KIT | Royal Tropical Institute

SPARK | Edition 1

Short Periodical Announcements of Research at KIT

Improving TB case detection around the world

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KIT is pleased to announce the development of the MATCH approach (Mapping and Analysis for Tailored Disease Control and Health System Strengthening), to support National TB Programmes (NTP) in finding undiagnosed cases of TB. Every year 10.4 million people fall ill with tuberculosis (TB). Although tuberculosis is a curable disease, approximately 4.3 million newly infected people are not diagnosed by health services and remain untreated. This failure results in continued transmission of the disease, while a mistreatment can ultimately lead to drug resistance or death. As a result, 1.4 million individuals in low and middle income countries die every year of a disease which could have been prevented if proper case detection and treatment services would have been available to them.

Until now national TB control strategies have relied on a "one-size-fits-all" approach. Instead, local differences in the number of people affected with TB, the presence of high risk populations, or a combination of other factors require different health interventions to be considered to best fit the local context. Given the limited resources available in affected low- and middle-income countries, there is a lack of capacity to use available data to plan and monitor TB case finding interventions locally. This caveat is currently identified as one of the main obstacles preventing health professionals from being able to curb the global epidemic and reducing the suffering of highly vulnerable people who are disproportionately affected by this disease[1].

Since 2016, KIT Health has supported an initiative of the *Stop TB Partnership* funded by The Global Fund for AIDS, Tuberculosis and Malaria to respond to this pressing problem. KIT Health's epidemiology team developed the MATCH[2] approach to strengthen NTPs and stakeholder capacity in finding the missing cases of TB. This approach allows our partners to strategically develop locally tailored TB control efforts. It also acknowledges the fact that the TB epidemic is variable and geographically heterogeneous, and therefore requires locally adapted responses.

The analytical approach and methods used correspond to a wide variety of health domains: collection and triangulation of data from often underused sources, and using Geographic Information Systems (GIS) software to analyse spatial patterns, hypotheses, and insights about a disease of interest. In this inaugural edition of SPARK we describe the rationale, innovation, and outputs of our approach to subnational data analysis and spatial visualization for locally differentiated TB planning.

[1] STOP TB STRATEGY 2016-2020

[2] Mapping and Analysis for Tailored Disease Control and Health Systems Strengthening

MATCH: A new approach to combine data for improved decision making.

First, we gather data from as many readily available, yet underused, sources as possible and integrate these into an access managed cloud-database.

1. Underused data sources

- National TB Program
  - TB notification
  - TB/HIV activities
  - TB treatment data
  - TB laboratory data
- National surveys and statistics
  - TB prevalence data
  - HIV co-morbidity data
  - Demographic and Health Survey
  - Service provision survey
- Health systems data
  - Location & functionality of TB service facilities
  - Diagnostic coverage data
- Population data
- Spatial data

world pop   UNdata A world of information   STATcompiler BUILDING TABLES WITH DHS DATA   dhis2 Academy   World Health Organization

Collaboration with NTPs to identify relevant sources of data

Second, together with our country partners, we apply a standard set of analytical frameworks to our data to understand the local TB epidemics and TB program responses.
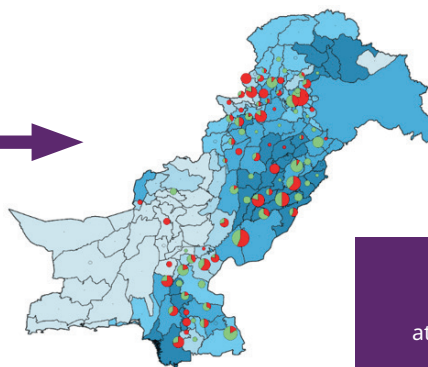
2. Analytical frameworks

1. Know your (local) TB epidemic

- Where are people with TB missed?
- Who are the missing people with TB?

2. Understand the local TB response

- Why are cases missed?
- Which context-specific interventions are needed to find those individuals with TB? (how)

NTPs are supported to map & analyse their own data at the district & sub-district level, looking for spatial patterns.

Third, we collaborate with our country partners to develop locally differentiated solutions which match the local analyses.

3. New locally differentiated action plans

Patient Pathway	Infection	Finding Care	Receiving a diagnosis	Completing treatment
Pathway constraints		Financial, awareness, or distance constrains	Clinical services insufficient	Low adherence to treatment
Interventions		Improve coverage (access)	Improve disgnostic testing	Active follow-up

NTPs use analytical interpretations to develop local plans of action and local monitoring and evaluation to see if their new activities address the identified challenges.

Strengthening the use of data in South and Southeast Asia

Bangladesh, Cambodia, India, Indonesia, Myanmar, Nepal, Pakistan, The Philippines, Vietnam

Bangkok, Thailand / April 19th – 26th 2017

The MATCH approach provides data analysts and decision makers with tools and methods to use their program data to make better informed decisions supported by local evidence. Therefore it is essential that the tools and methods are easily accessible and adopted by health professionals and epidemiologists focusing on TB prevention and care. In 2017 KIT provided training in the MATCH approach to TB programme staff who use data to improve programme effectiveness.

Funded by the Global Fund, *The Stop TB Partnership* and WHO Global TB Program (GTB), KIT Health's Epidemiology team traveled to Bangkok to facilitate the "Regional Asia Workshop on the use of subnational and disaggregated data for strategic planning in TB." During the workshop KIT trained TB epidemiologists and health professionals to use Geographic Information Systems to map and analyse data which was made available via a shared cloud database. Together with our partners and TB experts from the nine South and South-East Asian countries, the nine steps of the MATCH approach were applied using each country's data. After participants learned how to map and interpret their data in Quantum GIS (QGIS), TB program management staff joined the workshop to discuss how mapped outputs could be used to inform localised planning.
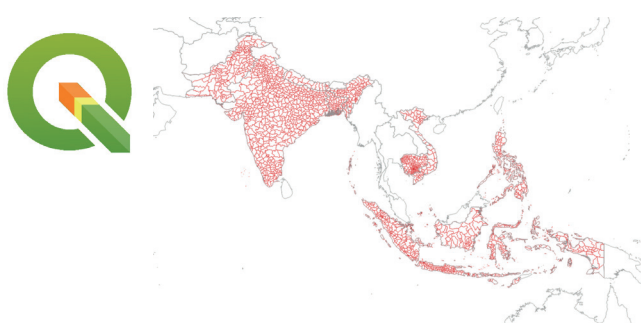

Examples of outputs from workshop

Participants of the workshop produced informative and well conceived subnational maps, demonstrating variations in TB burden and program responses. The map below produced by members of the Philippines Ministry of Health highlighted the discrepancy between diagnostic capacity and diagnostic outputs among 81 regional units in their country. This result shows, against general expectations, that the number of people with TB symptoms where the TB bacterium was actually found based on lab confirmation (bacteriologically confirmed) is low in areas where more testing services are available (Xpert). This observation raises questions whether the patients who are referred to be tested actually have TB symptoms or whether the coverage and access to these services are sufficient. Such observations result in follow-up questions which are to be validated using information on the presence of risk groups and potential barriers preventing people to get access to TB testing services.
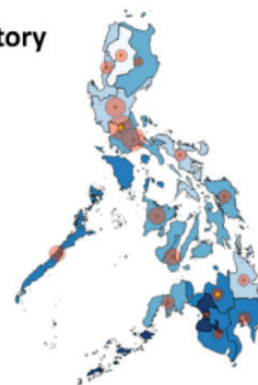
Data management requests for the workshop

Prior to the workshop, KIT worked with TB experts from WHO to collect and process data to make it easily accessible for analysis and mapping using a standardised and internally consistent cloud-based database. Although the principles of the data management requirements are quite clear, in practice it was a complex process which KIT is now attempting to simplify in collaboration with District Health Information System 2 (DHIS2) and QGIS developers. The purpose of this is to remove the data management barriers preventing disease program personnel to analyse, map and use their country's subnational data for locally differentiated programs.

Triangulating data sources to understand why TB cases are missed

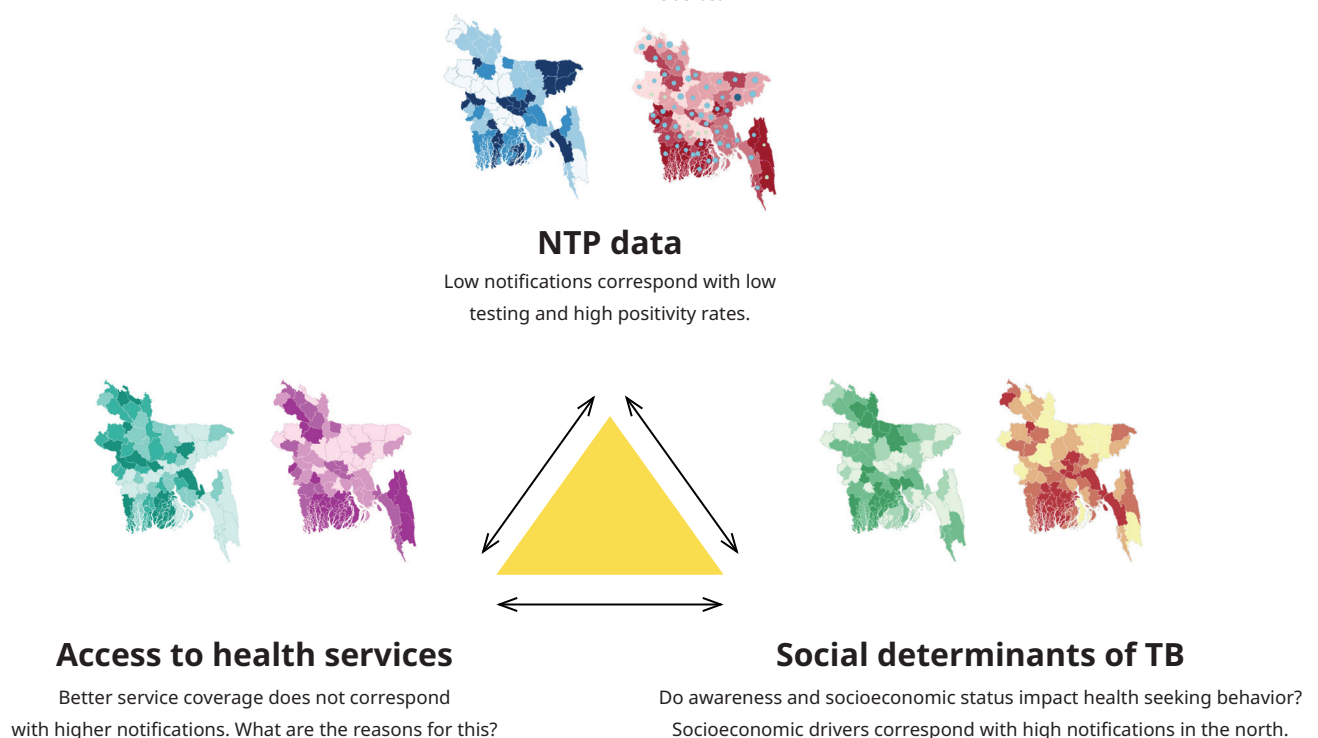**Triangulating multiple sources of data to identify areas of potential under-notification**

Following the Bangkok workshop, KIT, together with its partners, continued their support to generate maps visualising different TB and non-TB indicators in a selection of Asian countries, including Bangladesh. In August 2017 a five day participatory data analysis workshop was organised in Dhaka, Bangladesh. During this event, stakeholders from various institutions (BRAC, MSH, ICDDR - Bangladesh) worked together to generate new hypotheses about where missing cases of TB are found, whom they may be, why they may be missed, and which solutions are needed to reach and care for them. Building on the extensive knowledge of the team, various maps were produced and presented to assess these questions. These maps show that each district is operating in a unique environment: with a different TB burden, level of programme quality response, socioeconomic conditions, and access to facility services. Comparing these different pieces of information by triangulation can be useful to detect commonalities and inconsistencies in the data which in turn can be used for hypothesis generation.

Triangulation is a powerful analytical technique which facilitates validation of data through cross verification of information from two or more analytical methods or data sources. By combining multiple data sources and filters through which we observe epidemiological processes, we can validate assumptions about possible interventions to improve prevention and care. An example of how triangulation is used to compare and validate assumptions regarding TB case detection in Bangladesh is shown here.

The maps on the top show the number of people tested for TB within the total population as well as the number of diagnosed TB patients being reported. These maps provide information regarding how many TB suspects are being identified and diagnosed. Since these outcomes depend largely on the coverage and access to services, assumptions regarding service availability need to be validated. The maps to the lower left show indicators of general health service delivery (immunisation) and coverage (microscopic diagnostics available). Finally the number of people who are at risk for TB and are accessing health care is strongly influenced by their socioeconomic status. The maps to the lower right show the literacy and poverty of populations in Bangladesh. Brought together these three thematic conceptualisations provide a practical and concise picture of localised TB epidemics and programme responses.

In addition to triangulating data, spatial statistics are used to identify patterns and anomalies in these data to improve the rigour of these analyses. For more insights into said spatial analyses, please refer to our MATCH manual available on the KIT website.

NTP data

Low notifications correspond with low testing and high positivity rates.

Access to health services

Better service coverage does not correspond with higher notifications. What are the reasons for this?

Social determinants of TB

Do awareness and socioeconomic status impact health seeking behavior? Socioeconomic drivers correspond with high notifications in the north.

Tailoring MATCH according to programme priorities: addressing drug-resistant TB

Mapping drug-resistant TB, treatment outcomes and programme responses in Central Asia

Following the success of the workshop in Asia, KIT Health was requested by The Global Fund to apply the MATCH approach to support NTPs in the Central Asian region. Kazakhstan is one of thirty countries prioritised by the WHO as a high-burden multi drug-resistant (MDR)-TB country. Like drug-sensitive TB, MDR-TB also spreads from person to person, but drug resistance can arise due to poor treatment adherence. It takes much longer and is more difficult, and is often more painful to treat compared to drug-sensitive TB. Therefore in these settings, ensuring correct diagnosis and prompt treatment initiation, monitoring of adverse side effects, and providing treatment support to ensure treatment completion, are of utmost importance to limit the spread of MDR-TB.

In Kazakhstan, an estimated 25% of all new TB cases have MDR/RR-TB, while 43% of previously treated TB cases have MDR/RR-TB.

In the summer of 2017, KIT joined a WHO team performing an epidemiological review in Kazakhstan. The aim was to map and spatially analyse the notification of TB and MDR-TB patients, with the goal of identifying TB hot spots. Special attention was paid to treatment outcomes. To do so the team identified geographic regions where further investigation may help the NTP to understand factors associated with loss to follow-up and treatment failure. A comparison of the maps below allows one to identify regions with both a high percentage of MDR cases, and low treatment success rate. These areas may be prioritised for improved treatment monitoring to prevent the development of further drug resistance.
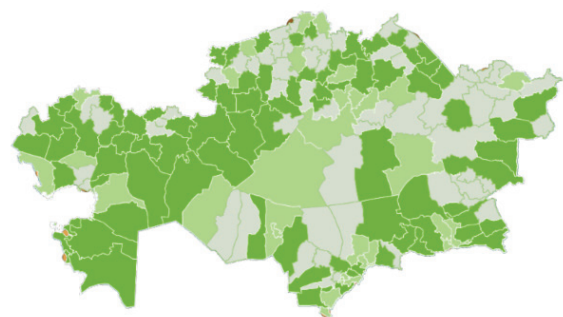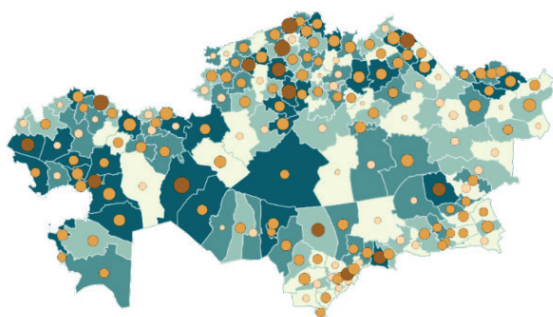
TB CNR 2016
per 100,000 population

Confirmed MDR cases
- 0 - 21
- 21 - 34
- 34 - 43
- 43 - 83

Confirmed MDR % new cases
- < 20
- 20 - 40
- 40 - 58

Treatment success rate %
- < 85
- 85 - 95
- 95 - 100

0   250   500   750   1000   1250   1500 km

Improving urban access to TB services in Pakistan

Mapping TB diagnostic and treatment facilities and their data in Khairpur and Islamabad Capital Territory

A number of countries that attended the Bangkok workshop requested continued support to either make further analyses of their subnational data or to collect different/more data to inform subnational TB planning. Since then KIT has supported Pakistan's National TB Programme in the collection of GPS coordinate data of TB diagnostic and treatment centers in Khairpur and Islamabad Capital Territory. These GPS data will be analysed with the corresponding facility level data and district level demographic data to measure access to TB diagnostic and treatment services.

This will help to plan for better service delivery in areas where need is high and resources are limited. The analysis will combine: availability and types of human resources trained to provide TB services, availability of diagnostic machines and supplies, laboratory performance, and facility catchment area population. Hypotheses can then be generated about which facilities should receive more training, more equipment, or may serve the community better through increased screening and testing. Data collection is now complete and analysis will begin in early 2018.
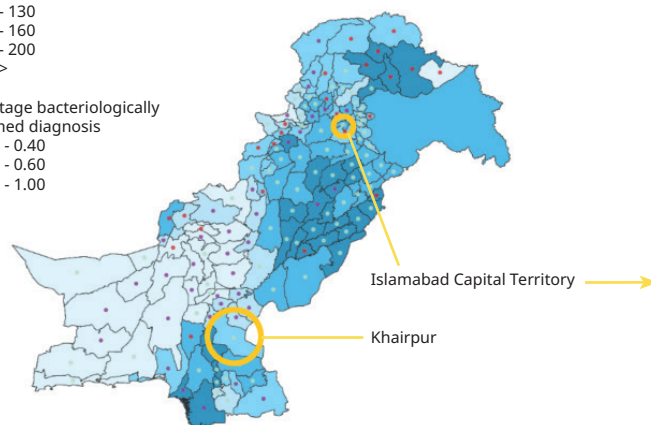
Diagnostic type

CNR and % bacteriologically confirmed

TB case notification rate all forms cases / 100.000
- 32 - 100
- 100 - 130
- 130 - 160
- 160 - 200
- 200 >

Percentage bacteriologically
confirmed diagnosis
- 0.06 - 0.40
- 0.40 - 0.60
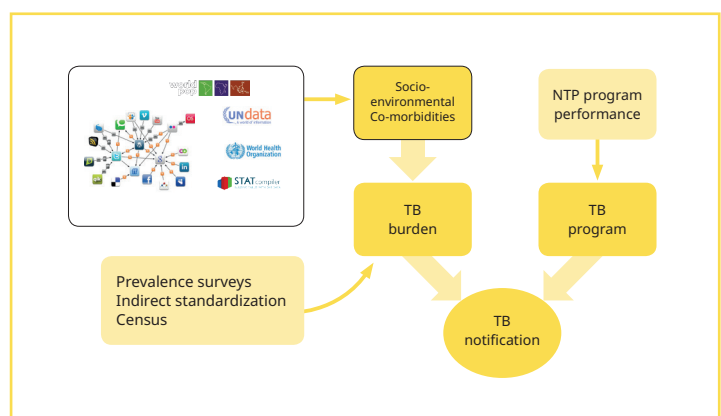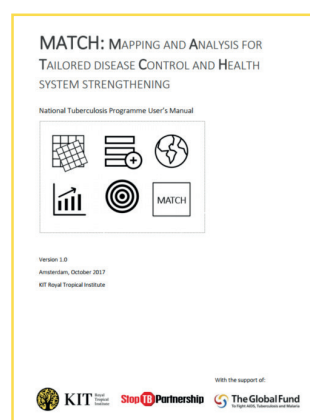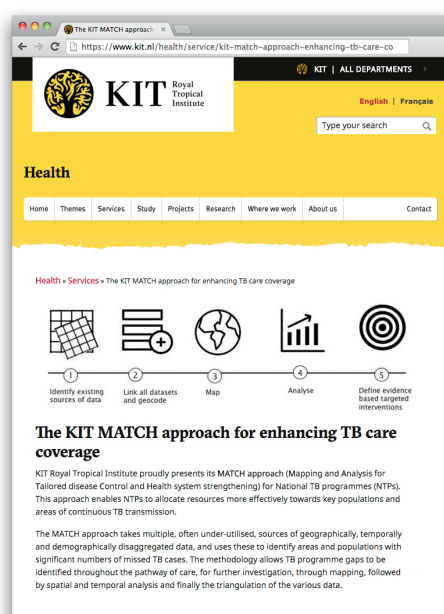- 0.60 - 1.00

Islamabad Capital Territory

Khairpur

Insights gained from district level analyses shown above will be brought down to the health facility level for a more granular understanding about the needs of the surrounding communities.

MATCH manual launch 47th Union World Conference on Lung Health in Guadalajara, October 11-14th

KIT Health encourages TB experts to join us in our mission to improve the use of available data and geo-spatial analysis to inform local decision-making. Based on feedback of NTPs who have successfully applied MATCH to subnational programming, KIT is committed to making the MATCH approach freely available to all who are interested.

> " *The [MATCH] tools helped us a lot in identifying areas needing special attention [... These are] very useful to identify program gaps and intervene accordingly."*
> NTP Bangladesh

KIT Health is proud to be able to share version 1.0 of the MATCH manual. KIT Health has documented the step-by-step methods applied to achieve the outputs described throughout this document. The MATCH manual describes the pragmatic comparisons TB programme managers can make between different sources of TB and non-TB data, in order to prioritise geographic areas, populations or case finding strategies for improved treatment coverage. It also contains the data management requirements needed to map and spatially analyse subnational data, and the questions TB program managers and monitoring and evaluation staff can discuss to be able to interpret their maps and make sound programmatic and monitoring and evaluation decisions based on those conclusions. The MATCH manual can be found at www.kit.nl/health/service/kit-match-approach-enhancing-tb-care-coverage/.

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