Diagnostic network optimization as part of a data-driven national strategic planning process in Kenya

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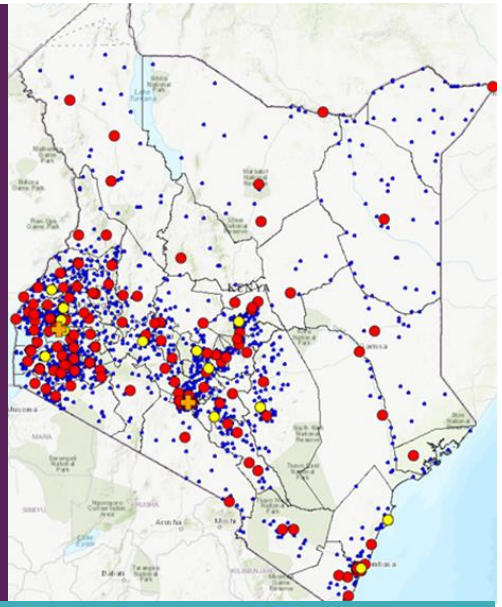
Laboratory network optimization to improve service delivery for TB. 31st October,
The 50th Union World Conference on Lung Health, Hyderabad, India



TB Service Delivery in Kenya

Counties	47
Sub-Counties	256
Total no. of health facilities	10,127
Number of TB treatment sites	**4,355**
Number of microscopy diagnostic sites	1,978
Central culture and molecular labs	2
Digital chest x-ray	2 per county
GeneXpert sites	189

The burden of TB in Kenya

Estimated total no. of people who fell ill with TB in 2018	**150,000**
No. of cases diagnosed in 2018 (missed 43%)	**96,478**
Estimated no. of children who fell ill with TB	**22,000**
No. of children diagnosed with TB (missed 55%)	**10,051**

Situation in the health system

42%of people with respiratory symptoms initially seek care at private clinics, laboratories and retail chemists (PPA, 2016)

Majority of the TB cases who seek care, did not get diagnosed at initial contact with the health provider (prev. survey 2016)

Majority of TB diagnosis is made after 4 – 5 hospital visits

21% of bacteriologically confirmed TB cases not notified (Initial loss to follow up) ?Leakages

TB diagnosis mostly done in the Chest/ TB Clinic

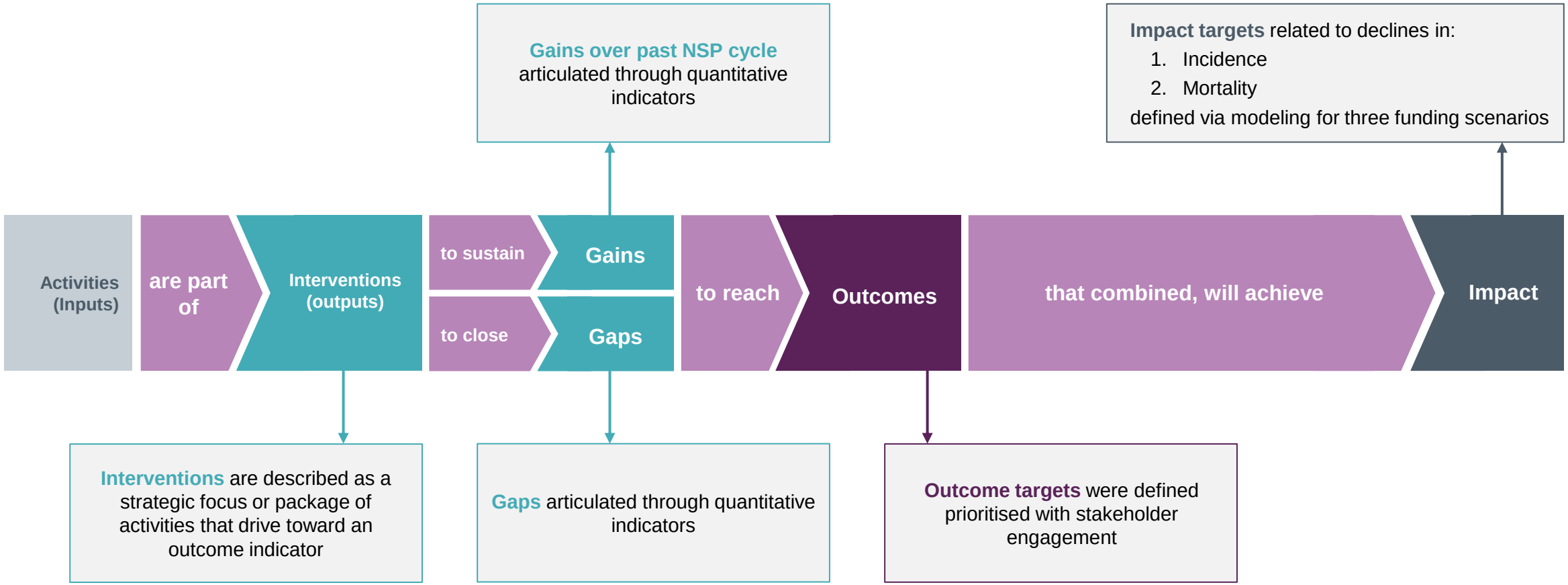
Vision, Mission & Strategic Focus

Vision	"A Kenya free of TB and leprosy, and reduced burden of lung disease"
Mission	"A Kenya free of TB and leprosy, and reduced burden of lung disease"
Impact Targets (by 2030)	i. Reduce the number of TB deaths compared with 2015 by 90% ii. Reduce the TB incidence rate compared with 2015 by 80% iii. Zero TB-affected families face catastrophic costs due to TB, leprosy or lung disease iv. Reduce the proportion of people with leprosy diagnosed with a grade 2 disability to below 5% v. Reduce the burden of chronic lung diseases by 20%, compared with 2015

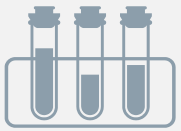
Strategic Focus

- Close the gaps along the care continuum to find and cure ALL people with TB
- Differentiated response by counties to address TB in local contexts
- Optimize the implementation of TB, leprosy and lung health services within UHC
- Prevent infection, active disease, morbidity and mortality
- Patient centered approach that promotes quality of care

Logic Flow of an Evidence-based National Strategic Plan

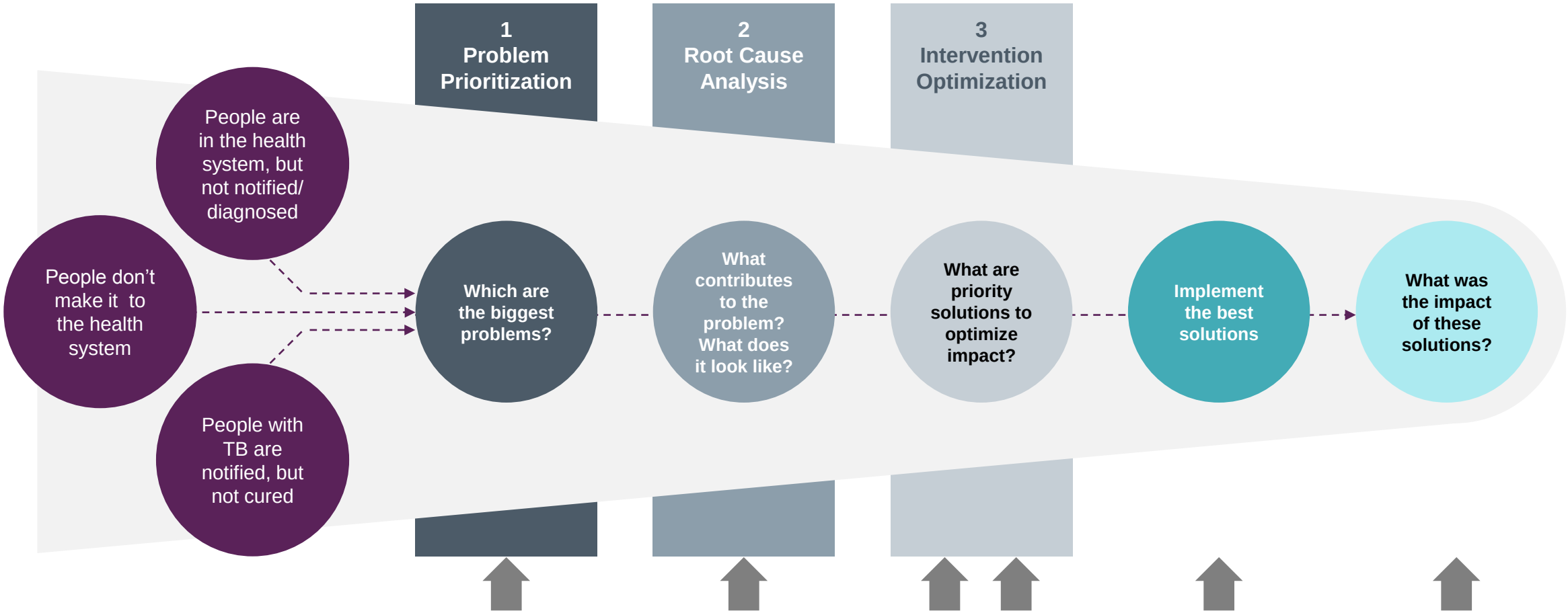


Outcome Targets

	Indicator	Baseline	Target
	Increase proportion of notified TB cases that receive a rapid diagnostic test (GeneXpert MTB/RIF) at the time of diagnosis	47%	90%
	Increase proportion of notified patients with rifampicin resistance who receive Second Line DST results	Data unavailable	100%
	Increase proportion of diagnostic testing sites that monitor performance indicators and are enrolled in an EQA system for all diagnostic methods performed	85%	100%

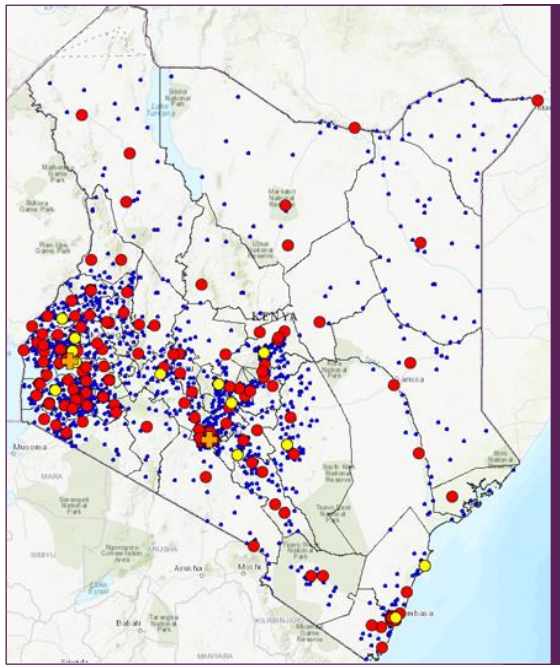
Framework for prioritization and planning

Step-wise approach to strategic planning that focuses on where people with TB may be "missing" from care



Diagnostic Network Optimization

Diagnostic Network Optimization for Kenya's National Strategic Plan for TB 2019-2023



2017 TB Diagnostic Sites

Key:

- GeneXpert (GX4)
- GeneXpert (GX16)
- Smear Site
- Culture Site

Baseline status (2017)

Low Xpert utilization

Limited access to Dx services

Sample referral lacking

NSP process (2018/19)

Using available evidence to inform a prioritized and patient-centred National Strategic Plan to meet End TB targets

Diagnostic network optimization embedded within NSP process and aligned with NTP priorities and targets for case detection

Diagnostic Network Optimization (2018)

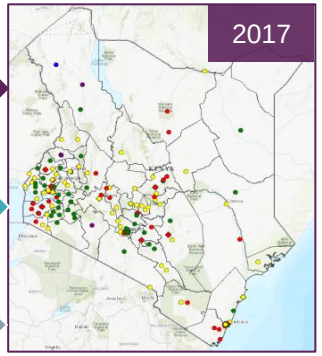
How to improve access with current network footprint? - relocation, longer working hours etc.?

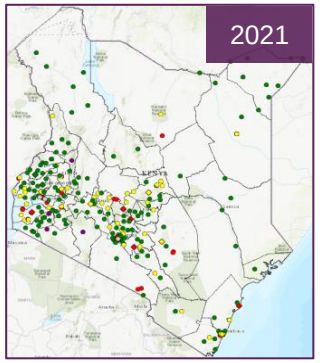
Can future testing demand be met without the need for capital outlay?

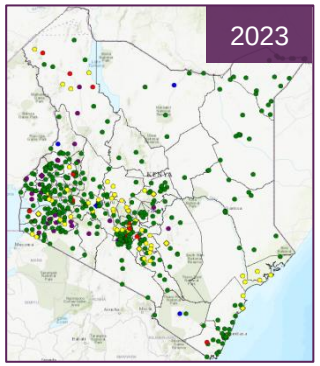
Are more instruments needed and if so, where to place them?

How to build an efficient sample referral network to improve patient access to services?

How to best integrate HIV EID and TB testing and sample referral?







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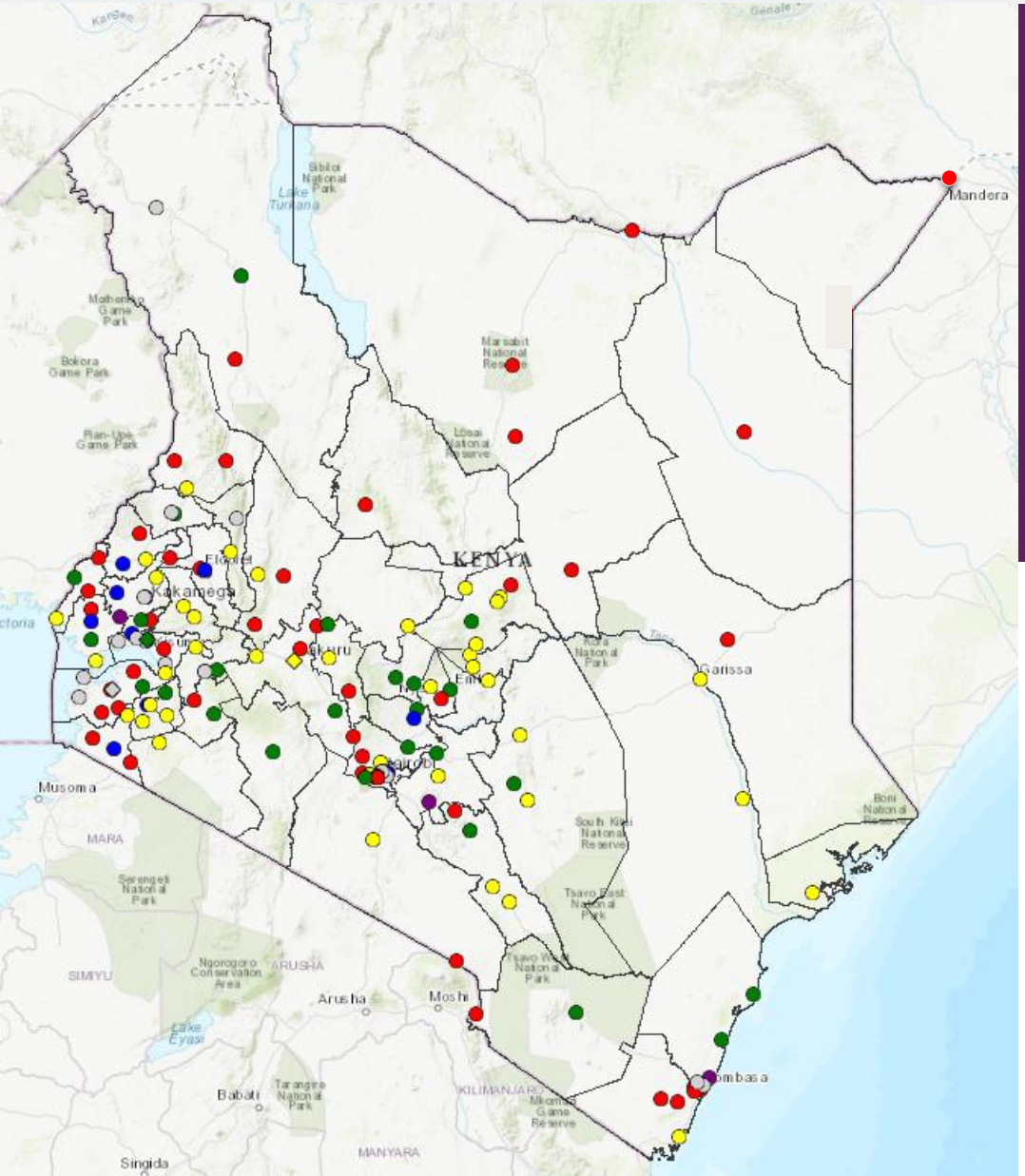
Distribution and capacity of NTLP Xpert testing sites - 2017



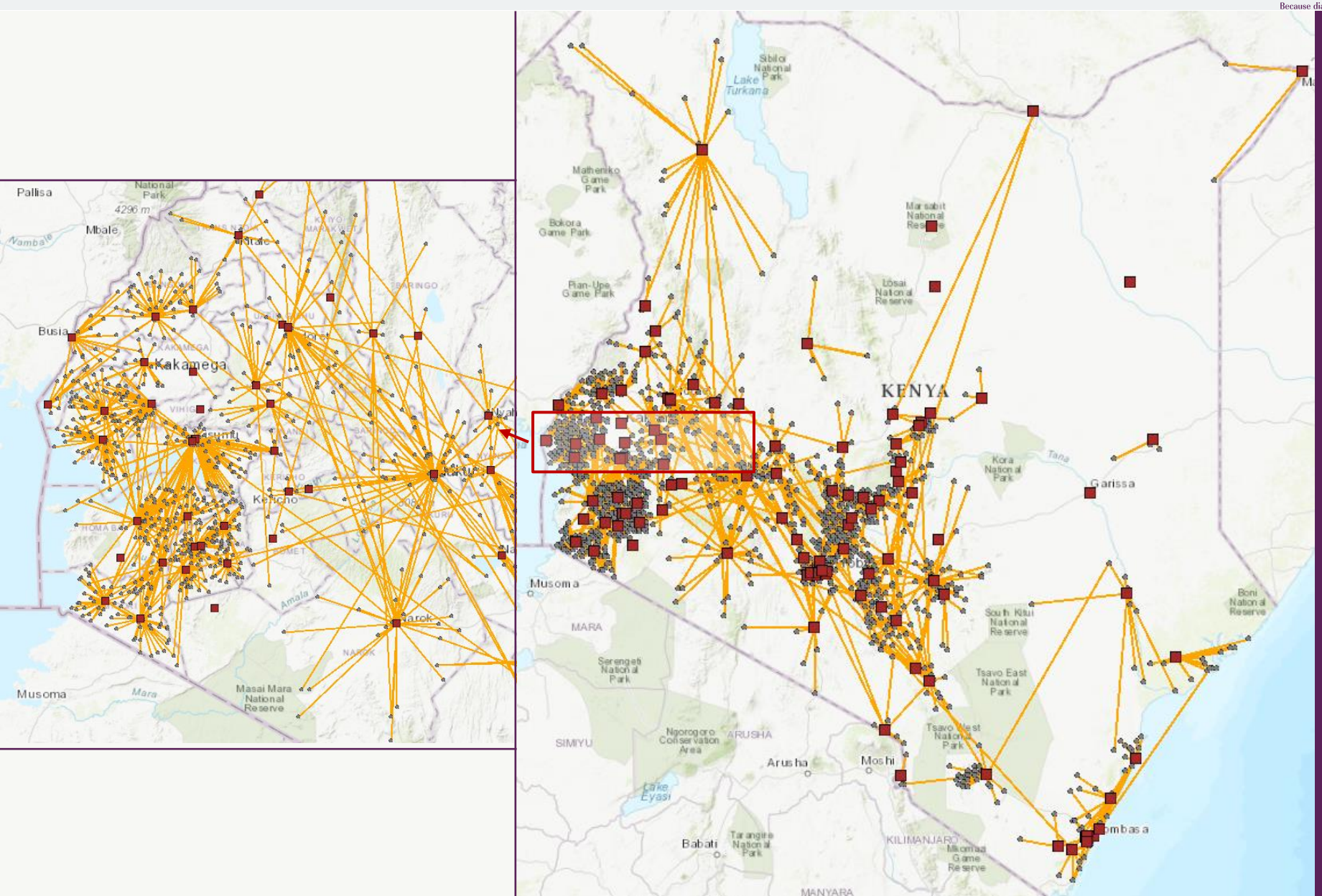
- 275k Xpert tests
- Map shows 162 NTLP Xpert sites, of which 141 reported data in 2017
- Over-capacity and heavily under-utilized sites are often right next to each other
- Largest number of sites fall into low utilization categories

Key:

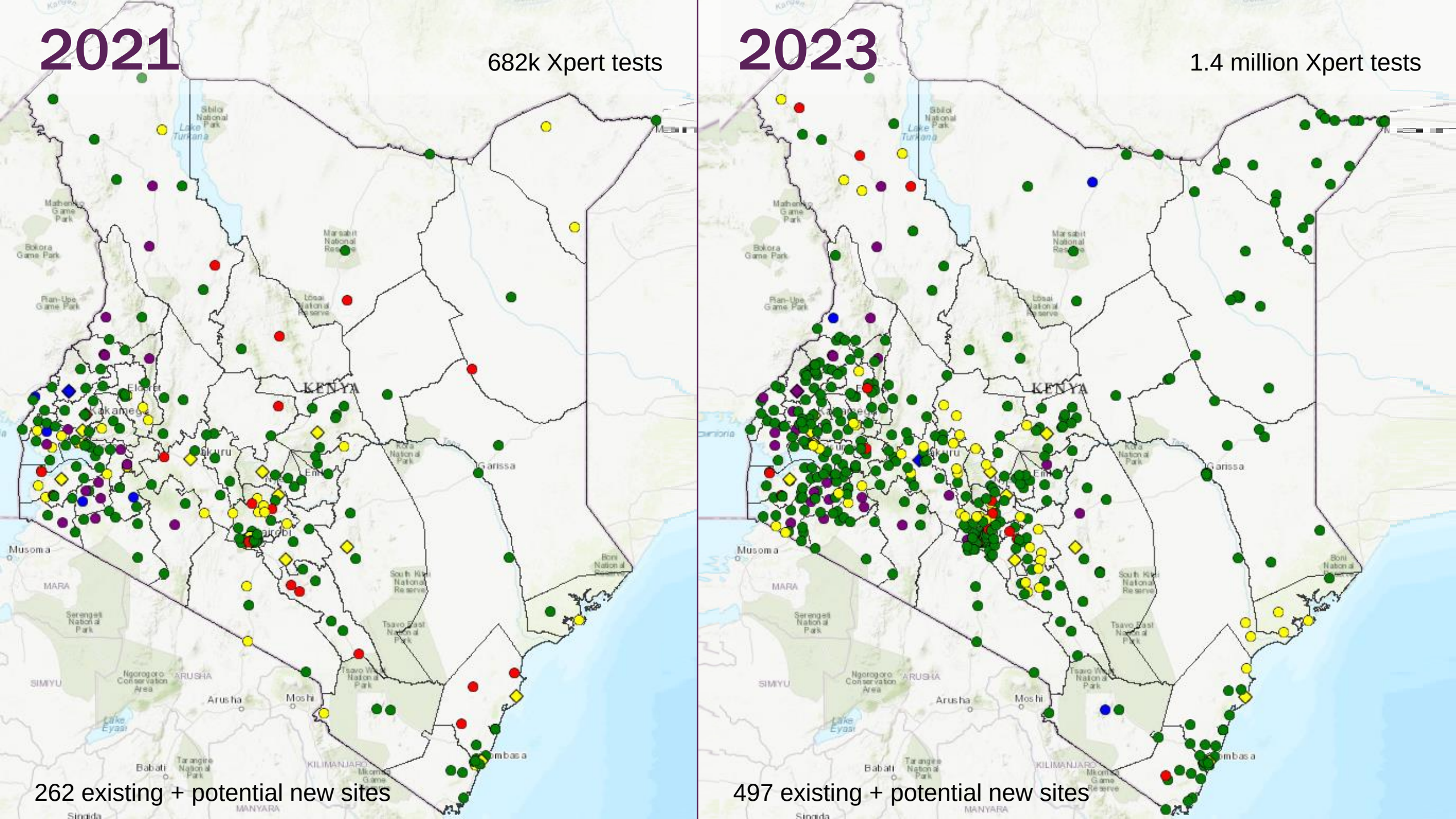
- ○ Circles (GX4) ◇ Diamonds (GX16)
- <4 tests/day for GX4 and <12 tests/day for GX16
- 4-8 tests/day for GX4 and 12-24 tests/day for GX16
- 8-12 tests/day for GX4 and 24-36 tests/day for GX16
- 12-16 tests/day for GX4 (over single shift capacity limit)
- over 16 tests/day for GX4
- No data available

All utilization calculations consider 12 tests/day capacity per GX4 and 240 working days. 48 tests/day for GX XVI.

Current sample referral flows – partial snapshot



- Incomplete data on the current sample referral flows
- What we know from the available data:
  - Health facilities often refer to multiple testing sites
  - Utilization of testing facilities in the same geographic area varies widely
  - Most referrals are within county boundaries although not always to the closest site
  - Some cross-county border referrals do occur


2021
682k Xpert tests
262 existing + potential new sites
2023
1.4 million Xpert tests
497 existing + potential new sites
KENYA
Nairobi
Garissa
Kakamega
Eldoret
Nakuru
Musoma
Arusha
Moshi
Mombasa
Lake Turkana
Lake Eyasi
MARA
SIMIYU
ARUSHA
KILIMANJARO
MANYARA

Considering optimized network models for 2021 and 2023

		Average service distance (km)		
County Category	**2017**	**2021** Existing sites only	**2021*** Allow new GX	**2023**
Easy		5.3	4.5	3.3
Moderate		11.0	8.3	5.4
Hard		28.5	16.1	12.8
National		**13.1**	**8.0**	**6.0**
Total GeneXperts	**180**	**208**	**262-297****	**497** [450-500]

2021: Adding new instruments is optimal, but overall annual op costs similar to extended current capacity

- A high proportion of sites in the existing sites only model are running at very high capacity (>12 tests)
- Where addition of new sites is allowed, the added sites are well-utilized (6-12 tests per day)
- Addition of new sites to hard to reach areas significantly reduces the average distance to an Xpert site
- How feasible is widespread implementation of shifts, private sector engagement in existing sites model?

Zero procurement of devices – assumes strengthen SRS, engage private sector and longer working hours

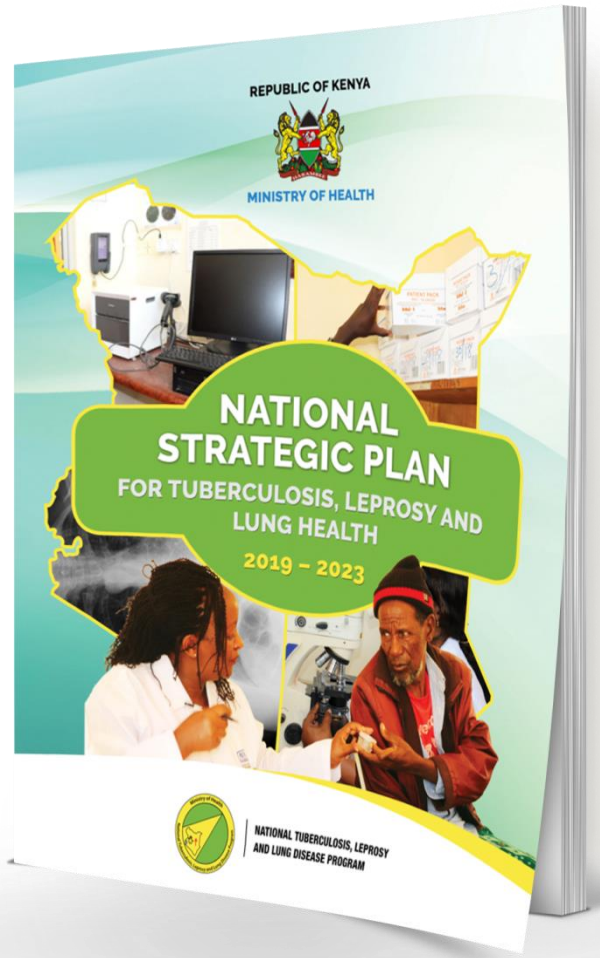
Device estimates for TB demand only. Adding EID testing needs higher end recommendation on number of instruments for 2021 and 2023

steep increase in costs below 450 sites

Even with transport cost sensitivity analysis (reduction in transport cost by ½ in ETR and ¼ in HTR due to multi-stop routes), the model still recommends over 450 sites

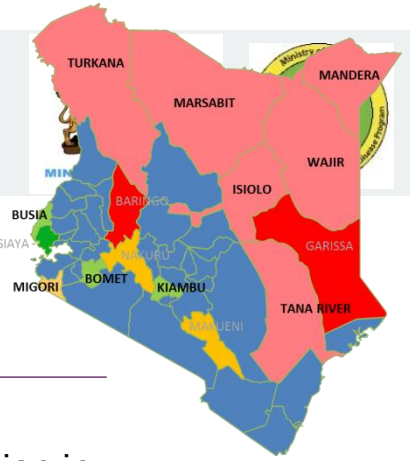
* Average service distances calculated for DG method.
** 262 with PG demand, 297 with DG demand

Uptake of network optimization outputs into NSP



- Sufficient network capacity exists to meet current TB demand and is largely well placed. Establishing SRS is a priority to enable scale up of testing to find the missing cases
- Transport legs remain long in hard to reach counties even with an optimized network design.
- For 2023 there is a strong justification for additional sites (total of 450 - 500 Xpert sites) even when only TB demand is considered.
- Hard to reach counties are prioritized for placement of new instruments to improve access
- Uncertainty exists around future test demand projections calculated on the basis of NSP targets; re-analysis in mid-late 2020 is strongly recommended

Integrating testing and sample referral systems: a county-customized approach to designing efficient and sustainable diagnostic networks



Objective:

Design county-specific integrated SRS using TB and HIV testing demand and selected integration of VL/EID/TB testing on GX in 15 of 47 counties, and use learnings to develop SRS implementation guide for scale up

Inputs:

- Scenarios considered EID testing at existing GeneXpert sites in HTR counties and referral to regional referral labs in others. All VL testing referred to regional labs.
- Sample referral for all TB and HIV tests from all HFs, twice weekly pick-up for HTR, 5 times weekly for ETR and MTR counties. Two SRS stages: (1) HF -> Hub/Xpert, (2) Hub/Xpert -> Referral Lab (VL, TB culture and some EID)
- All inputs and outputs validated by County TB officers and lab coordinators, NTLP & NPHLS

Findings: Integrated testing

- Majority (73%) of tests done are HIV VL, Xpert MTB/RIF 18% and EID, 9%, but significant variation in volumes and proportion of TB vs. HIV tests across counties
- Average GX utilization for TB is between 51% - 142% in ETR and MTR and 22% - 56% in HTR counties
- All HTR counties have sufficient spare capacity on GX to add EID testing (increased device utilization by 0-14%)
- Integrating VL on GX was not included as a possible scenario in this analysis. However demand projections suggest that 4/8 HTR counties would have sufficient GX capacity to integrate VL testing.
- VL demand in HTR/MTR far exceeded available capacity in most cases.

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Conclusions

- Diagnostic network optimization is a novel analytical approach which enables use of available country data to inform rational evidence-based decision-making on optimizing access to TB diagnostic services in support of finding the missing TB cases

- Diagnostic network optimization allows a differentiated approach to be used to account for sub-national differences and preferences, enabling pragmatic and action-oriented recommendations to be developed

- As with any analytical approach, the findings should be reviewed to determine the feasibility for operationalization, and accounting for the impact of uncertainties in some data sources and sensitivity analysis around key inputs

- Tracking the uptake of diagnostic network optimization recommendations and their impact on the overall network "health" in terms of access, quality and coverage, will be critical to demonstrate the value of the approach to building patient-centred and efficient diagnostic networks

Thank you

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