	95.3	[92.2 – 97.7]
Diff Sn and Diff Sp		35.8		-4.4	

Broger *et al*, PLOS Med 2020

HIV uninfected patients

Population	Site	Sensitivity % (95% C.I.)	Specificity % (95% C.I.)
Adults (n=187)	South Africa	25.0 (13.3 – 42.1)	98.1 (94.5 – 99.3)
Adults (n=185)	Peru	64.6 (53.6 – 74.2)	100.0 (96.5 – 100.0)

Broger et al. J Clin Invest 2020. (in press)





Digital xray with CAD

- offers new opportunities for TB and COVID-19 screening

Stop TB Partnership | AI4HLTH | FIND TB

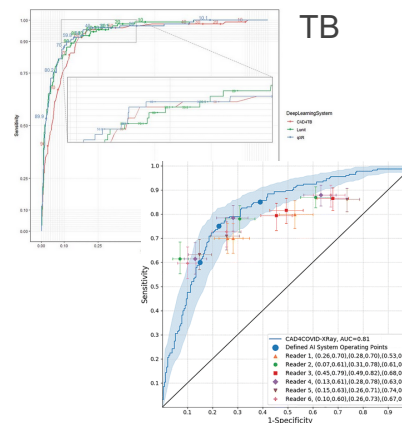
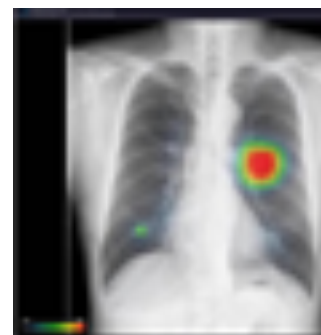
Welcome to the Stop TB Partnership and FIND resource center on computer-aided detection products for the diagnosis of tuberculosis

In recent years, the tuberculosis (TB) field has welcomed several computer-aided detection (CAD) products that provide an automated and standardized interpretation of digital chest X-rays based on artificial intelligence. The AI4HLTH resource center from the Stop TB Partnership and the Foundation for Innovative New Diagnostics (FIND) provides implementation-relevant information for a number of CAD products to assist country decision-making. Learn more about the features of available and upcoming CAD products for TB in the Products section below.

[Read more >](#)

AI Products for TB

Product	CAD Type	Certification	Development Stage	Intended Age Group
ARTELUS	Tubex	Pending	Pending (expected Q2 2021)	18+ years
DEEPTIX	DuTx	C-marked	On the market	14+ years
DELFT IMAGING	CAD4TB	C-marked	On the market	4+ years
Dr CADx	Dr CADx	Pending (expected in 2021)	Validation	16+ years
EPCON	X-rayME	Pending (expected Q1 2021)	Development Stage	18+ years
INTEVISION	Intellidex DR Chest	C-marked	On the market	18+ years (approved), 12-18 years
九和医疗	JH CX-1	Pending (China NMPA 3 expected in mid-2020)	Development Stage	15+ years
JLK inspection	JDOX (PHEMOS)	C-marked	On the market	15+ years
Lunit	INSIGHT CX	C-marked	On the market	14+ years
quire.ai	qR	Pending	Development Stage	0+ years (approved), 2+ years
RadiSen	ARS	Pending	Validation	16+ years



Delft Light



FujiFilm CalneoXair



JLK inspection

www.ai4hlth.org

Source: <https://www.delft.care/x-ray-systems/>; <http://jlkgroup.com/>;
<http://design.fujifilm.com/en/business/calneo-xair/>
 Murphy K, Radiology 2020; Qin et al Sci.rep. 2019; Yoo SH et al Frontiers 2020



Acknowledgments

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Thank you to the team!



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Sandra Kik

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Swapna Uplekar
Andres de la Rossa
Lauri Koivula
Tim Rodwell
Rebecca Colman
Sacha Laurent
Sophia Georghiou

Pamela Nabeta
Audrey Albertini
Anna Mantsoki
Christine Hoogland
Aurelien Mace
Tatiana Letsko
Karishma Saran
Sarah-Jane Loveday

**R&D policy reform –
From TB to Covid-19:**

**Profit-driven models failing
public health emergencies**

Sharonann Lynch
MSF Access Campaign
TBEC Webinar
October 2020

1/ Checklist: Equitable biomedical R&D

1. **Needs-driven:** evidence-based, driven by public health needs and suitable for people and places that need them most
1. **Coordinated:** financial and technical resources are directed towards high priority gaps and needs and reduce duplication
2. **Open and collaborative:** sharing of research knowledge improves efficiency and accelerates progress. Compounds in the public domain
3. **Equitable:** public goods
 - free from IP restrictions/barriers
 - priced as close as possible costs of goods
 - Available through sufficient production capacity, including transfer of technology
4. **Transparent:**
 - Clinical trial protocols, and results
 - Agreements and licenses
 - R&D funding and costs
 - Costs of goods
 - Pricing and regulatory policies

2/ TB R&D: funding

Total TB R&D Funding by Funder Category, 2018

Total: \$906,125,319

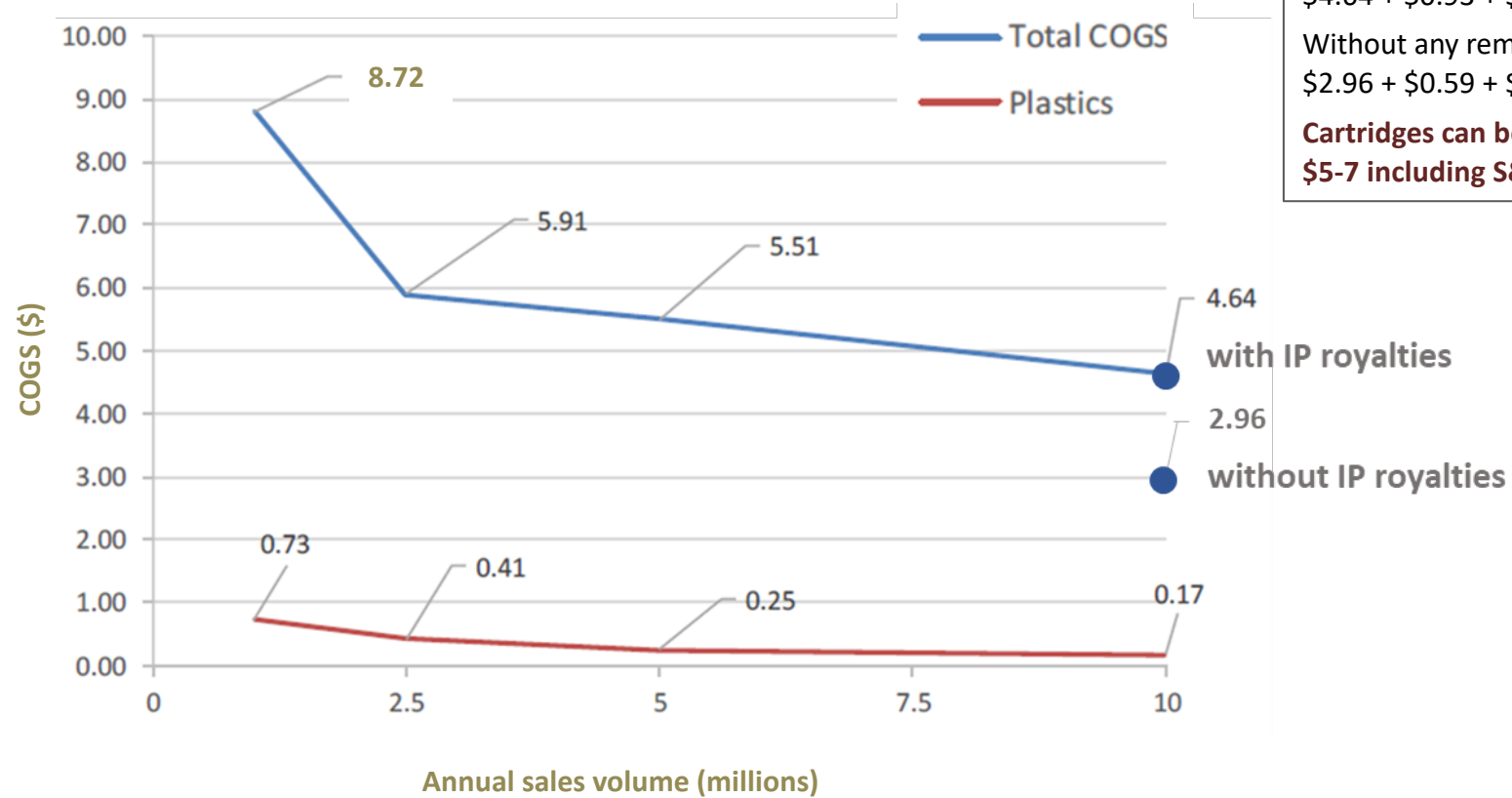


Source: TAG. Tuberculosis Research Funding Trends 2005 – 2018

3/ Case study Cepheid

- **1990s-2000s: Government funding for instrument development**
 - U.S. government \$165 million to develop the GeneXpert instrument
- **2012: Public + BMGF funding for TB tests (MTB/RIF cartridges)**
 - Unitaid, the Bill & Melinda Gates Foundation, and US government subsidy of \$11.1 million to “buy down” TB test price to \$9.98
 - Cepheid, 8 years and millions of tests later, refuse to reduce the price
- **2020: Public funding for Cepheid development of Covid-19 test**
 - U.S. government: \$3.7 million for Xpert SARS-CoV-2 test
- **Cepheid**
 - Pricing, shockingly, at \$19.80 each for LMICs
 - Supply: only 20% of its manufacturing capacity for LMICs

2018: Xpert MTB/RIF Ultra



COGS at 10 M/y + 20% profit + S&M

With remaining royalties:
 $\$4.64 + \$0.93 + \$1 = \6.57

Without any remaining royalties:
 $\$2.96 + \$0.59 + \$1 = \4.55

**Cartridges can be sold with profit at
\$5-7 including S&M**

4/ TB case study: Bedaquiline

Total public funding for bedaquiline exceeded J&J by almost double to 5 times J&J's pricing

- 2014: \$900 LICs, \$3,000 MICs, \$30,000 HICs per 6 months
- 2020: \$272 per 6 months (\$1.50 a day) – MSF/others called for \$1 a day
- Pharmstandard for Russia and CIS countries+Georgia remains \$1,476 per 6 months

Access

- From 2015 to 2019, only 51,000 people, **11% of those who need it had access**

Patents & licensing

- Evergreening patents & secondary patents could extend until 2027 (not mid 2023)
- License to Pharmstandard for Russia and CIS countries+Georgia (HIGH PRICES)
- License to TB Alliance for drug-sensitive TB & in the BPaL regimen for DR-TB

5/ TB case study: Pretomanid

BPaL (bedaquiline, pretomanid, linezolid): first all-oral 6-month treatment for extensively drug-resistant TB (XDR-TB) or treatment-intolerant or non-responsive pulmonary MDR-TB under operational research conditions

Public and philanthropic total funding for pretomanid?

- TB Alliance is non-profit

TBA's pricing policies

- Pretomanid: \$364 for 6 months treatment; BPaL: \$905 for 6 months
- Estimates should be \$11-35 a month
- Developed by TBA, manufactured by Mylan

Patents

- Patent on pretomanid expired in 2016 yet TBA filed for patents on the **BPaL formulation** in many countries

Licensing

- TBA license to Mylan and Macleods for manufacturing
- TBA also has not licensed pretomanid to the MPP

6/ Covid

- Government funding for \$7-9 billion for R&D Covid-19 medical products
- Without life-saving conditions
 - **Affordability** – preferably a small margin over cost of manufacturing
 - **Transparency**
 - R&D funding, cost of manufacturing
 - Clinical trial protocols, details, and results
 - **Accessibility**
 - Manufacturing capacity or tech transfer to supply LMICs
 - Non-exclusive licenses to allow multiple manufacturers

THANK YOU

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