From tools to patient-centric solutions

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We know TB patients struggle to get quality Dx and Rx in many LMICs

Missing patients and major access issues

Long, complex pathways to TB care & diagnostic delays

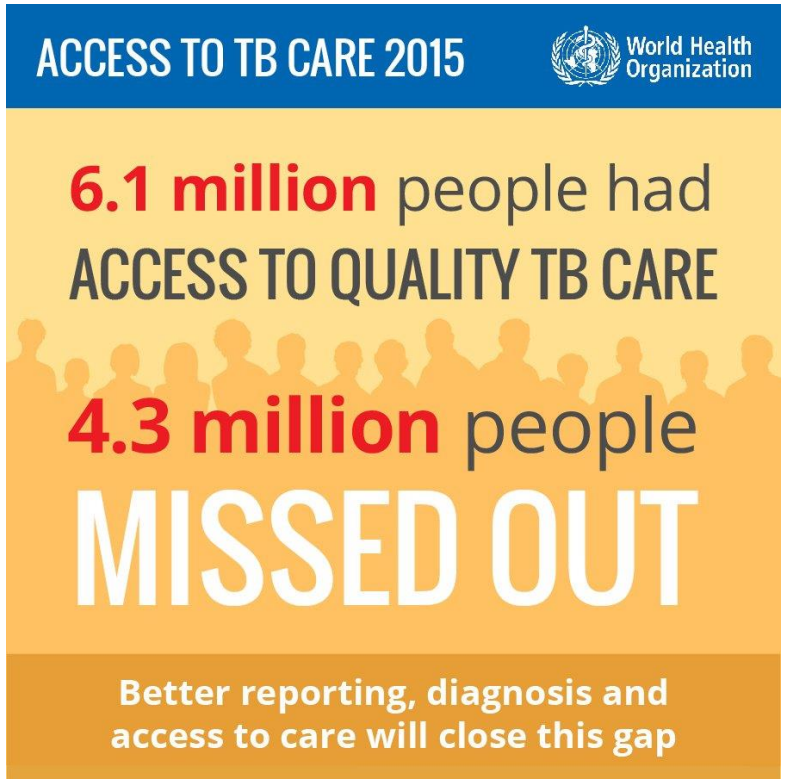
Broken care cascades

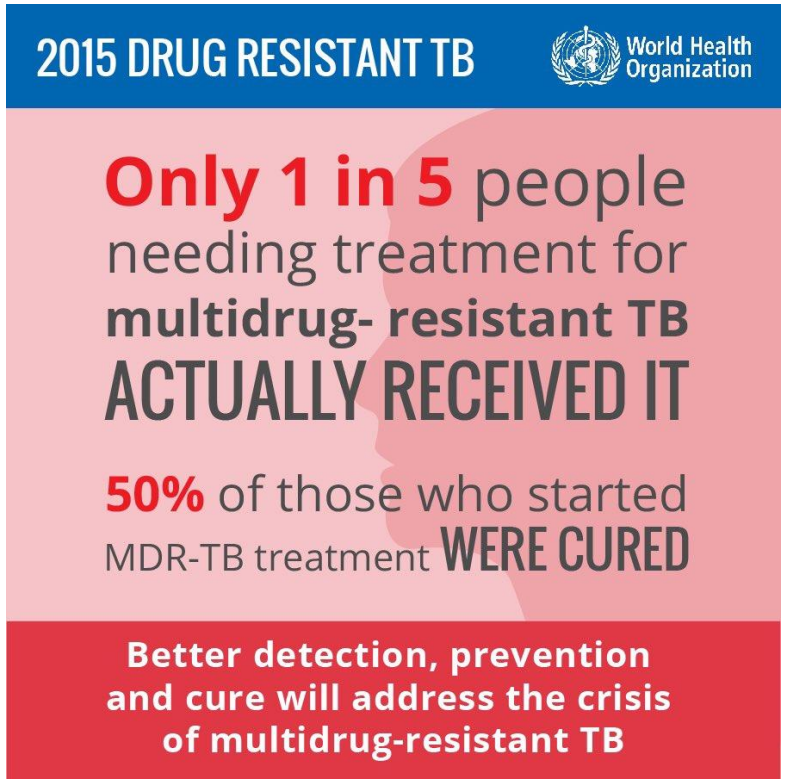
Challenges in getting decentralized care

Limited access to new tools

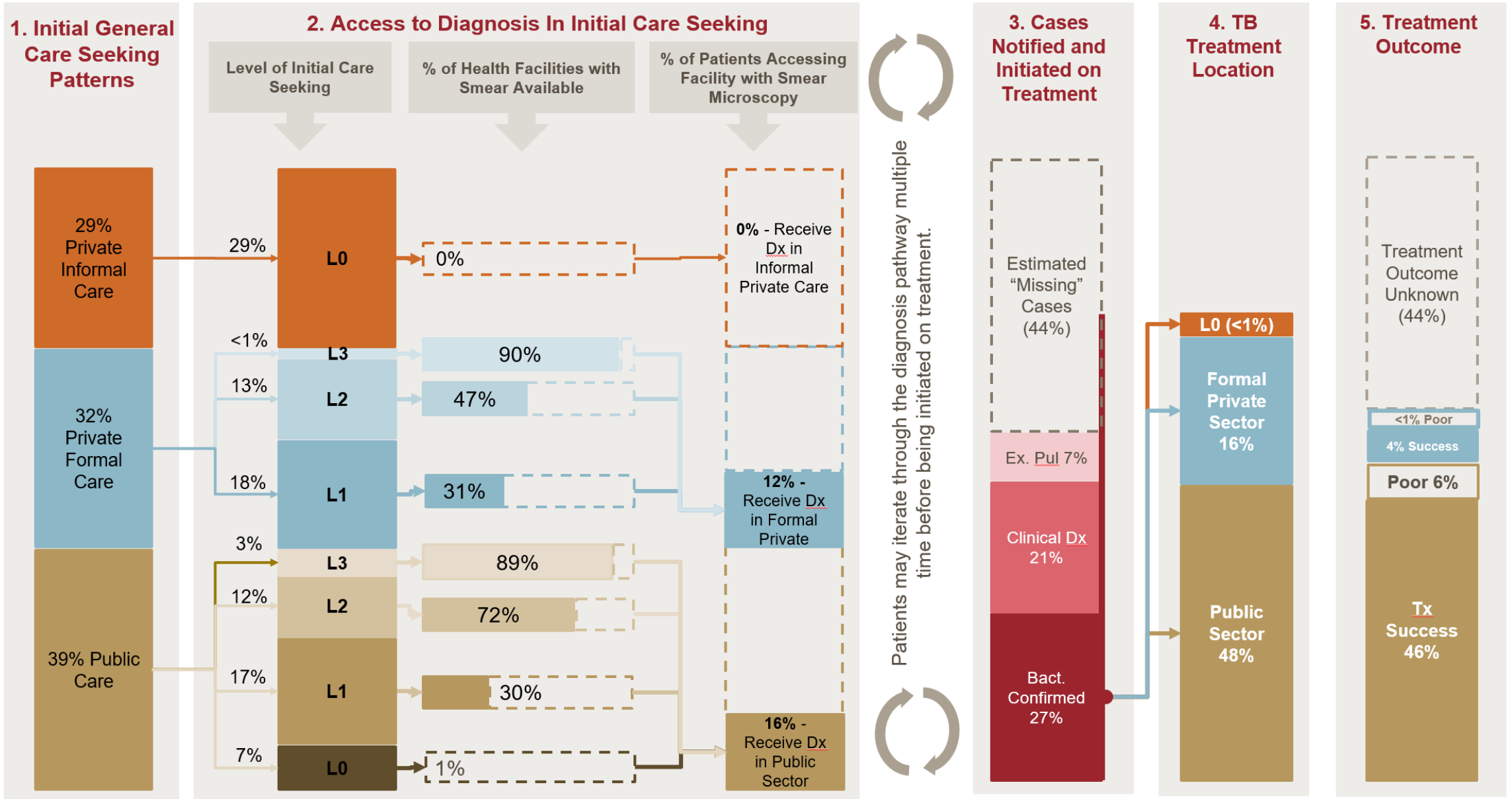
Cost and out-of-pocket expenses

Missing patients and poor access to care

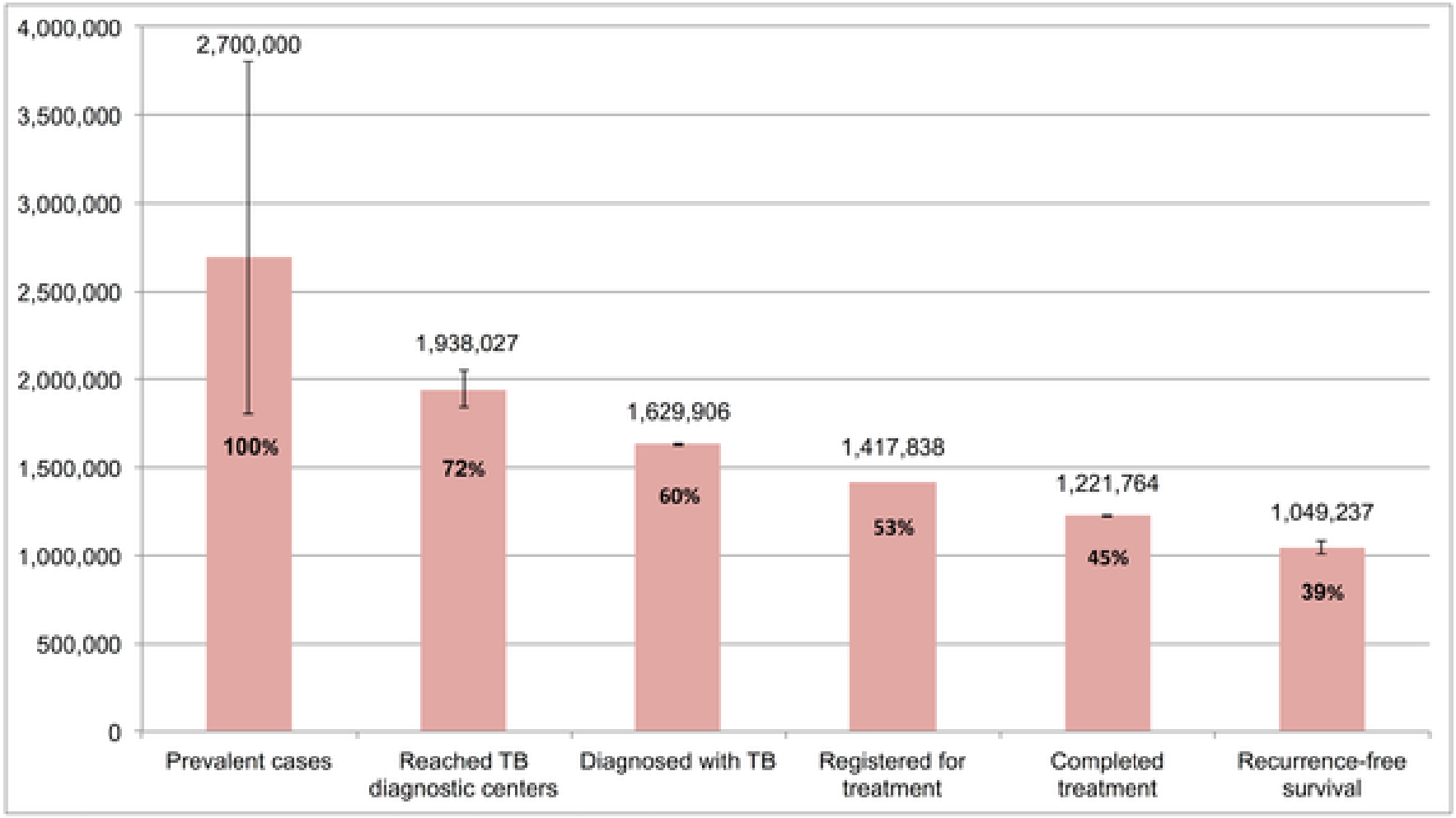




Patient pathway analysis: 11-Country Summary

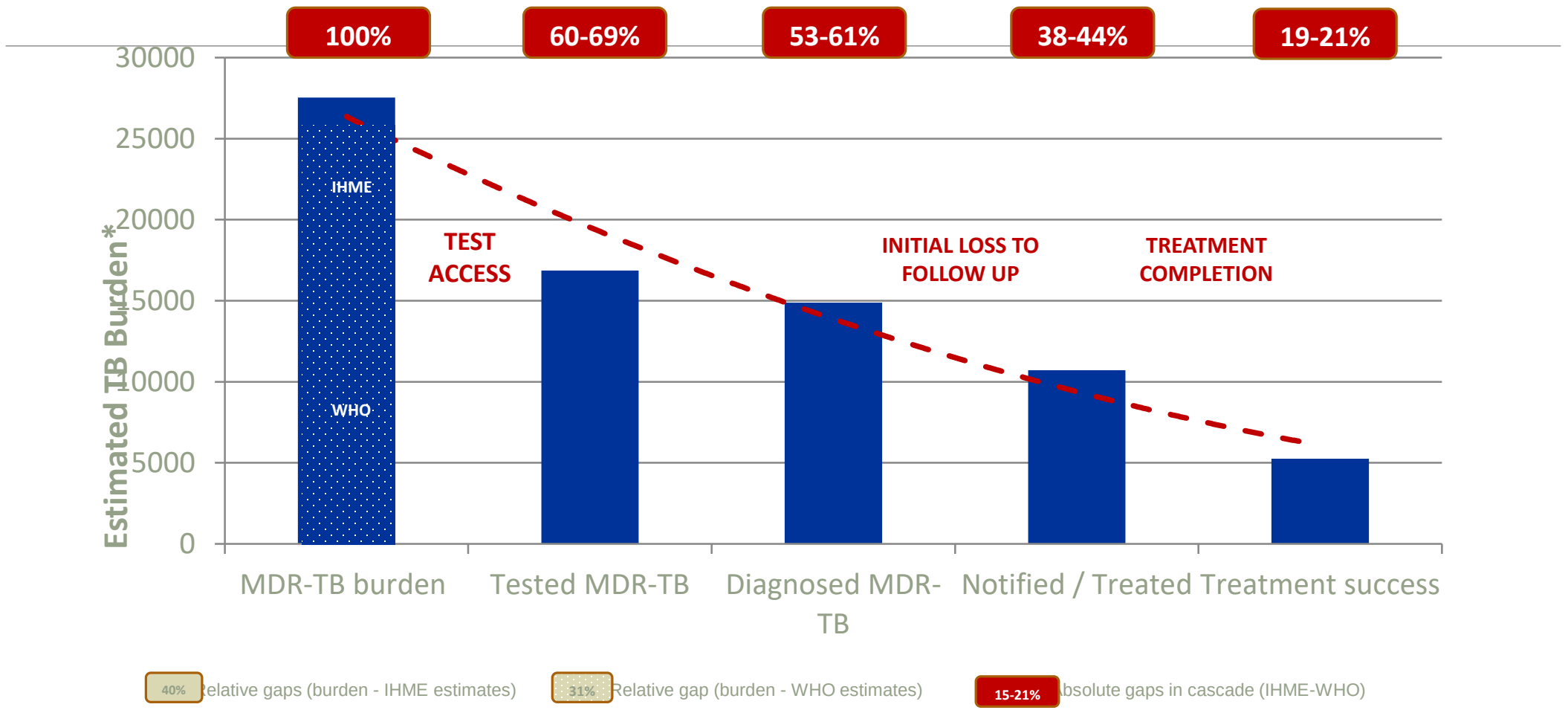


Cascade of care for all forms of TB in India's TB Control Program, 2013

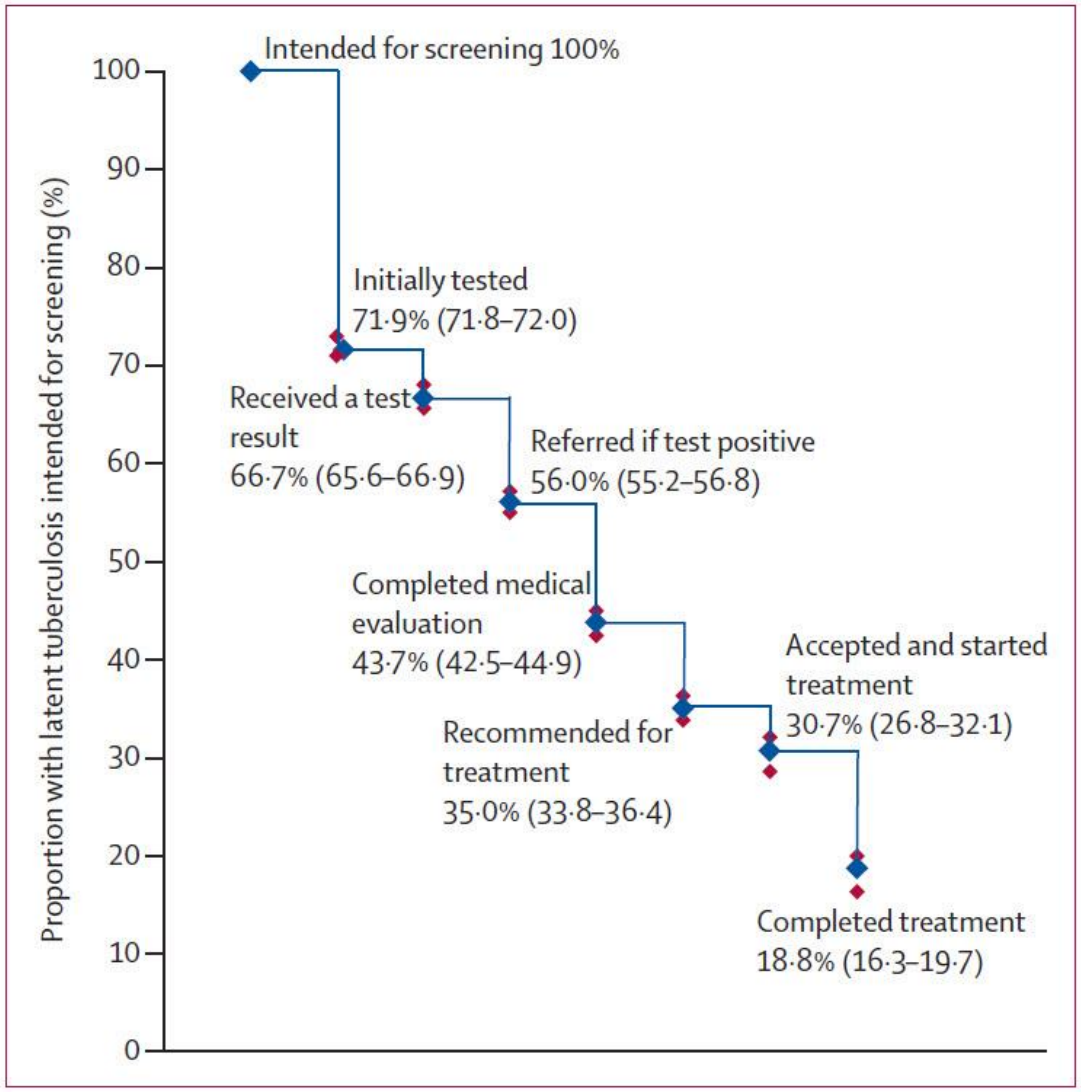


Subbaraman R, Nathavitharana RR, Satyanarayana S, Pai M, Thomas BE, et al. (2016) The Tuberculosis Cascade of Care in India's Public Sector: A Systematic Review and Meta-analysis. PLOS Medicine 13(10): e1002149. doi:10.1371/journal.pmed.1002149
http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002149

MDR-TB Care Cascade in South Africa

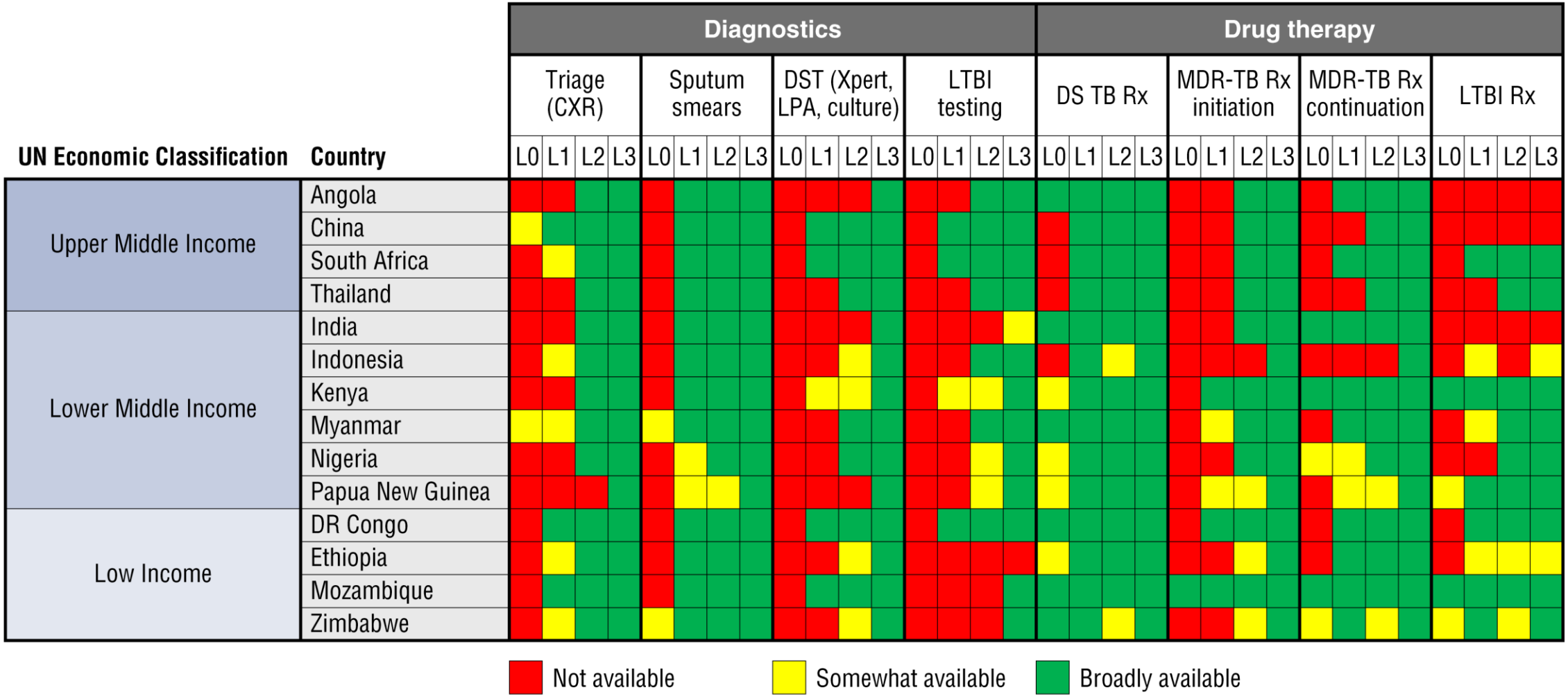


CARE CASCADE FOR LATENT TB INFECTION



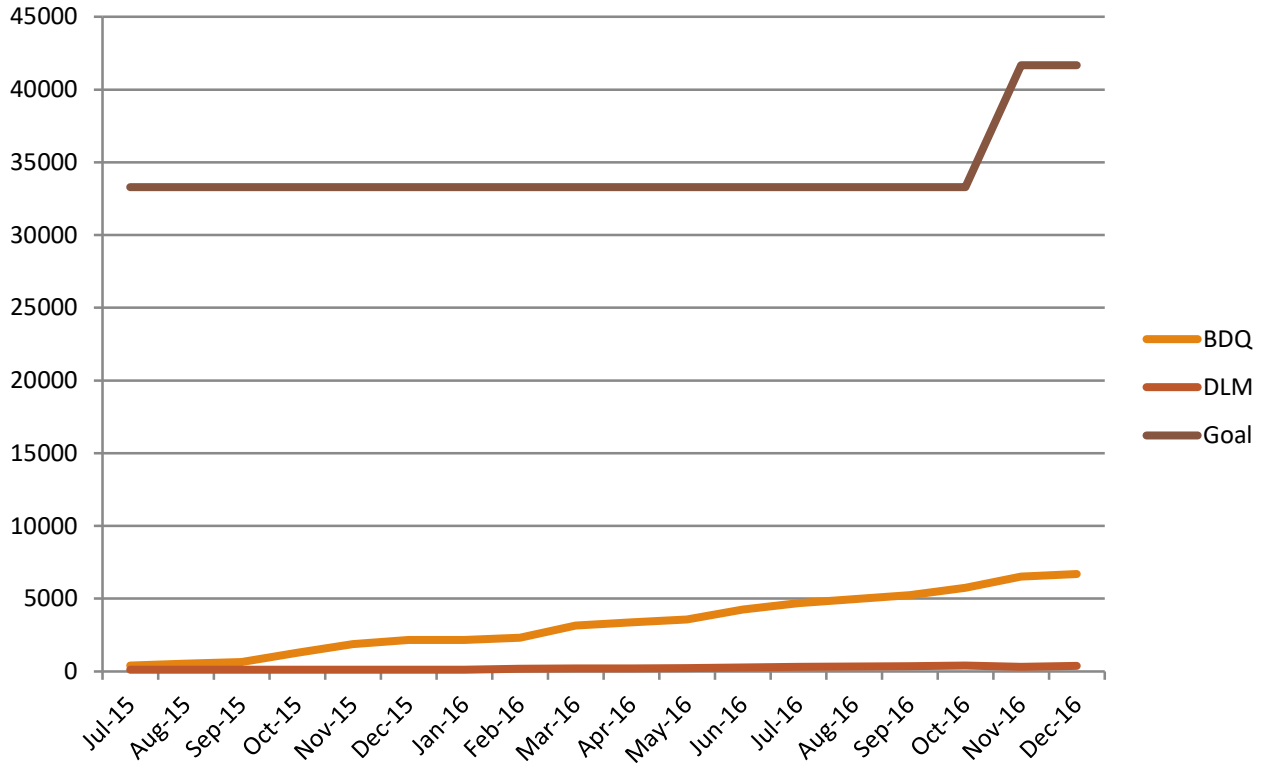
ALSDURF H ET AL. LANCET INFECT DIS 2016

RIGHT NOW, TB DX AND RX IS MAINLY AT L2 AND L3 LEVELS



Huddart S, MacLean E, Pai M. *Lancet Global Health* 2016

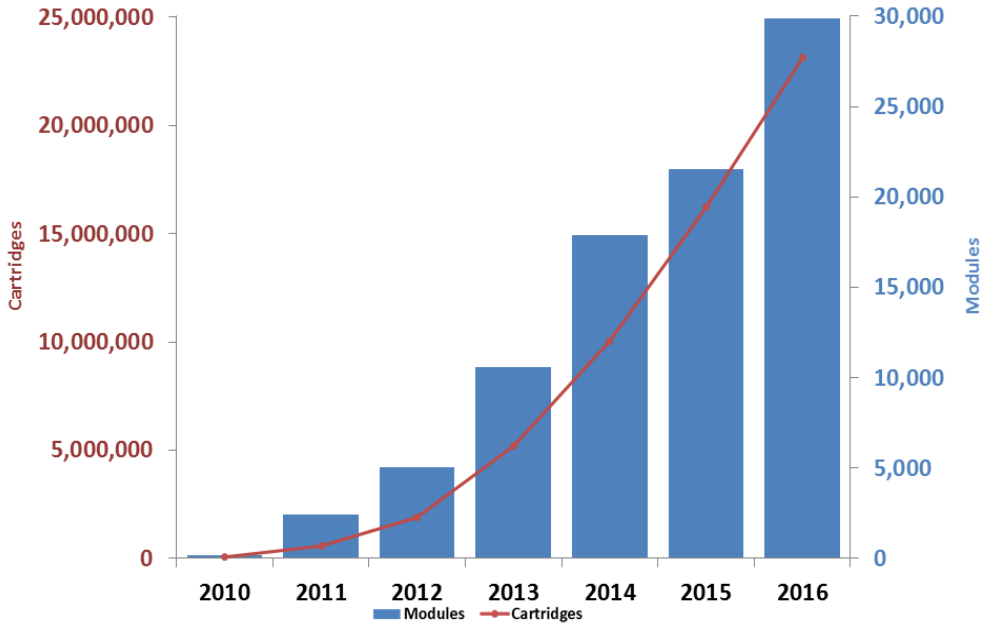
Access to new tools: new drugs



Progress in bedaquiline and delamanid global uptake by month compared with estimated need

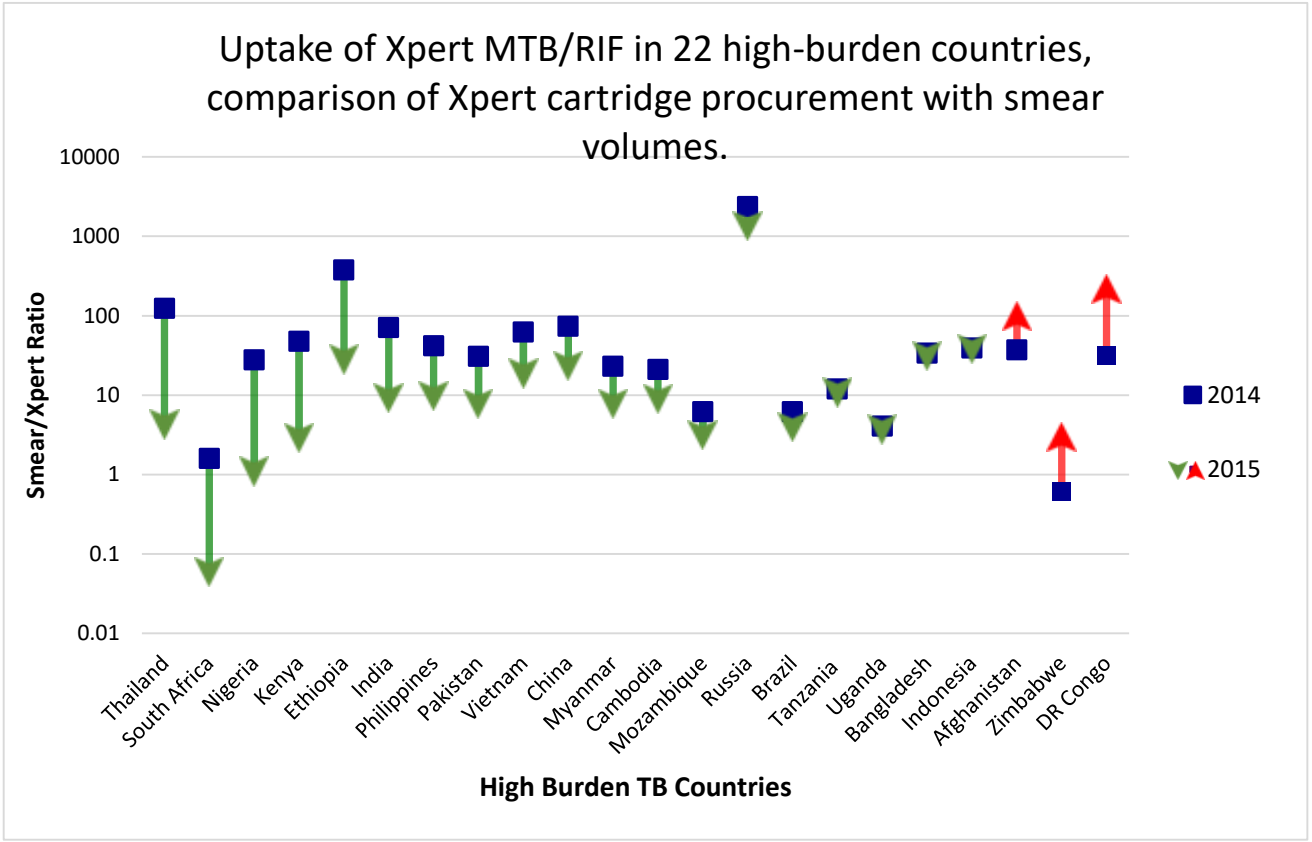
Source: DR-TB STAT

Access to new tools: new diagnostics (GX)



As of 31 December 2016, a total of 6,659 GeneXpert instruments (comprising 29,865 modules) and 23,140,350 Xpert MTB/RIF cartridges had been procured in the public sector in 130 of the 145 countries eligible for concessional pricing.

Data: Cepheid



Cazabon D, Pai M, et a. unpublished

Low utilization of new tools

RESEARCH ARTICLE

Low implementation of Xpert MTB/RIF among HIV/TB co-infected adults in the International epidemiologic Databases to Evaluate AIDS (IeDEA) program

Kate Clouse[1,2,3], Meridith Blevins[1,4], Mary Lou Lindegren[1,2], Marcel Yotebieng[5], Dung Thi Nguyen[6], Alfred Omondi[7], Denna Michael[8], Djimon Marcel Zannou[9], Gabriela Carriquiry[10], April Pettit[2,3]*, International Epidemiologic Databases to Evaluate AIDS (IeDEA) collaboration[¶]

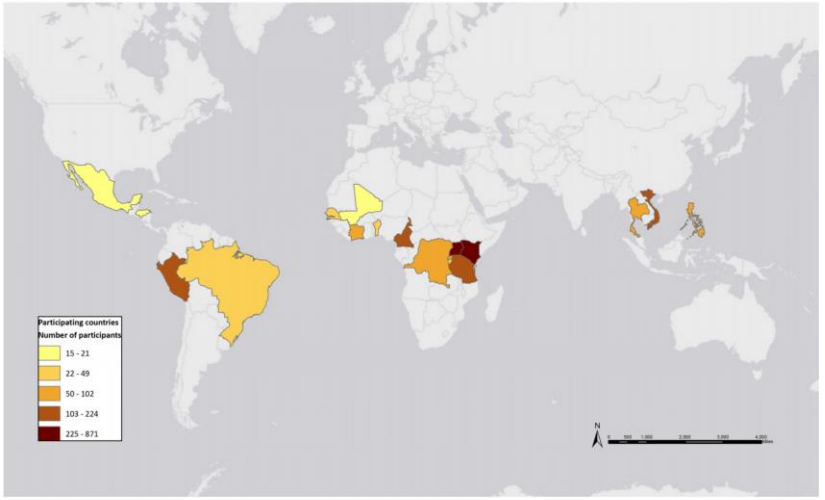


Fig 1. Participating countries (n = 18) and number of patients included by each. Map created in July 2016 by Kate Clouse using ArcMap GIS 10.3.1 (Esri, Redlands, CA).

Table 3. TB testing utilization and outcomes among 2722 adult patients.

	n (%)
TB test utilization (n = 2722)	
Received at least one TB test	2070 (76%)
Received no TB test	650 (24%)
Missing	2 (<1%)
Type of TB test performed (n = 2555)*	
AFB smear	2025 (79%)
Culture	333 (13%)
Xpert	118 (5%)
Other NAAT	79 (3%)

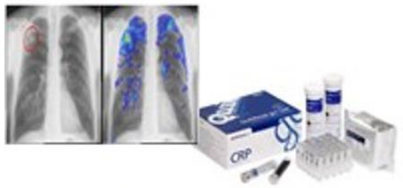
"Xpert utilization was low even though the majority of sites had access to the test"

Clouse K et al. PLoS ONE 2017


Problems
Solutions

TEST, TREAT AND TRACK: WE NEED COMPLETE SOLUTIONS

Symptomatic



Rapid Triage Test

Rapid Molecular Dx & Upfront DST

Culture/ sequencing confirmation at referral labs

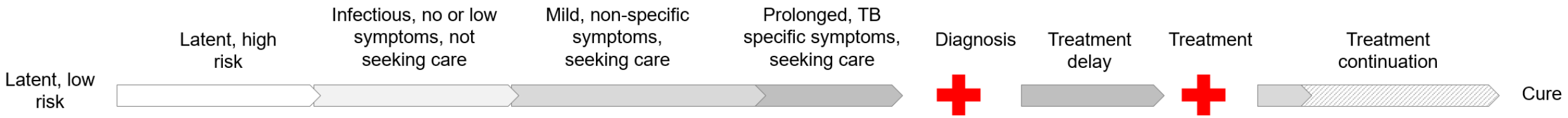
eTB ICT system

Electronic notification & tracking

Adherence monitoring tools

Shorter drug regimens

Solutions are required across the entire pathway



UNMET NEEDS	**Screen high risk populations for TB and risk of progression** to TB as they link for other causes, and ensure they are put on preventative treatment Consider active case finding	Get providers to **screen for rare TB occurrences** either with multi-disease or TB-only test	Get providers to know TB signs & symptoms and **screen for TB**	Increase **performance** of case detection at **lower levels** in health system, and **test non-pulmonary, non-sputum cases**	**Accelerate referral** of patients, samples and information to and from lab back to provider or patient	Get provider to **test for sensitivity to Rif, other drugs, and to shorter term regimen** at **lower levels** in health systems	Test **adherence** and **response** to treatment	
DELIVERY SOLUTIONS	**Intensive case finding in specific populations (e.g. ART clinics)** **LTBI treatment in high-risk populations (e.g. PLHIV)**	**Level 0/1 provider training & incentives for referrals** **Increased use of chest X-ray**		**Omni / Ultra uptake support; Ustar or Molbio in specific countries** **ICT-enabled sample referral to L3 for DST**	**ICT-enabled sample, patient and result referral**	**Omni/Ultra** **NAAT uptake support**	**Test for Rx response**	

WE WILL NEED OPTIONS ACROSS THE VALUE CHAIN

Move the test lower, and move the sample higher

L1: Primary care

GeneXpert Omni system with
Xpert MTB/RIF Ultra, TB LAMP,
TrueNAT MTB, EasyNAT TB

L2: District level

Xpert MTB/RIF, and Xpert XDR
for detecting resistance to quinolones
and second-line injectable drugs

L3: Reference lab

First and second line LPAs
High throughput NAATs
Next-generation sequencing

Sample transportation system, supported by ICT

MacLean E, Huddart S, Pai M. Exp Rev Mol Diag 2016

Centralized testing model for HIV and TB

ANALYSIS OF TURNAROUND TIME AND LOSS TO FOLLOW-UP IN LMICS

ANITA SURESH & MADHUKAR PAI

MCGILL TB CENTRE

Selected studies – HIV

Test	Country	Approach	Level of healthcare	Indicator		Citation
				Metric	Original (pre-intervention)	
EID	Multiple	EID national programmatic comparison	Central reference lab	TAT sample collection at site to lab, days	1.38 d in Namibia 5.25 d in Cambodia 12.6 d in Uganda	Chatterjee (2011)
				TAT result processing in lab, d	9 d in Namibia 18 d in Cambodia 23 d in Uganda	
				Loss to follow-up, % +ve infants not receiving txt	30% in Namibia 62% in Cambodia 63% in Uganda 78% in Senegal	
HIV CD4	Ethiopia	PPP Specimen Referral System utilizing postal workers	Reference lab	TAT from referral of specimens to a lab for CD4 monitoring to result receipt by referring facility, median, d (range)	7 d (2–14 d) in Addis Ababa 10 d (6–21 d) in Amhara Region	Kebede (2016)
				Time taken to transport specimen for monitoring after collection	4 h (2–6 h) in Addis Ababa >6 h (3–14 h) in other regions	
EID	Zambia		Central reference lab	TAT sample collected to result to caregiver, median (IQR; range) Central lab testing to return of result to clinic, median (IQR; range) Loss to follow-up, % +ve infants not receiving txt	92 d (84, 145; 28-487) 29 d (17, 36; 1-128) 33%	Sutcliff (2014)
HIV CD4	Multiple	POC vs. lab-based CD4 testing (Systematic Review)	Reference lab	TAT from HIV diagnosis to CD4 test, mean, d	10.5 d	Vojnov (2016)
				% patients who received CD4 test after HIV testing (95% CI)	70% (62-78%)	
				TAT HIV diagnosis to ART initiation, d	31.5 d	
				% patient retention CD4 testing to ART initiation (95% CI)	60% (47-74%)	
EID	Uganda	HUB model	Reference lab	TAT Sample collection-result delivery, d	49 d	Kiyaga (2013)

Selected studies – TB

Test	Country	Approach	Level of Healthcare	Indicator			Citation
				Metric	Original (pre-intervention)		
Culture	Uganda	PPP Specimen Referral System/postal workers	National TB Reference Lab	Specimen transport time, median, d (range)	12 d (1–240)		Joloba (2016)
				# sites referring specimens to NTRL (%)	50/900 (6%)		
Culture	Ethiopia	Time to first consultation, diagnosis and treatment	Multiple	TAT 1st visit to provider until 1st diagnosis, median, d (IQR) Delay based on where patients first seen, adj. odds ratio (95%CI)	27 d (8,60) Health centres: 5.1* (2.1, 12.5) Health posts: 109* (12, 958)		Yimer (2014)
Culture LPA Xpert	S. Africa	Decentralized Xpert impact on time to treatment initiation (TTT)	Reference lab District labs	TAT RIF-R sample determination to second-line txt initiation, median, d (IQR) • Culture DST • LPA • Xpert (full decentralization)	• 76 d (62-111) • 28 d (16-40) • 8 d (5-25)		Cox (2015)
LPA	S. Africa	MTBDR*plus* LPA DST implementation in central labs vs. culture	TB Referral Lab	TAT sputum collection to MDR results, median, d (IQR) TAT sputum collection to MDR txt initiation, median, d (IQR)	Before LPA: 52 d (41-77) 78 d (52-93)	After LPA: 26 d (11-52) 62 (32-86)	Hanrahan (2012)
LPA	India	MTBDRplus LPA DST implementation in central lab vs. LJ culture	TB National Reference Lab	TAT from result to txt initiation, median, d (IQR)	Before LPA: 8 d (7–13)	After LPA: 12 d (9–17)**	Singla (2014)

* Significantly associated

**Paradoxical increase post-LPA attributed to capacity issues