Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning, January 2021 - August 2023:

Final Report Annexes

Project implemented by the CDC Foundation and U.S. Centers for Disease Control and Prevention (U.S. CDC) with funding from the Bill & Melinda Gates Foundation

November 2023

CDC Foundation
Together our impact is greater

U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

Annexes

Annex 1: Global key informant interview guide

Annex 2: Country use case discussion guide

Annex 3: Country key informant interview guides

Annex 4: NTP survey questions

Annex 5: List of countries that completed the NTP survey

Annex 6: NTP survey “worth the investment” responses stratified by income group

Annex 7: NTP survey “opportunities” responses stratified by income group

Annex 8: NTP survey “challenges” responses stratified by income group

Annex 9: NTP survey “financial support received” responses stratified by income group

Annex 10: NTP survey “funding allocation” responses stratified by income group

Annex 11 Detailed findings of each supplemental TB data tool

Annex 12: Ethiopia Country Case Study Report

Annex 13 Kenya Country Case Study Report

Annex 14: Pakistan Country Case Study Report

Annex 15: Uganda Country Case Study Report

Annex 16: Viet Nam Country Case Study Report

Annex 1: Global key informant interview guide

Project ID:
Date:
Time:

Key Informant Interview Questions for Global Partners

Some things to keep in mind during the interview:

- *We're interested in your experiences with TB data collection tools in low and middle-income countries that have used or would be candidates to use, the tools and activities on the pre-interview questionnaire.*
- *Definition of "useful": Accurate and timely data that directly informs decision-making because they can be accessed and understood by stakeholders during program planning and decision making.*

"I will start by asking you about routine TB surveillance systems and then we will focus our discussions on TB supplemental tools and activities. When we say supplemental tools and activities, we are talking about all the surveys and tools that we asked about in the questionnaire you completed, such as TB prevalence surveys and Drug Resistance surveys."

Interview questions:

1. Thinking about the **routine** TB data collection systems that countries use, what are the biggest challenges, limitations and gaps in the **availability and use of data for TB program planning and decision making**?

"Thank you. We will now shift our focus to the TB supplemental tools and activities."

2. Thinking of these challenges, limitations or gaps, **can you tell us how supplemental tools and activities have been useful in addressing these or other important challenges**?

   [Start open-ended; but probe with tools that respondent doesn't include in their answer]

   [Probe about other challenges that tools can address – not limited to challenges listed above]

3. Thinking about these supplemental tools and activities, can you tell us two things: first, what is typically the motivating or driving factor for countries to implement these supplemental tools/activities? And second, who – as in the NTP and/or other specific partners – are typically involved in deciding to implement this activity in a country?

[Probe: Does this differ by tool/activity? Can you provide specific examples?]

4. Can you describe common challenges and opportunities encountered with planning and implementing these activities? Challenges and opportunities can include those at the country level as well as challenges and opportunities for funders and partners that are supporting the activities.

   [If not already mentioned, probe for: funding challenges, implementation challenges, burden on countries]

   [Follow-up question if they don't address specific activities: is there anything related to specific activities that you would like to add?]

5. Do you feel that the programmatic recommendations and decisions resulting from these tools are optimally implemented? If no, why? This is a general question, but feel free to speak about specific tools if you'd like.

   [Follow-up question if no: Do you have any suggestions on how this could be improved?]

6. **Considering the full spectrum of supplemental activities and the burden they may place on countries, funders and partners,** what do you think of the overall frequency and timing with which these supplemental activities are typically implemented in countries?

   [Prompt if needed: too frequent or not frequent enough]

7. Given that these activities require significant human and financial resources, do you think these activities are generally worth the investment? Please also tell us any key country characteristics that would influence your response. We'd like your answer to be tool-specific, so let's go down the list of activities that you said you were familiar with.

TB Tools and Activities	*Worth the investment*

8. Do you think that more resources should be invested into strengthening routine systems, even if it means that there may be fewer resources available for supplementary activities like the ones we are discussing today? Please give us some reasons for your answer.
9. Given the burden that these activities can place on countries, do you think there are opportunities for combining or streamlining activities with **related goals or similar**

methodology to reduce the overall burden? If yes, can you tell me which tools have potential opportunities to be combined or streamlined?

10. Given all that we have discussed, are there activities that you think should be prioritized for implementation? If your response varies depending on country characteristics, please tell us the country characteristics or other factors that influence your prioritization of activities.

    [Prompt with specific tools if needed]

11. Do you think there is a need to develop any new supplemental tools or activities to address gaps in routine programmatic data? If yes, what programmatic areas would benefit from new tools or activities?

12. Finally, I'd like you to consider a **broader scope** of TB data needs – think about existing data systems and how they are used, as well as the role of supplemental activities. From your perspective, what are the top data-related priorities moving forward to ensure that countries have and use "need to know" data for program planning and decision making?

    [Open ended response]

13. Is there anything else that you would like to tell us about the use and usefulness of these supplementary tools that you think is important to consider as part of this project?

Annex 2: Country use case discussion guide

TB Data Optimization Project: Country Use Case questions – [*COUNTRY*]

Introduction

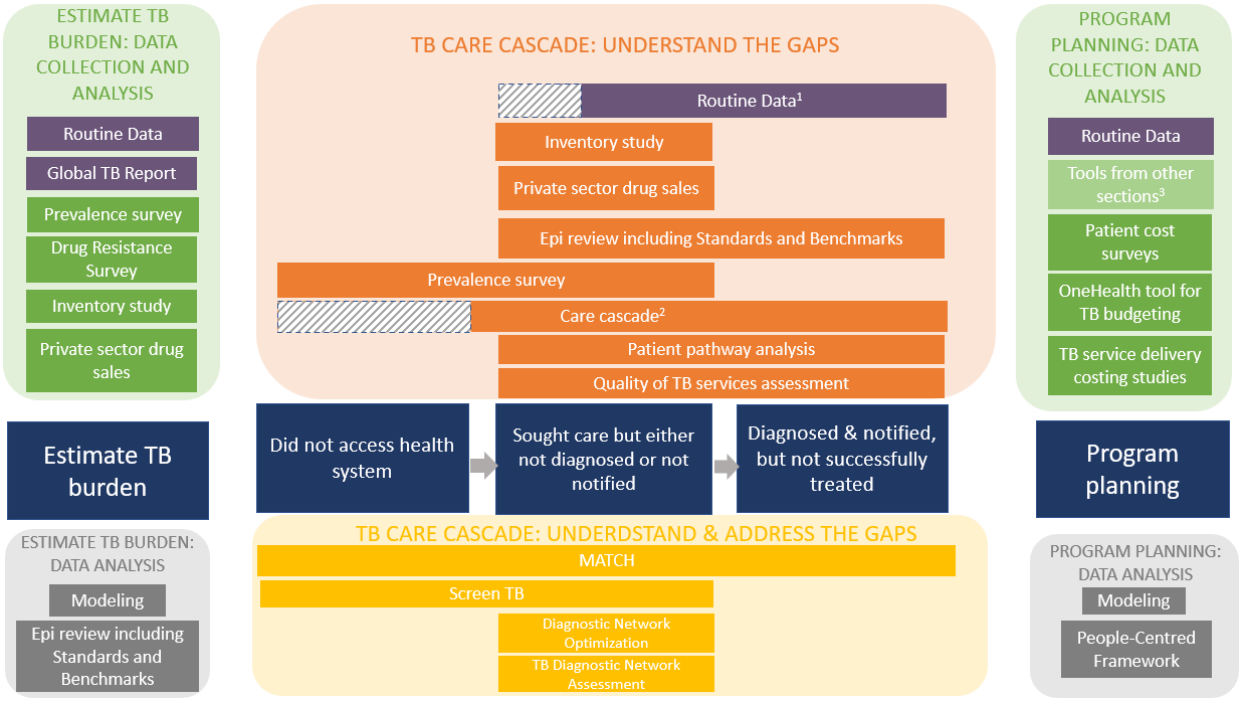
These questions are meant to be answered during a discussion with the NTP manager/head(s) of NTP and a group of 4-6 respondents. We encourage the NTP to include members of the TB Task Force or other working group that has substantial knowledge and experience with using data for TB program planning. The project team will arrange a time to meet with the NTP manager and other respondents using a tele-conferencing platform like Zoom to allow for discussion, follow-up questions and clarifications.

The purpose of the discussion is for the project team to better understand how TB data activities have helped the NTP and partners to:

1. Estimate the burden of TB in their country
2. Understand and address specific gaps in the TB care cascade
3. Make both short- and long-term plans for the TB program

Each question will relate to one of the blue boxes in the figure below. This figure shows the TB-related data activities that have been conducted in [*country*] and may have been used to understand the item the blue box.

[Figure 1: Framework for use of data tools in different aspects of TB program evaluation and planning] (*Customized to be country-specific by showing only the activities that the country has conducted*)



[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.
[2]Shaded area = Unless data from a prevalence survey is available, countries may not have data on people with TB who did not access the health system to use in care cascade analyses.
[3]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

We encourage the group of respondents to think about and discuss the questions as needed before meeting with the project staff.

Questions for discussion

The first questions deal with estimation of the TB burden.

1a. How do you **estimate the burden/level of drug-susceptible and drug-resistant TB in [*country*]**? When estimating the TB burden, how have you used different sources of data, including but not limited to the following sources?

Please consider two estimations of TB burden:

A) The true/actual burden of drug-susceptible and drug-resistant TB in your country
B) The figures used for target setting and planning

- Routine reporting – standard set of WHO indicators
- Routine reporting – additional indicators/analyses at country level
- WHO Global TB Report / Country profile
- Estimates from the Institutes for Health Metrics and Evaluation (IHME)
- Supplemental tools [*country*] has implemented:

- Any other surveys or assessments? (please specify the name of the survey/assessment)

1b. Which of these sources of data have been most critical for drug-susceptible and drug-resistant TB burden estimation? Why?

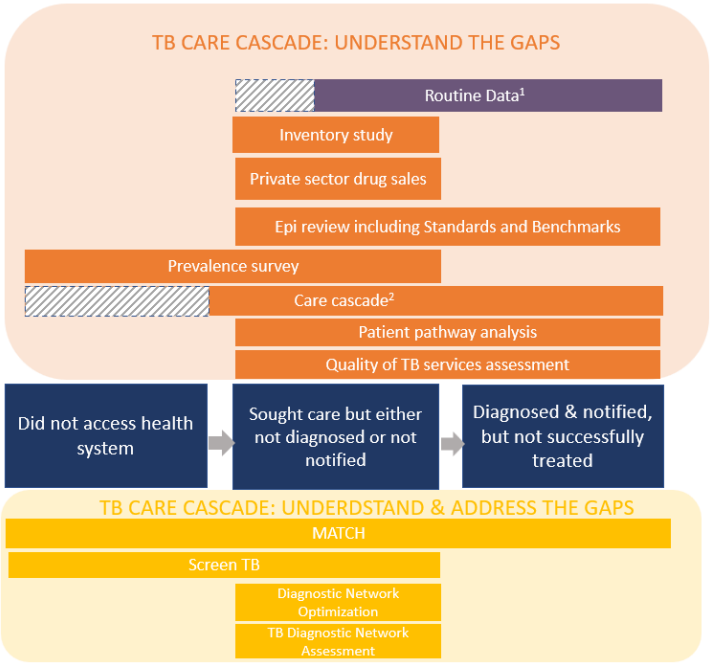
Are there any that you feel were less important or potentially not needed? Please explain.

1c. Are there other data or data tools/activities that would have been helpful to estimate the burden of DS or DR-TB?

The next three questions will focus on specific gaps shown in the blue boxes of the TB Care Cascade below. When asking about each of these "gaps" we are referring to: ***the number of people, their characteristics and possible reasons for the gap****. Using the first blue box as an example, we would like to know: have efforts been made to understand or address the number of people with TB that do not access the health system, the characteristics of those that did not access the system and/or the reasons for not accessing the system?*

[Figure 2: Framework for use of data tools to estimate different steps of the TB Care Cascade]

(*Customized to be country-specific by showing only the activities that the country has conducted*)



[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

2a. The first gap we'll discuss is accessing health care services. Have efforts been made to understand and/or address the gap in **people with TB who do not access health the health system**? If yes, how have you done this? If you used any of the following tools, please address the tool in your response.

- Routine reporting – standard set of WHO indicators
- Routine reporting – additional indicators/analyses at country level
- Supplemental tools [*country*] has implemented:
- Any other surveys or assessments? (please specify the name of the survey/assessment)

2b. Which of these activities have been most critical for understanding and/or addressing the gap in **people with TB who do not access the health system**? Why?

Are there any that you feel were less important or potentially not needed? Please explain.

2c. Are there other data or data tools that would have been helpful to understand and/or address the gap in **people with TB may not access the health system**? Please elaborate.

3a. The next gap we'll discuss is **people with TB who sought health care, but were either not diagnosed or not notified to the NTP**. Have efforts been made to understand and/or address these gaps in **people with TB who sought health care, but were either not diagnosed or not notified to the NTP?** If yes, how have you done this? If you used any of the following tools, please address the tool in your response.

- Routine reporting – standard set of WHO indicators
- Routine reporting – additional indicators/analyses at country level
- Supplemental tools [*country*] has implemented:
- Any other surveys or assessments? (please specify the name of the survey/assessment)

3b. Which of these activities have been most critical for understanding and/or addressing the gap in **people with TB who sought health care but were either not diagnosed or not notified to the NTP**? Why?

Are there any that you feel were less important or potentially not needed? Please explain.

3c. Are there other data or data activities that would have been helpful to understand and/or address the gap in **people with TB who sought health care, but were either not diagnosed or not notified to the NTP**.? Please elaborate.

4a. The next gap we'll discuss is under-reporting. Have efforts been made to understand and/or address the gap of people who are **diagnosed and notified to the NTP, but were not successfully treated**? **This includes people that did not initiate treatment and people that initiated but did not successfully complete treatment.** If yes, how have you done this? If you used any of the following tools, please address the tool in your response.

- Routine reporting – standard set of WHO indicators
- Routine reporting – additional indicators/analyses at country level
- Supplemental tools [*country*] has implemented:
- Any other surveys or assessments? (please specify the name of the survey/assessment)

4b. Which of these activities have been most critical for understanding and/or addressing the gap of people who were **diagnosed and notified to the NTP, but were not successfully treate**d? Why?

Are there any that you feel were less important or potentially not needed? Please explain.

4c. Are there other data or data activities that would have been helpful to understand and/or address the gap of people who were **diagnosed and notified to the NTP, but were not successfully treate**d?

The last question deals with TB program planning. We are interested in three types of program planning:

A. *National Strategic Plan (NSP) development*
B. *Global Fund applications*
C. *Routine/annual program planning*

5a. When planning for your national TB program, have you used the findings from the following activities? If yes, **how** have you used the findings from these tools? Please consider the three types of program planning mentioned above: preparing your National Strategic Plan, preparing your Global Fund application and routine/annual program planning,

- Routine reporting – standard set of WHO indicators
- Routine reporting – additional indicators/analyses at country level
- Supplemental tools [*country*] has implemented:
- Any other surveys or assessments? (please specify the name of the survey/assessment)

5b. Which of these activities have been most critical for program planning? Why?

5c. Are there any that you feel were less important or potentially not needed? Please explain.

5d. Are there other data or data activities that would have been helpful for these planning activities? If yes, please detail/explain.

Annex 3: Country key informant interview guides

Project ID:
Date:
Time:

Key Informant Interview Questions for Persons Working at the National Level

Some things to keep in mind during the interview:

- *We're interested in your experiences with TB data collection tools and activities in your country.*
- *Many of the questions in this interview will focus on "supplemental" TB data tools and activities. When we refer to "supplemental" activities, we are talking about surveys and data analysis activities that are not part of your routine data collection and analysis systems; these supplemental activities are implemented occasionally to provide supplemental information. Based on the reports we have reviewed, it looks like the recent supplemental TB data activities that have been implemented in [insert country] include [insert list of activities].*

Do you have any questions before we start?

The first few questions are just to help us understand your background in TB and your experience with the supplemental tools that have been implemented in [insert country].

1. Can you tell me how many years you have worked in positions or on projects that involve TB? _____ (years)

2. What is your current role?

3. Can you tell me how many years you have been in your current role? _____ (years)

4. Next, we will go through a list of supplemental TB data tools and activities that have been implemented in [insert country]. For each of these, could you tell me which of the following 3 categories best describes your experience with the specific activity?

   a) Directly involved with planning or implementing the activity.
   b) Not directly involved with planning or implementing, but have seen/heard the results or findings. *For key informants from the MOH*: if you approved or endorsed an activity and were informed of the findings, but not involved with implementing the activity, please choose this option.

c) Not involved and do not know what the results/findings were

List of tools or activities recently implemented in country *(to be pre-populated)*:

Tool/Activity (year)	**Role**
	☐ Was involved with planning or implementing ☐ Was not involved with planning or implementing, but has seen/heard the results or findings ☐ Not involved and do not know what the results/findings were
	☐ Was involved with planning or implementing ☐ Was not involved with planning or implementing, but has seen/heard the results or findings ☐ Not involved and do not know what the results/findings were

Now we will start the open-ended interview questions.

"I will start by asking you about routine TB surveillance systems and then we will focus our discussions on TB supplemental activities you are familiar with. When we say supplemental activities, we are talking about all the surveys and tools that we asked about earlier."

1. Thinking about the critical information desired for TB program planning and decision making, what information is **not provided by the routine data collection systems in [country]**?

   [Prompt if didn't mention: limitations in ability to use data/Is there anything that makes it hard to use the data?]

"Thank you. We will now shift our focus to the TB supplemental activities."

2. Can you tell us **if and how the supplemental activities** that were conducted in [country] have provided some of this critical information for the country?

3. Thinking about these supplemental activities, can you tell us two things:

a. First, what is typically the **motivating or driving factor** to implement these supplemental activities? Does this differ by activity?
b. Second, **who is typically involved in deciding** to implement such activities in your country? Does this differ by activity?

4. Can you describe **common challenges and opportunities** you have encountered with planning and implementing these supplemental activities?

   [Follow up (if NTP staff): How does implementing supplemental activities affect the NTP's workload?]

   [Follow up (if partner): What is your impression of how these supplemental activities impact the NTP's workload?]

5. How have the findings and recommendations from these supplemental activities typically been **disseminated?**

   Follow-up: do you think that the following groups of people have been adequately informed of the findings and recommendations:

   -NTP staff at national level

   -TB program staff at lower levels

   -Partners involved in supporting the TB program

6. **Thinking about the different supplemental activities you have implemented in recent years**, what do you think of the frequency and timing with which these supplemental activities were implemented?

   Please comment on what you think of:
   a. The frequency and timing of each tool
   b. The timing related to other tools or planning cycle

   [*Probe if they did not mention***:** For which of the tools would you recommend implementing more than once, e.g. to assess change over a specified time period? Are there any would you recommend implementing on a routine basis (e.g. once a year)?]

7. If you were to implement (or not) any of the supplemental activities again, **would you do anything differently and why**? We will go through the list of activities from before.

   [*Probe: ask about changes both in terms of implementation as well as use of outcome/results]*

8. Do you think the **recommendations from these supplemental activities have impacted TB program planning and decision making**? If yes, how? If no, why not? Are there any activities that have been particularly important or useful for your country?

   [*For those who already participated in use case discussion; re-phrase as*: We discussed the use of these tools for TB program planning and decision making during the group discussion on use case questions, is there anything that you want to add to what was said during the group discussion?]

   [*If not mentioned*: ask about tools they are familiar with]

9. Do you think that **more resources should be invested into strengthening routine systems**, even if it means that there may be **fewer resources available for supplementary activities?** Please tell us if your response depends on whether the activity is funded domestically or by donors.

   [Probe – if only give short yes/no answer, ask "can you give us some reasons for your answer?"]

10. Do you feel that it was necessary to implement all the different supplemental tools/activities the country has done, **or could some of these activities have been combined because they provided similar information or used similar methods to collect data?**

11. What would you like donors/international stakeholders and other countries to know about your experience with the various supplementary tools/activities?
    a. Donors/international stakeholders
    b. Other countries

12. Is there anything else that you would like to tell us about the use and usefulness of these supplementary tools that you think is important to consider as part of this project?

Project ID:
Date:
Time:

Key Informant Interview Questions for Persons Working at the Subnational Level

The first few questions are just to help us understand a little about your background working in TB.

1. Can you tell me how many years you have worked in positions or on projects that involve TB? _____ (years)
2. What is your current role?
3. Can you tell me how many years you have been in your current role? _____ (years)

Next, we would like to understand your experience with supplemental TB data activities that have been implemented in [*insert country*].

- ***Supplemental Activities*** *are surveys and data analysis activities that are not part of your routine data collection and analysis systems.*
- *These supplemental activities are implemented occasionally to provide additional information, mostly at the national level.*
- *These supplemental activities are often implemented with assistance from WHO, USAID, Global Fund, as well as local universities and research organizations.*
- *Supplemental activities [insert country] has implemented include: [insert list of activities].*

Do you have any questions before we start?

4. Now we will go through a list of supplemental TB data activities that have been implemented in *[insert country]*. For each of the activities we would like to know how familiar you are with this activity.

List of tools or activities recently implemented in *[insert country]* (*to be pre-populated*):

Tool/Activity (year/description/regions included)	**Role**
	Were you aware of this activity being implemented in *[insert country]* in *[year]*: ☐ Yes ☐ No [skip to next tool]

	Were you aware of this activity being implemented in your region? ☐ Yes ☐ No
	Your experience with the specific activity? ☐ Was involved with planning or implementing ☐ Was not involved with planning or implementing, but has seen/heard the results or findings ☐ Not involved and does not know what the results/findings were
	Were you aware of this activity being implemented in *[insert country]* in *[year]*: ☐ Yes ☐ No [skip to next tool]
	Were you aware of this activity being implemented in your region? ☐ Yes ☐ No
	Your experience with the specific activity? ☐ Was involved with planning or implementing ☐ Was not involved with planning or implementing, but has seen/heard the results or findings ☐ Not involved and does not know what the results/findings were

Now we will start the open-ended interview questions.

"I will start by asking you about routine TB surveillance systems and then we will focus our discussions on TB supplemental activities that you said you are familiar with. When we say supplemental activities, we are talking about all the surveys and tools that we asked about earlier."

1. What types of information are missing from your routine TB data collection systems in *[insert country]* that you need for planning and decision making?

   [Prompt if didn't mention: limitations in ability to use data - is there anything that makes it hard to use the data?]

"Thank you. We will now focus our discussion on the TB supplemental activities."

2. Can you tell us what kind of important information was provided for your region by the **supplemental activities** that were conducted in *[insert country]*?

[Prompt with the list of activities implemented in country if needed.]

3. When supplemental activities are implemented, **are you typically informed of the results or recommendations**? If yes, how did you hear about the results or recommendations?

   [Prompt with examples if needed: reports, email, workshops]

4. Have the **recommendations from supplemental activities impacted TB program planning or decision making in your region**? If yes, how? If no, why were the recommendations not useful?

   This is a general question, but feel free to speak about specific tools if you'd like.

5. What could the National level team **do** to make the findings from supplemental activities **more useful for your region**?

6. Has the **implementation** of supplemental activities created any **challenges or opportunities** for you and your regional staff? If so, please describe. [Note: ONLY ASK if activities took place in their region.]

7. What would **you like the National level team to know** about your needs and experience with supplementary activities in your region?

   Probe if not discussed:
   - Implementation of the activity [*Only ask if aware of activities taking place in region*]
   - Use of the results [*Only ask if aware of activities being implemented in country*]
   - Are there TB programmatic areas that would benefit from additional tools?
   - Do you see any benefit of conducting certain tools at subnational level? [*Only ask if aware of activities taking place in country*]

8. Is there anything else that you would like to tell us about the supplemental activities or data needs for program planning for the region?

Annex 4: NTP survey questions

TB Data Optimization

Online Survey for NTP Managers/Data Officers

Introduction:

- This project, "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" aims to develop recommendations to improve the collection and use of TB data for program planning and decision making.
- The project focuses on the use of **supplementary TB data activities** such as TB Prevalence Surveys, TB Drug Resistance Surveys, Patient Cost Surveys, Patient Pathway Analysis, Epidemiological Reviews and other activities that are conducted occasionally to supplement routine TB data collection and analysis.
- We are requesting **one survey per country**. The ideal respondent is someone in the National TB Program who is very familiar with the supplemental TB data activities that have been conducted in your country to complete this survey. For example, someone who:
    - Planned and/or implemented some of the supplemental TB data activities in your country
    - Used the results from the supplemental TB data activities in your country
    - Participated in the development of the last TB National Strategic Plan
- The respondent is welcome to solicit input from other NTP staff (e.g. M&E or data officer, program managers/coordinators, research team) that are familiar with and/or have historical knowledge of the supplementary TB data activities referenced in the survey, however it is easiest to complete the online survey at one time. We suggest reviewing the paper survey first and using it to solicit additional input needed prior to starting the online survey.
- Taking part in this survey is voluntary. Choose the "prefer not to answer option" if you do not feel comfortable answering the question.
- This survey is an opportunity for your country's TB program to provide feedback to global partners and funders and potentially influence global recommendations.
- There is no cost to you for participating, nor will you be paid to participate in the project. We thank you for the time you took to participate in this activity.

The project team will try to answer all your questions. If you have questions about the study, please contact Rachel Fiorillo at rfiorillo@cdcfoundation.org.

5-digit Unique Project ID: *(Required)* *Provided in email*	__ __ __ __ __

CONSENT:

Do you consent to participating in this survey? *(Required)*	☐ Yes (proceed to questionnaire) ☐ No (STOP HERE, END OF SURVEY)

A. DEMOGRAPHICS

1	WHO Region *(Required)* (*Select one*)	☐ African Region (AFRO) ☐ Region of the Americas (AMRO) ☐ Eastern Mediterranean Region (EMRO) ☐ European Region (EURO) ☐ South-East Asia Region (SEARO) ☐ Western Pacific Region (WPRO)
2	Total years working in TB program, including national program and subnational levels (provincial, regional etc.) *(Required)* (If multiple people helping to complete this survey, please respond for the primary respondent)	_____ years ☐ Prefer not to answer
3	What is your current position? *(Required)* (If multiple people helping to complete this survey, please respond for the primary respondent)	☐ NTP Manager/Head of NTP ☐ Acting NTP Manager/Head of NTP ☐ Head of M&E ☐ M&E Officer/Data Officer ☐ Head of Research ☐ Research Officer/Researcher ☐ Other (specify): _____ ☐ Prefer not to answer

B. FAMILIARITY WITH SUPPLEMENTAL TB DATA ACTIVITIES

1	**For the following activities, please indicate if your country has implemented the activity.**	
a	**National TB Prevalence Survey** *Large national survey where community members are screened for TB to estimate the true burden of TB.*	☐ Yes, multiple times ☐ Yes, one time ☐ My country has not implemented it yet, but is currently planning this activity

		☐ No, my country has not implemented this activity ☐ Heard of the activity but don't know if my country has implemented it ☐ Never heard of this activity ☐ Prefer not to answer
b	**TB Drug Resistance Survey** *Nationwide survey where sputum samples are collected from pulmonary TB patients and tested for resistance to determine the burden and pattern of drug-resistant TB.*	*This question will have the same response options as above.*
c	**TB Inventory Study** *National study where TB patient records from the national surveillance system are linked with other available case-based databases (e.g. laboratory registers) to examine the level of underreporting.*	*This question will have the same response options as above.*
d	**Private Sector Drug Sales Analysis** *An analytic approach to estimate the volume of TB patients treated by private sector providers using non-NTP drugs.*	*This question will have the same response options as above.*
e	**TB Patient Cost Survey/Catastrophic Cost Survey** *A nationwide survey among TB patients conducted at selected health facilities to estimate and understand the costs incurred by TB patients.*	*This question will have the same response options as above.*
f	**TB Service Delivery Costing Study (Value TB)** *A tool that estimates the cost of delivering TB interventions and services at the facility level.*	*This question will have the same response options as above.*
g	**One Health Tool for TB Budgeting** *A costing tool used to estimate resources required to implement the TB national strategic plan.*	*This question will have the same response options as above.*
h	**People Centered Framework** *A framework used for the development of the national strategic plan; it consolidates many sources of data to look at potential gaps in the TB care cascade.*	*This question will have the same response options as above.*
i	**TB Care Cascade Analysis** *An analytic approach to assess the TB continuum of care and outcomes for all the estimated annual TB patients in the country and illustrate where losses occur.*	*This question will have the same response options as above.*
j	**MATCH Analysis** *An analytic approach which uses subnational level spatial and program data to identify gaps in TB service delivery within subnational areas.*	*This question will have the same response options as above.*
k	**Patient Pathway Analysis**	*This question will have the same response options as above.*

	A tool that uses existing data to look at patient care-seeking practices and how they align with the availability of TB diagnostic and treatment services.	
l	**Diagnostic Network Optimization** *An analytic approach to look at how diagnostic services are organized in a country to inform the optimal location of TB diagnostic tools like GeneXpert.*	*This question will have the same response options as above.*
m	**TB Diagnostic Network Assessment** *A tool to assess the functionality of a national TB diagnostic network from the perspective of its ability to meet the needs of the TB national strategic plan.*	*This question will have the same response options as above.*
n	**TB Epidemiological Review, including Standards and Benchmarks** *A review of the routine TB surveillance system and TB data in the country (national and subnational levels) to look at the trend of key TB indicators to understand the epidemic ahead of strategic planning.*	*This question will have the same response options as above.*
o	**Quality of TB Services Assessment** *A survey conducted at a nationwide sample of health facilities where TB staff and patients are surveyed to assess the quality of TB services in the health facility.*	*This question will have the same response options as above.*
p	**Epidemiological Modelling** *A data modelling activity conducted at the national level to better understand the potential impact of interventions on disease burden and program costs.*	*This question will have the same response options as above.*
q	**Screen-TB** *A web-based tool used to compare different TB screening strategies and assess the expected cost and effectiveness of potential approaches, and their risks and benefits.*	*This question will have the same response options as above.*

2	**For the supplemental TB data activities your country has implemented, please indicate how you were involved.** (If multiple people helping to complete this survey, please respond for the primary respondent)
The first supplemental TB data activity you indicated your country has implemented (e.g. TB Prevalence survey, TB Drug Resistance survey, etc.) will be inserted here. (*Select all that apply*)	☐ Involved in planning ☐ Involved in implementing ☐ Have seen/heard/used the results ☐ Not involved and do not know the results ☐ Prefer not to answer
This question will be repeated for each supplemental TB data activity your country has implemented. (*Select all that apply*)	☐ Involved in planning ☐ Involved in implementing ☐ Have seen/heard/used the results ☐ Not involved and do not know the results ☐ Prefer not to answer

C. QUESTIONS

1	Which of the following do you consider the top challenges in the generation, analysis and use of TB data collected by routine data systems in your country? **Routine data systems: a country's TB/infectious disease surveillance system or health management information system.* *(Select up to 5)*	☐ Some key data are not collected by routine systems ☐ Availability of real-time data ☐ Paper-based system ☐ Aggregate data, not case-based ☐ Data quality ☐ Data flow is only from lower levels to higher levels ☐ Limited use of the data at national level ☐ Limited use of the data at lower levels ☐ Limited data analysis capacity at national level ☐ Limited data analysis capacity at lower levels ☐ Other (specify): _____ ☐ Prefer not to answer
2	In general, who **most often** suggests/proposes implementation of a supplementary activity? (*Select one*)	☐ The National TB Program/Ministry of Health ☐ In-country TB technical working group ☐ In-country partners (e.g. local academic institutions, local NGOs) ☐ International technical partners (e.g. WHO, KNCV, CDC, etc.) ☐ Funding partners (e.g. Global Fund, USAID, Bill & Melinda Gates Foundation, etc.) ☐ Other (specify): _____ ☐ Prefer not to answer
3	In general, which of the following is the **strongest** motivating factor for your country to implement supplemental activities? (*Select one*)	☐ Country's need for more data or evidence ☐ Measure progress towards Global TB strategies ☐ Request by donor ☐ Recommended by partners ☐ Availability of funding ☐ Other (specify): _____ ☐ Prefer not to answer

4	Who typically makes the **final** decision to implement supplemental activities in your country? (*Select one*)	☐ The National TB Program/Ministry of Health ☐ In-country partners (e.g. local academic institutions, local NGOs) ☐ International technical partners (e.g. WHO, KNCV, CDC, etc.) ☐ Funding partners (e.g. Global Fund, USAID, Bill & Melinda Gates Foundation, etc.) ☐ Other (specify): _____ ☐ Prefer not to answer
5	Have you ever felt pressure from external partners or funding agencies to implement a tool that was not perceived as a priority for the NTP?	☐ Yes, this has happened multiple times ☐ Yes, this has happened one time ☐ No, this hasn't happened ☐ Prefer not to answer
5a	If selected either 'yes' response to question 5: Which activity(ies) did you feel pressured to conduct that were not a priority for the NTP? *(Select multiple)*	☐ (A list of supplemental TB data activities your country has implemented will be listed) ☐ Other (specify): _____ ☐ Prefer not to answer
6	What are the **most** significant challenges you have encountered with planning and implementing supplemental activities? *(Select up to 5; if selected 'none of the above' do not select any other option)*	☐ Insufficient financial resources/funding ☐ Limited technical capacity of NTP staff to plan/implement activity ☐ Insufficient number of NTP staff or time to plan/implement activity ☐ Insufficient technical capacity to analyze data and/or write report ☐ Insufficient staff time to analyze data and/or write report ☐ Data availability for activities that need existing data ☐ Lack of coordination between partners ☐ Procurement challenges delay implementation ☐ Delayed receipt of results hinders their use ☐ Increases workload of TB program staff

		☐ Impact on routine program activities because staff are working on supplemental activity ☐ Other (specify): _____ ☐ None of the above ☐ Prefer not to answer
7	Which are the **most** significant opportunities or benefits you have experienced from implementing supplemental activities? *(Select up to 5)*	☐ Financial support from partners for the activities ☐ Technical support from partners for the activities ☐ Government commitment ☐ Opportunity to work with partners and funders ☐ Opportunity to build capacity of NTP staff ☐ Activities provide timely information during the program planning cycle ☐ Activities provide structure and/or equipment for routine TB activities ☐ Activities provide research opportunities ☐ Activities fuel advocacy for TB support and TB education ☐ Other (specify): _____ ☐ None of the above ☐ Prefer not to answer

8	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to helping you understand gaps in your TB care cascade?**
This question will be asked for each of the supplemental TB data activities your country has implemented.	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful ☐ Prefer not to answer

9	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to helping you routine programmatic planning and forecasting?**
This question will be asked for each	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful

of the supplemental TB data activities your country has implemented.	☐ Prefer not to answer

10	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to helping you to monitor progress towards targets?**
This question will be asked for each of the supplemental TB data activities your country has implemented.	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful ☐ Prefer not to answer

11	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to helping you develop your TB National Strategic Plan?**
This question will be asked for each of the supplemental TB data activities your country has implemented.	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful ☐ Prefer not to answer

12	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to helping you develop funding applications (e.g. Global Fund proposal)?**
This question will be asked for each of the supplemental TB data activities your country has implemented.	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful ☐ Prefer not to answer

13	**For each of the following activities that have been implemented in your country, can you tell us how important the findings were to impacting your country's guidelines and/or policies?**
This question will be asked for each of the	☐ Very important/helpful ☐ Somewhat important/helpful ☐ Not important/helpful ☐ Prefer not to answer

supplemental TB data activities your country has implemented.	

14	How are the results from supplemental data activities **most often** used? (*Select one*)	☐ Mostly internal use (e.g. reporting to NTP or MOH, NSP development) ☐ Mostly external use (e.g. reporting to outside partners or funders, development of external funding proposals) ☐ Equal mix of internal and external use ☐ None of the above (please explain):_____ ☐ Prefer not to answer
15	If you received a large grant for TB data activities that you could spend as you choose, how much would you allocate to strengthening routine data systems, with the rest going towards supplemental data activities? (*Select one*)	☐ 76-100% towards strengthening routine data systems ☐ 51-75% towards strengthening routine data systems ☐ 26-50% towards strengthening routine data systems ☐ 0-25% towards strengthening routine data systems ☐ Prefer not to answer

16	**For the following activities, please indicate whether (a) you think the activity was worth the investment and (b) you would want to implement it again.**	a. Please indicate whether you think the outcomes of the following activities were worth the required investment of resources (money, staff, time, etc.)?	b. Do you think it would be important for your country to implement the activity again?	c. For each of the following activities that you said you **would repeat**, what (if anything) would you do differently the next time you implement it?	d. If no to implementing the activity again, why not?	e. If no to implementing the activity again, is there another way you would collect or analyze similar data?
This question will be asked for each of the supplemental TB data activities your country has implemented.		☐ Yes ☐ No ☐ Unsure	☐ Yes ☐ No ☐ Unsure			

	☐ Prefer not to answer	☐ Prefer not to answer			

17	Please indicate which of the following activities you think would be important for your country to implement in the future. *(Select multiple)* *(If selected 'None', do not select other options)*	☐ (The TB data activities that your country has **not yet** implemented will be listed here) ☐ Other (specify): _____ ☐ None ☐ Prefer not to answer

18	**Please indicate how much technical support you received from partners for the following activities. Consider support needed for all the phases of an activity, including: planning, implementation, data analysis, reporting and dissemination and implementation of recommendations.**		
List of activities		How much technical support did you receive from external partners for this activity?	If inadequate support received: Which of the following areas needed more technical support? (*Select multiple*)
This question will be asked for each of the supplemental TB data activities your country has implemented.		☐ Little or no support needed ☐ Support needed and adequate support received ☐ Support needed but inadequate support received ☐ Unsure ☐ Prefer not to answer	☐ Planning ☐ Implementation ☐ Data analysis ☐ Reporting and dissemination ☐ Implementation of recommendations ☐ Translation into policy ☐ Other (specify):_____ ☐ Prefer not to answer

19	**Please indicate how much funding support you received from partners for the following activities. Consider support needed for all the phases of an activity, including: planning, implementation, data analysis, reporting and dissemination and implementation of recommendations.**		
List of activities		How much funding support did you receive from external partners for this activity?	If inadequate support received: Which of the following areas needed more funding support? (*Select multiple*)
This question will be asked for each of the supplemental TB data activities your		☐ Little or no support needed ☐ Support needed and adequate support received ☐ Support needed but inadequate support received	☐ Planning ☐ Implementation ☐ Data analysis ☐ Reporting and dissemination

country has implemented.	☐ Unsure ☐ Prefer not to answer	☐ Implementation of recommendations ☐ Other (specify):_____ ☐ Prefer not to answer

20	Considering your country's routine data and the supplemental activities that have been implemented, what important information is **STILL needed or missing** for program planning and decision making?	

D. ADDITIONAL COMMENTS

Please share any additional comments or feedback about your country's experience with supplemental TB data activities:	

END OF SURVEY. THANK YOU!

Annex 5: List of countries that completed the NTP survey

Number	NTP Survey Country	World Bank Income Group	WHO Region*
1	Belarus	Upper middle income	EURO
2	Bhutan	Lower middle income	SEARO
3	Botswana	Upper middle income	AFRO
4	Brazil	Upper middle income	AMRO
5	Burkina Faso	Low income	AFRO
6	Cambodia	Lower middle income	WPRO
7	Cameroon	Lower middle income	AFRO
8	China	Upper middle income	WPRO
9	DR Congo	Low income	AFRO
10	Egypt	Lower middle income	EMRO
11	Eswatini	Lower middle income	AFRO
12	Ethiopia	Low income	AFRO
13	Fiji	Upper middle income	WPRO
14	Georgia	Upper middle income	EURO
15	Ghana	Lower middle income	AFRO
16	India	Lower middle income	SEARO
17	Kenya	Lower middle income	AFRO
18	Lao PDR	Lower middle income	WPRO
19	Lesotho	Lower middle income	AFRO
20	Liberia	Low income	AFRO
21	Malawi	Low income	AFRO
22	Republic of Moldova	Upper middle income	EURO
23	Mongolia	Lower middle income	WPRO
24	Mozambique	Low income	AFRO
25	Namibia	Upper middle income	AFRO
26	Nepal	Lower middle income	SEARO
27	Nigeria	Lower middle income	AFRO
28	Pakistan	Lower middle income	EMRO
29	Papua New Guinea	Lower middle income	WPRO
30	Peru	Upper middle income	AMRO
31	Philippines	Lower middle income	WPRO
32	Rwanda	Low income	AFRO
33	Sierra Leone	Low income	AFRO
34	Solomon Islands	Lower middle income	WPRO
35	South Africa	Upper middle income	AFRO

36	Sri Lanka	Lower middle income	SEARO
37	Tajikistan	Lower middle income	EURO
38	Tanzania	Lower middle income	AFRO
39	Uganda	Low income	AFRO
40	Vietnam	Lower middle income	WPRO
41	Zambia	Low income	AFRO
42	Zimbabwe	Lower middle income	AFRO

*AFRO = African Region; AMRO = Region of the Americas; EMRO = Eastern Mediterranean Region; EURO = European Region; SEARO = South-East Asian Region; WPRO = Western Pacific Region

Annex 6: NTP survey "worth the investment" responses stratified by income group

NTP Survey: Country respondents on whether implementing the supplemental TB data tool was worth the investment, by tool

	Low income (n=10)					Lower-middle income (n=22)					Upper-middle income (n=10)				
Tool	**Total**	**Yes**	**No**	**Unsure**	**Prefer not to answer**	**Total**	**Yes**	**No**	**Unsure**	**Prefer not to answer**	**Total**	**Yes**	**No**	**Unsure**	**Prefer not to answer**
TB Prevalence Survey	6	100%				15	86.7%	6.7%	6.7%		3	33.3%	66.7%		
TB DR Survey	8	100%				20	90%		5%	5%	6	83.3%	16.7%		
TB Inventory Study	0					6	66.7%		16.7%	16.7%	3	33.3%		66.7%	
Private Sector Drug Sales Analysis	0					3	66.7%	33%			0				
TB Patient Cost Survey	4	75%	25%			12	100%				5	80%		20%	
TB Service Delivery Costing Study	1	100%				3	66.7%	33%			1	100%			
One Health Tool for Budgeting	3	100%				0					0				
People Centred Framework	4	100%				5	60%		20%	20%	1			100%	
TB Cascade Care Analysis	4	100%				11	100%				6	66.7%	33.3%		
MATCH Analysis	1		100%			3	33.3%	33%	33.4%		0				
Patient Pathways Analysis	2	100%				5	80%	20%			0				
Diagnostic Network Optimization	3	100%				9	77.8%	11%		11.1%	0				
Diagnostic Network Assessment	2	100%				5	80%			20%	0				
TB Epi Review	9	88.9%		11.1%		22	68.2%	14%	9.1%	9.1%	8	87.5%		12.5%	
Quality of TB Services Assessment	3	66.7%		33.3%		2	100%				0				

Epi Modeling	4	100%				11	72.7%	18%	9.1%		5	80%		20%	
Screen TB	1	100%				3	66.7%		33.3%		1	100%			

Annex 7: NTP survey “opportunities” responses stratified by income group

NTP Survey: Country respondents on the most significant opportunities from planning and implementing supplemental TB data tools

Response	Low income N=10, %(n)	Lower-middle income N=22, %(n)	Upper-middle income N=10, %(n)
Financial support from partners	70.0 (7)	72.7 (16)	80.0 (8)
Technical support from partners	90.0 (9)	95.5 (21)	70.0 (7)
Government commitment	50.0 (5)	59.1 (13)	20.0 (2)
Opportunity to work with partners and funders	60.0 (6)	27.3 (6)	40.0 (4)
Capacity building for NTP staff	100 (10)	81.8 (18)	80.0 (8)
Activities provide timely information during the program planning cycle	30.0 (3)	40.9 (9)	20.0 (2)
Activities provide structure and/or equipment for routine activities	30.0 (3)	13.6 (3)	20.0 (2)
Activities provide research opportunities	20.0 (2)	31.8 (7)	50.0 (5)
Activities fuel advocacy for TB support and TB education	20.0 (2)	9.1 (2)	30.0 (3)
Other	0 (0)	4.6 (1)	0 (0)

Annex 8: NTP survey “challenges” responses stratified by income group

NTP Survey: Country respondents on the most significant challenges from planning and implementing supplemental TB data tools

Response	Low Income N=10, %(n)	Lower-middle income N=22, %(n)	Upper-middle income N=10, %(n)
Insufficient financial resources/funding	80.0 (8)	86.4 (19)	80.0 (8)
Limited technical capacity of NTP staff to plan/implement activity	60.0 (6)	54.6 (12)	60.0 (6)
Insufficient number of NTP staff or time to plan/implement activity	60.0 (6)	40.9 (9)	80.0 (8)
Insufficient technical capacity to analyze data and/or write report	50.0 (5)	45.5 (10)	50.0 (5)
Insufficient staff time to analyze data and/or write report	30.0 (3)	22.7 (5)	50.0 (5)
Data availability for activities that need existing data	20.0 (2)	13.6 (3)	10.0 (1)
Lack of coordination between partners	0 (0)	18.2 (4)	10.0 (1)
Procurement challenges delay implementation	40.0 (4)	36.4 (8)	30.0 (3)
Delayed receipt of results hinders their use	0 (0)	4.6 (1)	0 (0)
Increases workload of TB program staff	10.0 (1)	27.3 (6)	20.0 (2)
Impact on routine program activities because staff are working on supplemental activity	0 (0)	22.7 (5)	20.0 (2)
Other	0 (0)	4.6 (1)	0 (0)

Annex 9: NTP survey “financial support received” responses stratified by income group

NTP Survey: Country respondents on inadequate support received for supplemental TB data tools, by tool

	Low income (n=10)		Lower-middle income (n=22)		Upper-middle income (n=10)	
Tool	**Total**	**Financial support needed but inadequate support received**	**Total**	**Financial support needed but inadequate support received**	**Total**	**Financial support needed but inadequate support received**
TB Prevalence Survey	6		15	13.3%	2	
TB DR Survey	8	25.0%	20	10.0%	6	
TB Inventory Study	0		6		3	33.3%
Private Sector Drug Sales Analysis	0		3	33.3%	0	
TB Patient Cost Survey	4		12	8.3%	5	20.0%
TB Service Delivery Costing Study	1		3		1	
One Health Tool for Budgeting	3	33.3%	0		0	
People Centred Framework	4	25.0%	5	20.0%	1	
TB Cascade Care Analysis	4	75.0%	11	9.1%	6	16.7%
MATCH Analysis	1		3		0	
Patient Pathways Analysis	2		5		0	
Diagnostic Network Optimization	3		9		0	
Diagnostic Network Assessment	2		5		0	
TB Epi Review	9	11.1%	22	13.6%	8	
Quality of TB Services Assessment	3		2		0	
Epi Modeling	4	25.0%	11	18.2%	5	20.0%
Screen TB	1		3		1	

Annex 10: NTP survey “funding allocation” responses stratified by income group

NTP Survey: Country respondents on how much funding they would ideally allocate towards routine data systems with the rest going towards supplemental TB data tools

Response	Low income N=10, %(n)	Lower-middle income N=22, %(n)	Upper-middle income N=10, %(n)
76-100%	40.0 (4)	18.2 (4)	10.0 (1)
51-75%	20.0 (2)	50.0 (11)	40.0 (4)
26-50%	20.0 (2)	27.3 (6)	40.0 (4)
0-25%	20.0 (2)	4.6 (1)	10.0 (1)

Annex 11 Detailed findings of each supplemental TB data tool

Supplemental TB data tool	Triangulated findings: Impact/Usefulness of tool	Triangulated findings: Repeat implementation of tool	Triangulated findings: Do differently/suggestions for improvement
TB Prevalence Survey (TBPS) NTP survey: 24/42 countries have implemented a TBPS. Country case studies: 5/5 countries have implemented a TBPS. Global respondents: 19/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Strong agreement that the TBPS is critical/worth the investment even though it is costly and requires a lot of effort. Several case study countries mentioned the need for a repeat TBPS as earlier data are outdated.	Long period in between surveys; repeat surveys are wanted by some countries, but not always possible in terms of funding/ commitment. Several people mentioned that surveys should only be repeated if there is anticipated change to be assessed.	The desire for subnational level estimates was the most frequent response. However, powering surveys to get subnational level estimates is typically not feasible since it requires substantial more funding and time. Other frequent responses include better timing (e.g. more timely implementation, don't implement during rainy season or an election period), use digital technologies (e.g. digital data collection - previous surveys were paper-based) and use new screening tools and technologies (e.g. AI-assisted digital chest x-rays, GIS mapping).
TB Drug Resistance Survey (DRS) NTP survey: 34/42 countries have implemented a DRS. Country case studies: 5/5 countries have implemented a DRS. Global respondents: 15/24 respondents were involved	Strong agreement that the DRS is worth the investment. However, this tool will eventually not be needed if 80% resistance testing coverage of new TB cases can be achieved. Several case study countries mentioned the need for repeat DRS as earlier data are outdated.	Repeats needed if routine data cannot provide the information.	The responses were mostly similar across the data sources. Frequent responses include use new TB diagnostic tools and methods to measure DR and MDR-TB burden (e.g. new molecular techniques such as GeneXpert, next generation sequencing) and the desire for subnational level estimates.

with planning/implementing and/or have seen/heard of the results.			
Epidemiological reviews, including standards and benchmarks NTP survey: 39/42 countries have implemented an epi review. Country case studies: 5/5 countries have implemented an epi review. Global respondents: 14/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Respondents indicated epi-reviews are worth the investment, as it helps to understand gaps in routine surveillance; it provides epidemiological background for NSP writing; opinion on level of effort to conduct this differs; advantage is it can be done at subnational level and is useful there and is relatively low cost.	Repeat as part of NSP cycle.	Similar frequent responses across data sources, such as nothing and building capacity of and involving TB program staff at subnational levels.
Diagnostic Network Optimization (DNO) NTP survey: 12/42 countries have implemented a DNO. Country case studies: 2/5 countries have implemented a DNO. Global respondents: 4/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	The vast majority of survey countries that implemented the DNO reported the DNO was worth the investment and very important/helpful for understanding gaps in the TB care cascade, routine programmatic planning and forecasting, monitoring progress towards TB targets, NSP development, developing funding applications and impacting the country's guidelines and policies. Qualitative respondents generally agree that it is useful for resource allocation (optimal placement of diagnostic tools).	Suggested by country and global respondents that it could be repeated annually.	Not a lot of similar responses across data sources other than implementing the DNO more regularly once it has already been done.

	It would be helpful if capacity is built in country so that they could use the DNO on their own and it can be done more routinely.		
Patient Cost Survey (PCS) NTP survey: 21/42 countries have implemented a PCS. Country case studies: 3/5 countries have implemented a PCS. Global respondents: 15/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	A vast majority of survey countries that have implemented the PCS reported it is worth the investment, but a lower percentage reported substantial impact from the findings. Respondents may believe it is worth the investment because zero catastrophic costs is an END TB target and countries need to report on this indicator. There were mixed qualitative responses about whether survey results impacted programmatic change/policy. Several country and global KII respondents mentioned that findings did not result in programmatic change (yet) and may be more difficult to do so because addressing catastrophic costs is a multi-sectoral effort. Though for some countries it helped facilitate universal health care and social welfare discussions.	Overall agreement there is need to repeat, but only if it is anticipated that there will be change to be assessed.	No suggestions for improvement.
Inventory Study (IS) NTP survey: 9/42 countries have implemented an IS. Country case studies: 3/5 countries have implemented an IS. Global respondents: 9/24 respondents were involved with planning/implementing	Mixed agreement on whether the IS is worth the investment. Not all countries need to implement the IS.	Suggested it could be done more routinely.	No suggestions for improvement.

and/or have seen/heard of the results.			
Private Sector Drug Sales Analysis (PSRx) NTP survey: 3/42 countries have implemented a PSRx. Country case studies: 2/5 countries have implemented a PSRx. Global respondents: 6/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Less well-known and therefore very few responses.	Limited responses.	Very few suggestions across the data sources.
TB Service Delivery Costing Study (SDCS) NTP survey: 5/42 countries have implemented a SDCS. Country case studies: 2/5 countries have implemented a SDCS.	Less well-known and therefore very few responses, but there is agreement that having cost data is potentially useful for costing the NSP.	Limited responses.	Very few suggestions across the data sources.

Global respondents: 7/24 respondents were involved with planning/implementing and/or have seen/heard of the results.			
One Health Tool for TB Budgeting (OHT) NTP survey: 20/42 countries have implemented the OHT. Country case studies: 2/5 countries have implemented the OHT. Global respondents: 8/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Less well-known and therefore very few responses, but several people said that OHT goes hand in hand with NSP development.	Limited responses.	Very few suggestions across the data sources.
People-Centred Framework (PCF) NTP survey: 10/42 countries have implemented a PCF. Country case studies: 5/5 countries have implemented a PCF. Global respondents: 15/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	General agreement that the PCF is useful for consolidating all available TB data and (several) countries have used it for NSP development. There is a level of uncertainty regarding future use of the PCF from both countries and global partners since the process is still evolving. Countries and global respondents agree that it can be repeated during the NSP development period; countries want to repeat it if there is funding.	Repeat to prepare for NSP; once the first one is done repeats should take less effort.	Responses included: -No suggestions for improvement -Better involvement of TB program staff -Ensure follow up on recommendations from the activity.

TB Care Cascade Analysis (CCA) NTP survey: 21/42 countries have implemented a CCA. Country case studies: 0/5 countries have implemented a CCA though countries may have implemented something similar in their own country. Global respondents: 13/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	General agreement that the CCA is worth the investment. Caveat: The CCA could have been interpreted very broadly to include any type of CCA, not specifically the methods described by Subbaraman R, Nathavitharana RR, Mayer KH, Satyanarayana S, Chadha VK, Arinaminpathy N, et al. (2019) Constructing care cascades for active tuberculosis: A strategy for program monitoring and identifying gaps in quality of care. PLoS Med 16(2): e1002754.	Suggested it could be done more routinely.	No suggestions for improvement.
MATCH approach (Mapping and analysis for tailored disease control and health system strengthening) NTP survey: 4/42 countries have implemented the MATCH approach. Country case studies: 2/5 countries have implemented the MATCH approach. Global respondents: 5/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Less well-known and therefore very few responses, but mixed responses on whether it is worth the investment. Both country and global respondents mentioned it is/potentially is useful but difficult to understand.	Limited responses.	Very few suggestions across the data sources.

Patient Pathway Analysis (PPA) NTP survey: 7/42 countries have implemented a PPA. Country case studies: 5/5 countries have implemented a PPA. Global respondents: 14/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	The vast majority of survey countries that have implemented the PPA reported the PPA was very important/useful for NSP development but not as many reported the same for understanding gaps in the TB care cascade or routine program planning. Qualitative respondents more frequently discussed its usefulness for understanding and addressing gaps in the care cascade and informing program needs and interventions.	Repeat to prepare for NSP development.	Responses included: -Nothing -Implement at subnational level -Include private sector sites
TB Diagnostic Network Assessment (DNA) NTP survey: 7/42 countries have implemented a DNA. Country case studies: 2/5 countries have implemented a DNA. Global respondents: 5/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	The TB DNA is less well-known than DNO. Responses were similar to those for DNO. The vast majority of survey countries that implemented the DNA reported the DNA was worth the investment and very important/helpful for understanding gaps in the TB care cascade, routine programmatic planning and forecasting, NSP development and impacting the country's guidelines and policies. The TB DNAs were all conducted recently and often did not make it into the most recent NSP. Respondents generally agree that it is important as it informs improvements needed for the diagnostic network. Caveat: There is potential broad interpretation of DNA as there are other TB diagnostic network assessments that differ from the	Limited responses.	No similar responses across data sources but there were also only a few respondents from each data source.

	comprehensive USAID-developed TB DNA which was the intended focus of the questions.		
Quality of TB Services Assessment (QTSA) NTP survey: 5/42 countries have implemented a QTSA. Country case studies: 2/5 countries have implemented a QTSA. Global respondents: 3/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	Less well-known/newer and therefore very few responses. Country key informants mentioned that the QTSA is useful for NSP development. The vast majority of survey countries (though there are only a few) that have implemented the QTSA reported it was worth the investment and very important/helpful for understanding gaps in the TB care cascade and impacting the country's guidelines and policies. In the desk reviews, there was little to no evidence of the QTSA being used in the NSP (this may be because it was completed after NSP writing).	Limited responses.	No similar responses across data sources (but there were few respondents overall).
Epidemiological Modelling NTP survey: 24/42 countries have implemented modelling. Country case studies: 5/5 countries have implemented modelling. Global respondents: 19/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	It is worth the investment but need technical assistance and capacity building in country so that countries can participate and understand what goes into the models. Helpful for target setting and intervention prioritization but need quality data for input and enough understanding on what the model provides/outcomes mean.	Repeat as part of NSP cycle; could be done more routinely and at subnational level if there is technical capacity.	Some similar responses across data sources, such as building staff capacity in country to be able to use models, but also to understand the inputs and results of the models. Improving or using different modelling methods was also mentioned a few times.
Screen-TB (STB) NTP survey: 5/42 countries have implemented STB.	Less well-known and therefore very few responses, but not strong agreement that it is worth the investment. STB has not been used	Limited responses.	No responses.

Country case studies: 0/5 countries have implemented STB. Global respondents: 7/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	much, only six survey countries indicated to have used it. Global respondents mentioned that maybe it is too easy to use and thus may not give accurate results.		

Annex 12: Ethiopia Country Case Study Report

Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning: Ethiopia Country Case Study Report

Project implemented by the CDC Foundation and Centers for Disease Control and Prevention (CDC) with funding from the Bill & Melinda Gates Foundation

May 2023

List of abbreviations

BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
DRS	Drug Resistance Survey
GIS	Geographic information system
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NTP	National Tuberculosis Program
NSP	National Strategic Plan
OHT	OneHealth Tool for TB Budgeting
PCF	People-Centred Framework
PCS	Patient Cost Survey
PPA	Patient Pathway Analysis
QTSA	Quality of TB Services Assessment
TB	Tuberculosis
TBPS	National TB Prevalence Survey
SDCS	TB Service Delivery Costing Study
WHO	World Health Organization

Project team and participants

Project Team

Miranda Bodfish	Associate Vice President, Infectious Disease Programs, CDC Foundation
Christina Braccio	Health Scientist, Global Tuberculosis Branch, U.S. CDC
Anand Date	Branch Chief, Global Tuberculosis Branch, U.S. CDC
Rachel Fiorillo	Project Manager, Infectious Disease Programs, CDC Foundation
Jennifer Harris	SIA Team Lead, Global Tuberculosis Branch, U.S. CDC
Eveline Klinkenberg	Consultant, Connect TB, the Netherlands
Stephanie O'Connor	Epidemiology Fellow, Global Tuberculosis Branch, U.S. CDC
Victoria Tully	Public Health Analyst, Global Tuberculosis Branch, U.S. CDC

Project Steering Committee

Sevim Ahmedov	USAID
Kenneth Castro	Emory University and USAID
Daniel Chin	Bill & Melinda Gates Foundation
Kathy Fiekert	KNVC Tuberculosis Foundation
Harry Hausler	TB HIV Care
Fukushi Morishita	World Health Organization, WPRO
Nnamdi Nwaneri	The Global Fund
Suvanand Sahu	Stop TB Partnership
Charalampos (Babis) Sismanidis	World Health Organization
Stavia Turyahabwe	Tuberculosis and Leprosy Program, Ministry of Health Uganda

Ethiopia participants

Abayneh Admas	Federal Ministry of Health, National TB and Leprosy Program
Daniel Gemechu Datiko	Management Sciences for Health, USAID Eliminate TB Project
Kelecha Demissue Fulas	Oromia Regional Health Bureau
Ismael Hassen	World Health Organization, Ethiopia
Anteneh Kassa	USAID, Ethiopia
Andargachew Kumsa	Federal Ministry of Health, National TB and Leprosy Program
Taye Letta	Federal Ministry of Health, National TB and Leprosy Program
Ermias Tefera	Afar Regional Health Bureau
Ben Tegegn	Addis Ababa City of Administration Health Bureau
Addisalem Yelima	World Health Organization, Ethiopia

EXECUTIVE SUMMARY

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of TB data activities outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these activities are referred to as "supplemental" TB data activities. This project took place from February 2021 through May 2023 and had three phases:

1) Global-level desk review and key informant interviews
2) Country case studies in five countries
3) Online survey of NTP managers in countries that had substantial experience with supplemental TB data activities

This report summarizes the activities and findings of the Ethiopia case study (conducted September 2021 to February 2022) and is intended for the Ethiopia National TB Control Program (NTP) and their partners. This country case study consisted of three parts 1) a desk review of existing evidence related to Ethiopia's use of supplemental TB data tools and activities; 2) a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade; 3) a series of key informant interviews on the use and usefulness of supplemental TB data activities implemented in Ethiopia.

The following overall themes emerged from the combined analyses for Ethiopia:

- **Supplemental TB data activities are useful and provide important information for planning, decision making and National Strategic Plan (NSP) development:** Findings from the various supplemental TB data activities Ethiopia has implemented have been used to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but the country also relied extensively on routine surveillance data. Like all routine surveillance systems, it cannot capture all data needed for program planning. There is a need for case-based reporting which will help resolve some key data challenges such as issues with disaggregation, though supplemental TB data activities will still be needed to periodically provide additional information. Almost all the supplemental TB data activities Ethiopia has implemented in the last 10 years have been used in preparation for NSP development and/or applied to the 2021-2026 NSP; the people-centred framework was used to consolidate all the data. Data activities that have been particularly useful include the prevalence survey, drug resistance survey and patient pathway analysis. Other important data activities such as the OneHealth tool for TB budgeting and epidemiological modelling were essential in contributing to NSP development.

- **Priority future supplemental TB data activities:** A repeat national TB prevalence survey was recommended in the 2019 end-term review and planned for in the 2021-2026 NSP. Almost all key informant interview respondents mentioned that the prevalence survey is outdated, as the last one was conducted more than 10 years ago, and they would like for

the second prevalence survey to be powered to have subnational level estimates due to the diverse populations in the different regions. A national TB patient cost survey was recommended in the 2017 mid-term review and 2019 end-term review. Though one has not been conducted yet, the NTP has planned for the survey to be conducted during this national strategic plan period (2021-2026). Additional data activities that would be useful for the country to conduct include an inventory study.

- **Proper timing and coordination and funding availability of supplemental TB data activities is critical:** It is important to implement the country's prioritized supplemental TB data activities in preparation for the development of the next NSP, but it is well-known that funding availability is a common challenge with planning and implementing these supplemental activities, especially for costly surveys such as the prevalence survey. It has been a challenge for the country to maintain the recommended frequencies to implement the various data activities. The majority of the TB program budget comes from donors; there is a need to increase domestic funding for TB.

- **Dissemination of results and recommendations:** NTP staff and TB partners are generally well-informed of the findings and recommendations from the supplemental TB data activities Ethiopia has implemented, especially those who were involved with implementation and dissemination. The most common events for dissemination include the annual TB Research Advisory Council (TRAC) conference and the semi-annual TB program review meetings. The findings from several data activities have been published in a journal. While the regional TB coordinators are invited to the meetings and TRAC conference to learn about the findings, dissemination at subnational level could be improved, especially at the lower administrative levels (e.g. zonal, woreda). In general, subnational level TB program staff would like to be more engaged with the national level team and be able to share experiences and get specific recommendations from the supplemental activities for their region.

- **Remaining data gaps for planning:** While strengthening routine surveillance systems is a priority, not all information for program planning can be provided by routine data. The following data or data sources needed for program planning and decision making have been highlighted: data capturing missed TB patients between diagnosis and treatment; TB-related mortality; subnational level estimates of DS- and DR-TB burden for each region; operational research to understand why extra-pulmonary TB has increased.

The case study was an opportunity for Ethiopia's TB program and partners to share their experience and give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Ethiopia's Ministry of Health (MOH) look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. However, findings from this case study are not meant to stand alone; they have been compiled with findings from the four additional country case studies, global-level interviews and global desk review and the NTP manager survey. The triangulated findings are being used to develop a framework that will help countries prioritize TB

data-related activities and develop a timeline for these activities. This framework is currently under development in partnership with the World Health Organization (WHO).

MAIN REPORT

Project Background

Overview of the overall project

Currently there are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist in the collection of and use of TB-related data. While these TB data activities provide important information, they are often supplemental to routine data collection and implementation of such activities can place an extensive burden on ministries of health (MOH), national TB programs (NTPs) and partners, and may not occur in an optimized and efficient manner.

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of "supplemental" TB data activities from both the country and global partner perspectives. For this assessment, "supplemental" TB data activities are those that go above and beyond routine data activities. These activities may include, but are not limited to, TB prevalence surveys (TBPS), drug resistance surveys (DRS), inventory studies, patient cost surveys (PCS), TB service delivery costing studies, care cascade analyses, One Health Tool for TB budgeting (OHT), diagnostic network optimization (DNO), epidemiological modeling, mapping and analysis for tailored disease control and health system strengthening (MATCH analysis), patient pathway analysis (PPA), people-centred framework (PCF), quality of TB services assessment (QTSA), TB diagnostic network assessment (DNA), private sector drug analysis, screen-TB and epidemiological reviews including standards and benchmarks. The goal of the "TB Data Optimization" project, was to document experiences from countries and global stakeholders in implementing "supplemental" TB data activities and use this information to develop effective and efficient approaches to optimizing TB data-related activities for program planning.

This assessment was conducted from January 2021 through July 2023 by the U.S. Centers for Disease Control and Prevention (CDC) and the CDC Foundation (a non-profit organization affiliated with the CDC) and funded by the Bill & Melinda Gates Foundation.

Overall project objectives

1. Summarize existing evidence and global partner perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
2. Summarize country perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
3. Map and align objectives and metrics across supplemental TB data- and evidence-related activities.
4. Synthesize findings into a set of recommendations for the optimization of data generation, review and analysis efforts.

This mixed-methods assessment was conducted in three phases as shown in Figure 1. Refer to Annex 1 for more details on the project phases.

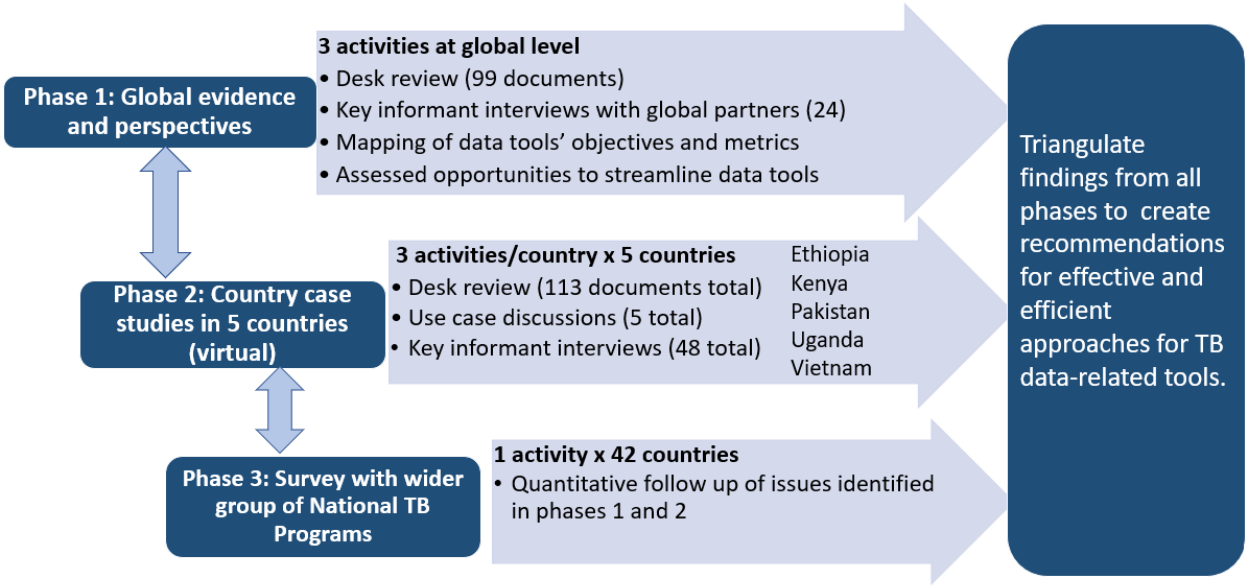


Figure 1. Three phases of the project

This report summarizes the activities and findings of the Ethiopia country case study and is intended for the Ethiopia MOH/NTP and their partners.

A more comprehensive full project report, with findings and recommendations from all three project phases and observations from all five country case studies, will be made available by project staff when complete.

Country case study objectives

1. Review existing evidence related to Ethiopia's use of TB data tools and activities (desk review).
2. Conduct a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade.
3. Conduct key informant interviews on the use and usefulness of supplemental TB data activities implemented in Ethiopia.

Country Case Study Methods

Desk review

A list of supplemental TB data activities that Ethiopia has implemented was obtained from the WHO. The list of activities was shared with Ethiopia's NTP to confirm and update where needed. The documents reviewed were obtained through the MOH/NTP website, e-journals or shared by NTP staff.

Twenty-one supplemental TB data activity reports, publications and strategic planning documents from the last 10 years were reviewed. A standardized template (see Annex 2) was used to abstract information. Lessons learned were abstracted from activity reports while evidence of the use of the activities' findings/recommendations was abstracted from strategic planning documents such as National Strategic Plans and Global Fund applications. From these, an overall summary with main takeaways was synthesized.

Documents reviewed:

1. Quality of Tuberculosis Services Assessment in Ethiopia: Report, May 2020
2. First Ethiopian National Population Based Tuberculosis Prevalence Survey, July 2011 (report)
3. Second Round National Anti-Tuberculosis Drug Resistance Survey in Ethiopia (2011-13) Final Report
4. Third Round Anti-Tuberculosis Drug Resistance Survey in Ethiopia 2017/19 (report)
5. Increasing Access to Tuberculosis Services in Ethiopia: Findings from a Patient-Pathway Analysis (journal publication)
6. Financial burden of HIV and TB among patients in Ethiopia: a cross-sectional survey (journal publication)
7. Estimating TB plan costs using the OHT-TB module in Ethiopia (case study in WHO's "Compendium of data and evidence-related tools for use in TB planning and programming)
8. The first population-based national tuberculosis prevalence survey in Ethiopia, 2010-2011 (journal article)
9. Ethiopia Epidemiological review mission in preparation of National TB program review, 2013 (report)
10. Update to Epidemiological review Ethiopia (2004-2008 EC) in preparation of National TB program review, 2016 (report)
11. Tuberculosis Epidemiologic Review of Ethiopia, 2019: Analysis and evaluation of the tuberculosis surveillance system (report)
12. TIME Modelling Application: Final Report
13. Sub-national prevalence survey of tuberculosis in rural communities of Ethiopia (journal article)
14. Developing an optimized NSP using PCF (presentation)
15. Ethiopia TBL program national strategic plan 2013/14-2020-21 End-term review (report)
16. Report of an independent mid-term review of the implementation of the Ethiopia TB and Leprosy Control Strategic Plan 2013-2020
17. TBL-NSP July 2021-June 2026
18. TBL-NSP 2006-2013 EC (2013/14-2020) with update for 2010-13 (2008-20/21)
19. National Plan for Tuberculosis Research in Ethiopia (2017-2022)

20. Revised Strategic Plan TBL 2006-2013 EC (2013/14-2020)
21. The Global Fund Funding Request Form Allocation Period 2020-2022

Use case discussion

The purpose of the use case discussion was to better understand how TB data activities have helped the National TB Program and TB partners to:

1. Estimate the burden of TB in Ethiopia
2. Understand and address specific gaps in the TB care cascade
3. Make both short- and long-term plans for the TB program

"Use case" questions were developed with the aim to understand how the countries have used the various supplemental TB data tools and activities for the three purposes above (see Annex 3 for the use case discussion guide). Each set of questions was related to a section of the project's data framework (see Figure 2 below). Figure 2 shows the TB-related data activities that have been conducted in Ethiopia that may have been used to better understand each section of the data framework.

A 90-minute group discussion with five NTP staff and TB partners was conducted virtually over Zoom in January 2022. The NTP focal person was asked to select participants within the NTP and TB partners who were closely involved in implementing and/or using the data from the supplemental activities and/or involved in the development of the most recent National Strategic Plan and Global Fund Application. The discussion was audio recorded and transcribed using NVivo's automated transcription software. Two project staff reviewed the notes and audio recording of the discussion and summarized responses for each section of the data framework. The summaries were compared to ensure consistency and accuracy.

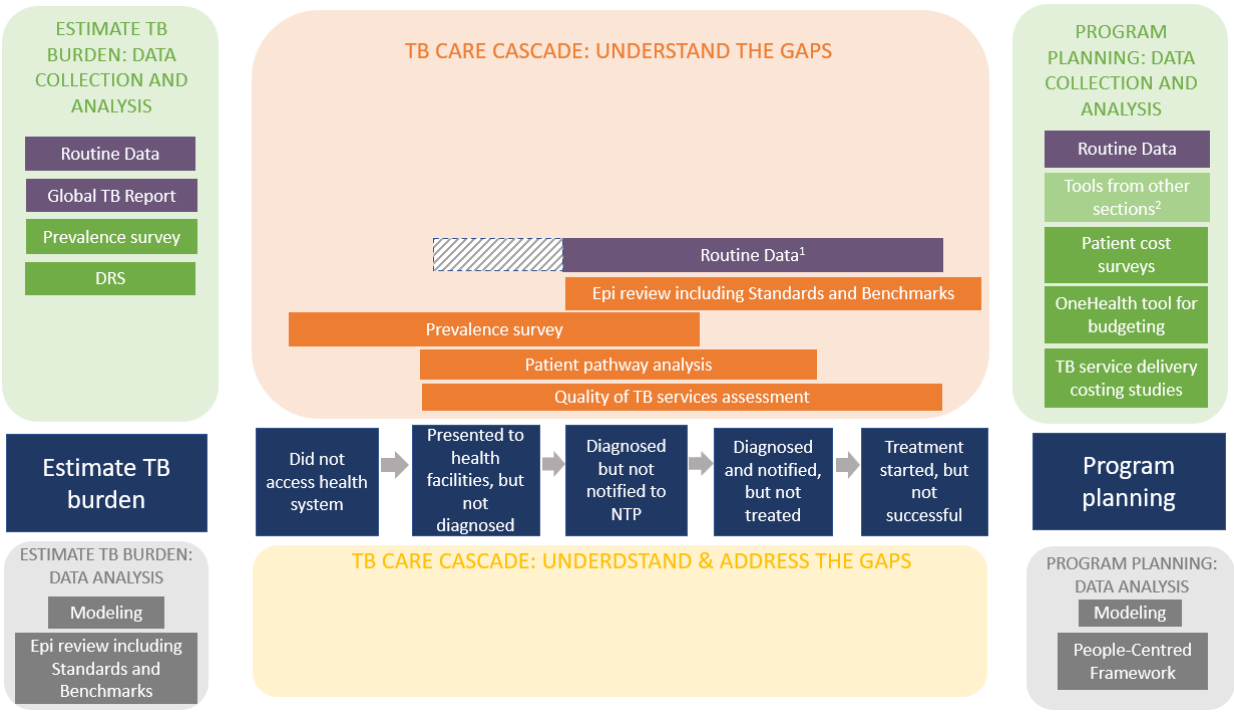


Figure 2. Framework for use of data activities in different aspects of TB program evaluation and planning adapted to the Ethiopia setting

[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

[2]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Key informant interviews

The purpose of the key informant interviews was to better understand the use and usefulness of the supplemental TB data activities.

Individual interviews were conducted with nine people that work at the national or subnational levels. At the national level, NTP staff and persons at partner organizations that supported conduct of TB data activities or use TB data were interviewed. At the subnational level, TB program staff at the regional level were interviewed. The interviews were approximately 60- to 90 minutes long.

Interviews were audio recorded, then transcribed verbatim using NVivo's automated transcription software. The transcripts were reviewed and coded by two project team members using NVivo. All codes were reviewed and agreed upon by project team members. Content analysis was conducted and key emerging themes (if at least 25 percent of respondents discussed a topic) were summarized.

Country Case Study Findings

Desk review

Desk review summary by TB data activity:

Supplemental TB data activity	Evidence of use of findings in National Strategic Plans (NSP)	Evidence of use of findings in Global Fund applications	Evidence of use of findings in program reviews
TB prevalence survey (TBPS) 2010/2011	*2021-2026 NSP, Revised 2013/14-2020 NSP and 2013/14-2020 NSP:* Findings were included to provide context in the background section. It was noted that the survey is outdated in the 2021-2026 NSP	*2020-2022 application:* Findings were highlighted to provide rationale for prioritization for funding to address gaps in the patient pathway. A national prevalence survey with subnational	*2019 end-term review:* A repeat TBPS was recommended. *2017 mid-term review:* Findings were highlighted to provide TB epidemiological background.

		analysis was listed as an activity under Strategic Objective 5: strategic information and research as part of the budget request.	
Drug resistance survey (DRS) 2011-2013 (2nd) 2017-2019 (3rd)	*2021-2026 NSP:* Findings from the 3rd DRS were highlighted to provide context in the background section. The 3rd DRS is listed as an achievement under "Strategic Information and Research" for the previous NSP period. The 3rd DRS was listed as a source to inform NSP development. *NSP with update for 2018-2020/21:* Findings from the 1st DRS (2005) and 2nd DRS (2013) were highlighted to illustrate MDR-TB trends in the country over time.	*2020-2022 application:* The 3rd DRS is used as an example of past experience under "Implementation Arrangements".	*2019 end-term review:* Findings from the 3rd DRS were highlighted to provide context. *2017 mid-term review:* It is mentioned that a 3rd DRS is planned for 2017 and the last national representative survey was conducted in 2005.
Patient pathway analysis (PPA) 2017	*2021-2026 NSP:* Findings were used to highlight the need to address gaps along the patient pathway. A repeat PPA was listed as a research priority. It was noted as a source of evidence to inform the NSP.	*2020-2022 application:* Findings were used to provide context and highlight lessons learned. Findings were used as rationale for prioritization for funding.	*2019 end-term review:* Findings were used to highlight key gaps and challenges and to provide context for recommendations. It was listed as a key achievement and noted that the NTLP plans to carry out a repeat PPA.
People-centred framework (PCF) 2020	*2021-2026 NSP:* The PCF was used to develop the NSP. The PCF process was described in detail.	*2020-2022 application:* It was mentioned that the PCF was used to develop the NSP.	*2019 end-term review:* The PCF was recommended.
Epidemiological review, including standards and benchmarks 2013 2016 2019	No evidence of 2013, 2016 or 2019 epi review.	No evidence of 2013, 2016 or 2019 epi review.	The 2019 epi review was disseminated at the 2019 end-term review briefing meeting in preparation for the 2019 program review. *2017 mid-term review:* The 2016 epi review

			provided input into the 2017 mid-term review. Key findings from the 2016 epi review were presented in the executive summary under Surveillance, Monitoring and Evaluation. The 2013 epi review provided input into the 2013 program review.
Patient cost survey (PCS) **Planned, but not conducted yet*	*2021-2026 NSP:* Findings from a cross-sectional survey of financial burden among HIV and TB patients were used to provide context for the background section and highlight gaps across the care continuum. A national PCS is planned to be conducted during this NSP period.	*2020-2022 application:* It was mentioned that a national PCS will be conducted to inform policy and strategies to address catastrophic household expenditure due to TB. A PCS was listed as an activity under Strategic Objective 5: strategic information and research as part of the budget.	*2019 end-term review:* A national PCS was recommended for the NTLP to conduct in collaboration with partner organizations. *2017 mid-term review:* A national PCS was recommended for the NTLP to conduct in collaboration with partner organizations.
Quality of TB services assessment (QTSA) 2019	*2021-2026 NSP:* Findings were highlighted throughout to provide context for the background section and several of the strategic objectives. It was listed as a source to inform NSP development.	*2020-2022 application:* Findings were highlighted to provide context for lessons learned.	No evidence. The QTSA was not yet complete by the 2019 end-term review.
Epidemiological modelling 2019	*2021-2026 NSP:* TIME model used to consider impact and cost-effectiveness to prioritize interventions. Findings were presented in the NSP. *NSP with update for 2018-2020/21:* It was mentioned that TIME modelling was used and partners were acknowledged, but no findings were presented.	*2020-2022 application:* Modelling was listed as a prioritization approach used to select interventions for funding. TIME modelling was used to assess the TB epidemiologic impact of the interventions to prioritize interventions. Results of the intervention optimization modelling was used to show how	*2019 end-term review:* It was recommended that modelling may be used during the development of the next NSP to support the selection of interventions to be included.

		the funding request reflects value for money.	
OneHealth tool for TB budgeting 2020	*2021-2026 NSP:* OHT was used to prepare the NSP budget. *NSP with update for 2018-2020/21:* OHT was used to cost the updated NSP.	No evidence/not mentioned.	No evidence.

Overall findings

Priority TB data activities and research:

A repeat national TB prevalence survey with subnational estimates was recommended in the 2019 end-term review and in the 2021-2026 National Strategic Plan; it was noted that results of the first survey conducted in 2011 are outdated, which makes it a challenge to accurately estimate TB burden. A national prevalence survey with subnational analysis was listed as part of the budget request for the 2020-2022 Global Fund application.

The NTP would like to conduct a repeat patient pathway analysis; this was noted as a research priority in both the 2019 end-term review and the 2021-2026 National Strategic Plan.

The 2017 mid-term review and 2019 end-term review recommended for the NTP to conduct a national patient cost survey. A national patient cost survey is planned to be conducted during the 2021-2026 NSP period.

Supplemental data activities that were listed as relevant or extensively reviewed for NSP development include:

The patient pathway analysis, OneHealth Tool for TB budgeting, TIME impact model, quality of TB services assessment and people-centred framework were helpful in informing NSP development. The prevalence survey and drug resistance surveys provided context for the TB epidemiology background of the country. The quality of TB services assessment findings was also highlighted throughout the 2021-2026 NSP.

Supplemental data activities that were used or referenced in the Global Fund applications as rationale for funding include:

Results of the prevalence survey and patient pathway analysis findings were used to provide rationale for prioritization for funding in the Global Fund 2020-2022 application, while modelling was used to prioritize interventions for funding.

It was mentioned in the 2020-2022 application that a national patient cost survey will be conducted to better understand the source of out-of-pocket expenditure for TB patients and to inform tailored strategies to mitigate costs for patients.

Supplemental data activities that were important, used for or influenced the recommendations of program reviews include:

The prevalence survey and drug resistance survey findings were used to provide TB epidemiology background in the program reviews. Patient pathway analysis findings were used to highlight key gaps and provide context for recommendations coming out of the 2019 end-term review. Epidemiologic reviews provided important input into the program reviews.

The quality of TB services assessment was not yet complete prior to the 2019 end-term review, therefore, findings were not used as input.

Use case discussion

Respondent characteristics

Five NTP staff and TB partners consented to and participated in the use case discussion. All five participants (100%) were male. Three participants (60%) were NTP/MOH staff and two were from a TB partner organization.

Key findings from each section of the data framework

	Most critical and/or useful sources of data	Other data or tools that would be useful

Estimation of TB burden	• For drug sensitive TB (DS-TB):
	  ○ Prevalence survey was critical in providing a baseline estimate for TB burden, but it is outdated.
	  ○ Now mainly rely on WHO annual estimates from the Global TB report since burden estimates from the prevalence survey have become more outdated.
	  ○ Routine reporting.
	• For drug resistant TB (DR-TB):
	  ○ Drug resistance survey; have conducted multiple, which has allowed for monitoring DR-TB burden and trends.
	• For target setting:
	  ○ Data generated from analysis of routine reporting.
	  ○ Performance reports.
	  ○ Epi modelling .
		• Socioeconomic determinants and demographics of key and vulnerable populations would help target TB services.
		• Burden estimates of key population groups to factor into national prevalence.
		• Inventory study to know level of under-reporting.
		• True estimate of TB-related mortality; need data from vital registration.
		• Epi modelling and epi review to estimate true burden of childhood DS-TB and DR-TB.
		• Better burden estimation at subnational level.

People with TB who do not access the health system	• Data from prevalence survey shows among the detected TB cases, how many people did not access health services.	• National, subnational and local assessment mapping to quantify and understand why people do not access services; need to know the number,

	• Patient pathway analysis showed where we are potentially missing people. • Root cause analysis from the people-centred framework helped to understand why people are being missed. • Routine data from service providers to see who is accessing care (demographics) and who is left behind. • Desk review of publications as part of the mid-term review to look into factors influencing care seeking. • Feedback from routine supportive supervision visits identified unreached/underserved areas.	location and characteristics of key population groups who are not accessing services.
People with TB who presented to health facilities but were not diagnosed and/or not notified	*For those not diagnosed:* • Patient pathway analysis was critical in understanding where people presented versus the availability of diagnostic tools. • Quality of TB services assessment showed access gap and looked at quality elements such as turnaround time. • Prevalence survey was conducted using chest x-ray, which indicated missed cases using symptom-based screening approach. *For those not notified:* • Referral tracker used to track patients on health facility registers who were referred to treatment facilities. • DR-TB: Routine reporting used to look into people diagnosed with DR-TB and people who are enrolled into treatment at specific treatment facilities to identify those missed.	*For those not diagnosed:* • Could get more information from local studies and operational research. • Access to data generated from routine TB laboratory services would be helpful to understand positivity rates and laboratory related issues. • TB screening data from health facilities and supportive supervision data are missing from routine reporting, they should be included. *For those not notified:* • Inventory study to understand people diagnosed but not notified or linked to treatment. • A tool to track specialized treatment hospitals and private facilities who are not part of the NTP system that diagnose and refer TB patients.
People with TB who were diagnosed but not successfully treated	*For those not started on treatment:* • Look at any gaps between number of people diagnosed in the lab and those in the registers who are linked to treatment during supportive supervision visits.	*For those not started on treatment:* • Inventory study. • Local operational research to identify root causes of why diagnosed TB patients did not start treatment.

	• Quarterly routine reporting to look at number diagnosed with DR-TB versus number enrolled at DR-TB treatment facilities. *For those not successfully treated:* • Analysis of routine reporting important to look at treatment outcomes for both DS-TB and DR-TB. • Epi review looks at trends over time of routine reporting which provide insight into treatment outcomes. • Annual cohort analysis of DR-TB patients; conduct of mortality audits at facility level to understand cause of death while on treatment.	• Need a central level database to triangulate GeneXpert system data with MDR-TB patient tracking system to look at discrepancy between all RIF cases detected and those enrolled on treatment. • Referral tracker to identify gaps between referral and confirmation of arrival of patient to treatment facility. *For those not successfully treated:* • Routine system not disaggregated by HIV status or other co-morbidities, so lacking details on patients not successfully treated. • Vital events registry system data may provide a more direct measure of cause of death. • Targeted mortality audits.

TB program planning	• National TB Strategic Plan (NSP) development:
	  ○ People-centred framework.
	  ○ Patient pathway analysis.
	  ○ Epi modelling (intervention modelling) was used extensively.
	  ○ Epi reviews have been used extensively.
	  ○ Prevalence survey findings used to design interventions.
	  ○ Drug resistance survey.
	  ○ OneHealth tool was used to cost the NSP.
	• Global Fund proposal:
	  ○ Prevalence survey.
	  ○ Drug resistance survey.
	• Routine program planning:
	  ○ The NSP guides routine planning.
	  ○ Drug resistance survey.
	  ○ Routine reporting.
		• A repeat prevalence survey with subnational level estimates.
		• Inventory study.
		• TB diagnostic network optimization or TB diagnostic network assessment.

Key takeaways

- The NTP extensively used the findings from the supplemental activities to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but also

relied extensively on routine data. A need for case-based reporting was mentioned; respondents believe that moving to an electronic case-based system would resolve key data challenges the NTP currently faces, such as issues with disaggregation.

- The first TB prevalence survey has been very useful. It has provided estimates of the TB burden in the country and other important secondary data, however, it is outdated as the first survey was conducted over 10 years ago. One of the NTP's top priorities and greatest needs is to conduct a repeat prevalence survey, preferably with the power to provide subnational level estimates.
- Inventory study and local operational research were mentioned several times as other data or tools that would be useful for better understanding gaps in the TB care cascade and for program planning.
- Almost all the supplemental TB data activities Ethiopia has implemented in the last 10 years have been used in preparation for NSP development and/or applied to the 2021-2026 NSP. The people-centred framework was used to consolidate all the data.
- The TB service delivery costing study (conducted in 2019) was rarely mentioned and was not used for NSP development or to write the Global Fund application.

Key informant interviews

Respondent characteristics

Of the nine key informants, seven were NTP staff and two were in-country TB partners (Figure 3). On average, the respondents have been doing TB-related work for 10.7 years (standard deviation = 4.6). Respondents were mostly male (89%) (Figure 3) and mostly worked at the national level (67%) (Figure 3). The majority (more than 50 percent) of respondents were familiar with (either were involved in implementing and/or planning and/or heard the results of findings) the prevalence survey, drug resistance survey, people-centred framework, epidemiological reviews including standards and benchmarks, epidemiological modelling, OneHealth tool for TB budgeting and quality of TB services assessment (Figure 4). Less well-known were the patient pathway analysis and TB service delivery costing study (Figure 4). Patient pathway analysis was the only supplemental TB data activity where no interviewed respondents were involved with planning or implementing.

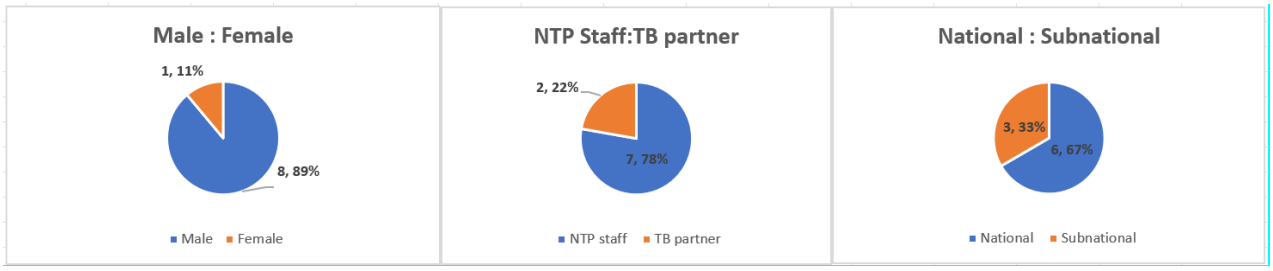


Figure 3. Characteristics of key informants (left: male to female ratio; middle: NTP staff to TB partner ratio; right: national to subnational ratio)

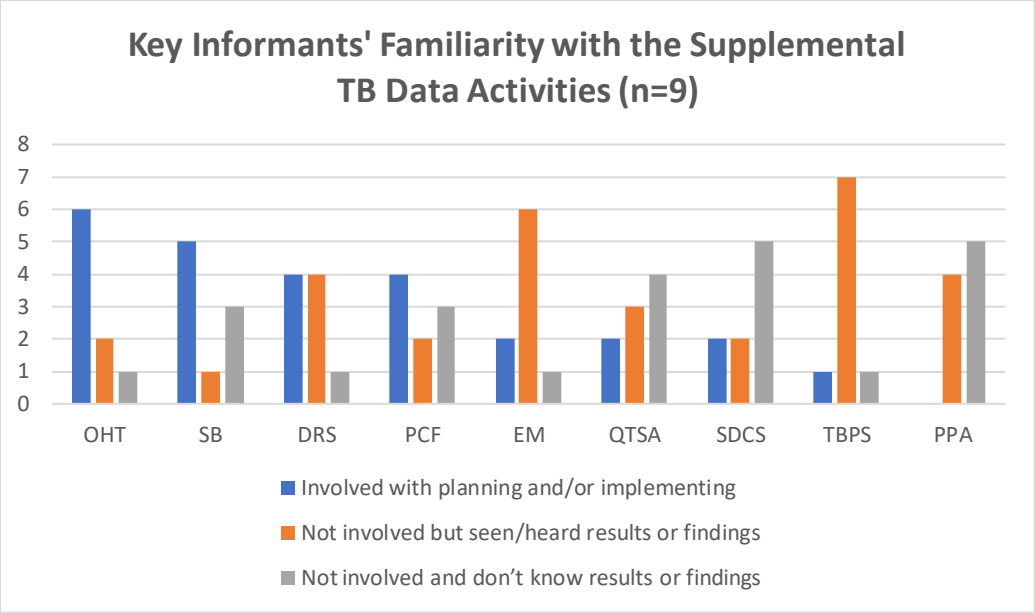


Figure 4. Key informants' familiarity with the supplemental TB data activities implemented in Ethiopia

OHT = OneHealth Tool for TB budgeting; SB = epidemiological review, including standards and benchmarks; DRS = drug resistance survey; PCF = people centred framework; EM = epidemiological modelling; QTSA = quality of TB services assessment; sdcs = service delivery costing study (Value TB); TBPS = TB prevalence survey; PPA = patient pathway analysis

Key emerging themes

The following key themes emerged from the key informant interviews.

Theme: Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan.
• The current routine surveillance system cannot capture all data needed for program planning, therefore, additional data and information on TB burden, access to services, mortality and determinants is needed to guide the national TB program response; majority of respondents believe that an electronic case-based surveillance system would strengthen reporting and utilization of routine data, however, supplemental data activities will still be needed to augment routine data. • The prevalence survey, drug resistance survey and epidemiological modelling provided DS-TB and/or DR-TB burden estimates and trends, which impacted decisions on intervention design, drug procurement, resource mobilization and program planning. • The prevalence survey, drug resistance survey and patient pathway analysis were the most frequently mentioned activities that impacted program planning, decision making and resource mobilization.   ○ The prevalence survey findings helped design and prioritize interventions (e.g. mobile TB clinic to reach pastoral communities, using chest x-ray for screening instead of symptom-based screening).

- The drug resistance survey helped provide guidance on strategies to address drug resistance in the country and informed drug procurement.
- Patient pathway analysis helped with resource allocation (e.g. focus investments on primary healthcare settings) and optimizing TB case finding.
- Findings from data activities such as prevalence survey and epidemiological reviews helped provide evidence to justify funding and resource requests to the government and donors.

- Many respondents agreed that supplemental TB data activities contributed to NSP development, including the OneHealth tool for TB budgeting, epidemiological modelling, people-centred framework, quality of TB services assessment, service delivery costing study and patient pathway analysis; other activities such as epidemiologic reviews assessed the progress/impact of the NSP.
  - However, some respondents mentioned limited use of the quality of TB services assessment and the OneHealth tool for TB budgeting.
- The financial burden of HIV and TB study (conducted by Assebe et al in 2018-2019) was also frequently mentioned as being useful for mobilizing resources/providing evidence to justify funding requests to the government and donors as findings gave insight into TB-related financial burdens to patients and their households; the NTP would like to conduct a national patient cost survey.

Illustrative quote:
"The **prevalence survey** and all other listed supplemental activities are very important for the country in terms of planning, knowing the burden of the disease in the country and also for monitoring." Key Informant, National level, Ethiopia

Theme: Challenges with funding

- Funding/resource availability is a common challenge with planning and implementing supplemental TB data activities.
- Funding limitations impact frequency of costly activities (e.g. prevalence survey is outdated, the last one was more than 10 years ago).
- Respondents would like donors and international stakeholders to know to keep investing in the country's prioritized supplemental TB data activities, which are necessary for the long-term effort to eliminate TB.
- The majority of the TB budget comes from Global Fund and other donors; there is a need to increase annual domestic funding.

Illustrative quote:
"The other element is whenever you don't have the tools to implement, you may not be able to do it. So certain tools were needed for- imagine if you want to do cost study, then you need to have the expertise, the tools and the resources. I think that issue must be equipped to do the activities." Key Informant, National level, Ethiopia

Theme: Timing and coordination of supplemental activities is important

- The prevalence survey being outdated was frequently mentioned by respondents and this has caused challenges with estimating burden; it is a challenge to maintain set schedules to implement supplemental TB data activities.

- It is important to align certain supplemental TB data activities with the strategic planning cycle (e.g. important to implement epidemiologic modelling and OneHealth tool on time for NSP development and writing funding applications.
- There is a need to improve coordination and timing of funding for supplemental TB data activities.

Illustrative quote:
"Timing depends on the activity. For example, **drug resistance survey** is expected to be repeated every three to five years, but it is not implemented as that…**drug resistance survey** and **prevalence survey** are not implemented in time. The **epidemiological modelling**, **One Health Tool for TB budgeting** depends on the strategic planning and the Global Fund concept note writing. If the strategic plan is five years, we expect to develop another one. For the **epidemiological modelling, One Health Tool**, this kind of tools are very important we use it in time. For **people-centred framework** we started to use this last year, hopefully we resume this in the next strategic plan for strategic plan development and conceptual development for the Global Fund." Key Informant, National level, Ethiopia

Theme: There is a lack of technical capacity in the country, it is important to build local capacity

- Subnational levels have inadequate technical capacity to utilize data for decision making.
- There is a need for staff with experience and skills to perform analysis and produce reports.
- There is a need for staff with the capacity to execute field activities (e.g. data collection, laboratory skills needed for prevalence survey and drug resistance survey).

Illustrative quotes:
"One of the main limitations is technical capacity, so those focal persons or points at the [regional] and lower level are not very well capable of using this data for local decision making. I think that the capacity of TB focal persons in the facilities only aggregate and send data, but they don't really do the analysis within their communities." – Key Informant, National Level, Ethiopia

"I would like this [epidemiological modelling] to be done regularly before every planning year and use the projection for planning and implementation going forward. And then at the end of every year, it would be excellent to have what changes we made and what impact they actually identified from the results. So doing it every year could be very good, but I think the scope could be limited to regional levels or if you have the training capacity at the local levels and actually engage them in using their local data." – Key Informant, National Level, Ethiopia

Theme: Dissemination of results and recommendations

Dissemination practices:

- At national level
  - Conferences: The annual TB Research Advisory Council (TRAC) conference hosts presentations on research findings, tools, guidelines and updates from local universities, NGOs and WHO.
  - Program review meetings: Findings are shared at semi-annual program review meetings at the national and regional levels.

- NTP staff are generally well-informed and first to be informed of findings and recommendations, especially if they participated in implementation and/or used the findings.
- Partners are generally well-informed and have access to the findings; the NTP shares results with partners who were involved/contributed; local partners involved in a technical working group or task force are informed at quarterly meetings.

- At subnational level
  - Meetings: the regional level TB staff are invited to biannual review meetings and the TRAC conference to learn about findings.
  - Dissemination is a challenge and needs to be improved at the subnational levels, especially the lower levels (e.g. zonal, woreda); findings are shared but may not be useful due to special needs a population in a region may have (e.g. pastoralist communities).
- Shared widely
  - Journal publications (e.g. prevalence survey, drug resistance survey, patient pathway analysis, service delivery costing study).
- Supplemental TB data activities that are most widely disseminated and/or published
  - Prevalence survey
  - Drug resistance survey
  - Service delivery costing study (Value TB)
  - Patient pathway analysis

Illustrative quote:
"NTP staff are well informed; they are part of the supplemental activities and the dissemination. But the problem is at the subnational level, more profoundly at the zonal level and the woreda level. Because in the national dissemination, people from regions will be invited, documents shared, information shared. But for various reasons, there is lack of funding to go down and to organize [...mission trip] and everything yearly. - Key Informant, National level, Ethiopia

Suggestions for improvement from respondents

- The need for subnational level estimates or analyses were frequently mentioned by respondents.
  - Burden estimates for each region from prevalence survey and drug resistance survey; incidence rates vary in the regions, so the national estimates may not be representative.
  - Doing patient pathway analysis at subnational level.
  - Conducting the quality of TB services assessment locally.
- Need to improve dissemination at lower levels (e.g. zonal, woreda); dissemination generally reaches national level and regional level TB staff.
- Subnational level staff would like to be more engaged with the national level team and share experiences from their region.
- Apply new technologies:
  - Use molecular diagnostic techniques instead of relying mainly on culture for the drug resistance survey.
  - Use AI-assisted chest x-ray for the next prevalence survey for standardized interpretation.

Overall Findings

When the findings from the case study's three activities were jointly analyzed, several overall themes emerged and are described below. These combined findings are the same as those presented in the executive summary.

- **Supplemental TB data activities are useful and provide important information for planning, decision making and National Strategic Plan (NSP) development:** Findings from the various supplemental TB data activities Ethiopia has implemented have been used to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but the country also relied extensively on routine surveillance data. Like all routine surveillance systems, it cannot capture all data needed for program planning. There is a need for case-based reporting which will help resolve some key data challenges such as issues with disaggregation, though supplemental TB data activities will still be needed to periodically provide additional information. Almost all the supplemental TB data activities Ethiopia has implemented in the last 10 years have been used in preparation for NSP development and/or applied to the 2021-2026 NSP; the people-centred framework was used to consolidate all the data. Data activities that have been particularly useful include the prevalence survey, drug resistance survey and patient pathway analysis. Other important data activities such as the OneHealth tool for TB budgeting and epidemiological modelling were essential in contributing to NSP development.
- **Priority future supplemental TB data activities:** A repeat national TB prevalence survey was recommended in the 2019 end-term review and planned for in the 2021-2026 NSP. Almost all key informant interview respondents mentioned that the prevalence survey is outdated, as the last one was conducted more than 10 years ago, and they would like for the second prevalence survey to be powered to have subnational level estimates due to the diverse populations in the different regions. A national TB patient cost survey was recommended in the 2017 mid-term review and 2019 end-term review. Though one has not been conducted yet, the NTP has planned for the survey to be conducted during this national strategic plan period (2021-2026). Additional data activities that would be useful for the country to conduct include an inventory study.

- **Proper timing and coordination and funding availability of supplemental TB data activities is critical:** It is important to implement the country's prioritized supplemental TB data activities in preparation for the development of the next NSP, but it is well-known that funding availability is a common challenge with planning and implementing these supplemental activities, especially for costly surveys such as the prevalence survey. It has been a challenge for the country to maintain the recommended frequencies to implement the various data activities. The majority of the TB program budget comes from donors; there is a need to increase domestic funding for TB.

- **Dissemination of results and recommendations:** NTP staff and TB partners are generally well-informed of the findings and recommendations from the supplemental TB data activities Ethiopia has implemented, especially those who were involved with implementation and dissemination. The most common events for dissemination include the annual TB Research Advisory Council (TRAC) conference and the semi-annual TB program review meetings. The findings from several data activities have been published in a journal. While the regional TB coordinators are invited to the meetings and TRAC conference to learn about the findings, dissemination at subnational level could be improved, especially at the lower administrative levels (e.g. zonal, woreda). In general, subnational level TB program staff would like to be more engaged with the national level team and be able to share experiences and get specific recommendations from the supplemental activities for their region.

- **Remaining data gaps for planning:** While strengthening routine surveillance systems is a priority, not all information for program planning can be provided by routine data. The following data or data sources needed for program planning and decision making have been highlighted: data capturing missed TB patients between diagnosis and treatment; TB-related mortality; subnational level estimates of DS- and DR-TB burden for each region; operational research to understand why extra-pulmonary TB has increased.

Conclusion and next steps

This country case study was conducted to learn from Ethiopia's experience with planning and implementing supplemental TB data activities and to better understand how these activities have helped the NTP and TB partners to: gain insight of the TB burden in the country, better understand and address gaps in the TB care cascade and make both short- and long-term plans for the TB program.

The case study was an opportunity for Ethiopia's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Ethiopia's MOH look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. Key takeaways from the Ethiopia case study will be factored into the overall recommendations coming out of the project, which will cover both general aspects of planning and implementing supplemental TB data tools as well as tool-specific recommendations.

Findings from Ethiopia have been compiled with findings from the four additional country case studies, global-level interviews and desk review and the NTP manager survey. The triangulated findings will be used to develop a framework to help countries prioritize TB data-related activities in partnership with WHO.

Annex 13 Kenya Country Case Study Report

Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning: Kenya Country Case Study Report

Project implemented by the CDC Foundation and Centers for Disease Control and Prevention (CDC) with funding from the Bill & Melinda Gates Foundation

June 2023

List of abbreviations

BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
DNO	Diagnostic Network Optimization
DRS	Drug Resistance Survey
GIS	Geographic information system
MATCH	Mapping and Analysis for Tailored disease Control and Health system strengthening
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NTLP	National Tuberculosis, Leprosy and Lung Disease Program
NSP	National Strategic Plan
PCF	People-Centred Framework
PCS	Patient Cost Survey
PPA	Patient Pathway Analysis
SDCS	TB Service Delivery Costing Study (Value TB)
TB	Tuberculosis
TBPS	National TB Prevalence Survey
WHO	World Health Organization

Project team and participants

Project Team

Miranda Bodfish	Associate Vice President, Infectious Disease Programs, CDC Foundation
Christina Braccio	Health Scientist, Global Tuberculosis Branch, U.S. CDC
Anand Date	Branch Chief, Global Tuberculosis Branch, U.S. CDC
Rachel Fiorillo	Project Manager, Infectious Disease Programs, CDC Foundation
Jennifer Harris	SIA Team Lead, Global Tuberculosis Branch, U.S. CDC
Eveline Klinkenberg	Consultant, Connect TB, the Netherlands
Stephanie O'Connor	Epidemiology Fellow, Global Tuberculosis Branch, U.S. CDC
Victoria Tully	Public Health Analyst, Global Tuberculosis Branch, U.S. CDC

Project Steering Committee

Sevim Ahmedov	USAID
Kenneth Castro	Emory University and USAID
Daniel Chin	Bill & Melinda Gates Foundation
Kathy Fiekert	KNVC Tuberculosis Foundation
Harry Hausler	TB HIV Care
Fukushi Morishita	World Health Organization, Western Pacific Region Office
Nnamdi Nwaneri	The Global Fund
Suvanand Sahu	Stop TB Partnership
Charalampos (Babis) Sismanidis	World Health Organization
Stavia Turyahabwe	Tuberculosis and Leprosy Program, Ministry of Health Uganda

Kenya participants

Martin Githiomi	Division of National Tuberculosis, Leprosy and Lung Disease Program (DNTLD-P)
Maureen Kamene	Ministry of Health Kenya
Bernard Langat	AMREF Health Africa
Stephen Macharia	Division of National Tuberculosis, Leprosy and Lung Disease Program (DNTLD-P)
Carolly Migwambo	Homabay County, Tuberculosis
Loraine Mugambi	Centre for Health Solutions – Kenya (CHS)
Job Okemwa	Turkana County, Tuberculosis
Eunice Omesa	World Health Organization - Kenya
Jane Ong'ango	Kenya Medical Research Institute (KEMRI)
Philip Owiti	USAID

Aiban Ronoh	Division of National Tuberculosis, Leprosy and Lung Disease Program (DNTLD-P)

EXECUTIVE SUMMARY

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of TB data activities outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these activities are referred to as "supplemental" TB data activities. This project took place from January 2021 through August 2023 and had three phases:

1) Global-level desk review and key informant interviews
2) Country case studies in five countries
3) Online survey of National TB Program (NTP) managers in countries that had substantial experience with supplemental TB data activities

This report summarizes the activities and findings of the Kenya case study (conducted January to April 2022) and is intended for the Kenya National Tuberculosis, Leprosy and Lung Disease Program (NTLP) and their partners. This country case study consisted of three parts 1) a desk review of existing evidence related to Kenya's use of supplemental TB data tools and activities; 2) a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade in Kenya and 3) a series of key informant interviews on the use and usefulness of supplemental TB data activities implemented in Kenya.

The following overall themes emerged from the combined analyses for Kenya:

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the national strategic plan (NSP):** The different supplemental activities that Kenya conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and develop interventions and strategies for national strategic planning, but the country also relied extensively on routine data. Activities that have been particularly useful include the prevalence survey, drug resistance surveys, patient cost survey, patient pathway analysis, diagnostic network optimization, people-centred framework and inventory study. Other important activities included epidemiological reviews and epidemiological modelling. For the next NSP development period, the NTLP plans to use the people-centred framework again in the planning process for both the national and county level. The NTLP would like to do additional modelling to help determine targets and identify procurement needs but would need technical assistance for this. The NTLP would also like to conduct a repeat drug resistance survey and inventory study but would prefer an easier and less costly approach to the inventory study. Respondents indicated a need for subnational level data and estimates to identify interventions and set targets at lower levels, the desire to strengthen costing of TB services

by costing all aspects of the TB care cascade and would like for the OneHealth tool for TB budgeting to be strengthened.

- **Timing, coordination and availability of funding of supplemental activities are critical:** Timing and coordination of a supplemental TB data activity or with multiple activities can be challenging, especially when there are multiple stakeholders involved with planning and implementation. External partners and the NTLP should coordinate to ensure prioritized supplemental activities for the next strategic planning period are implemented at the right time and in time to inform development of the next NSP. In general, there is inadequate domestic funding for TB-related activities and almost all supplemental activities are funded by external donors. In the past, there was a challenge with alignment of funding with the country's priorities in a strategic period. As a result, multiple supplemental activities were being implemented at the same time at the end of the strategic period rather than over five years. Moving forward, it will be important to plan the order and timing of data activities, rather than keeping the timeline open.

- **Important to build local capacity to be able to implement supplemental activities without dependence on external technical assistance:** While supplemental TB data activities have provided opportunities for capacity building for TB program staff in the country, there is desire to further build capacity to be able to eventually implement supplemental activities in country without external technical assistance. Part of the challenge is the high workload and competing priorities for TB program staff who are running routine programmatic activities and implementing supplemental activities at the same time, so there is also a desire to build the workforce and hire additional staff for supplemental activities. Furthermore, there is a desire to build more of a research culture as well as technical capacity among subnational level TB staff to implement certain supplemental activities in their own counties. Respondents believe that investment in south-south support is important to helping build capacity in the country.

- **Dissemination of results and recommendations:** Dissemination of findings and recommendations is done at various levels. NTLP staff and partners are often adequately informed since they are involved in planning and implementation of the supplemental activities and are invited to dissemination events. After dissemination, there is a need to have a dedicated time as well as a forum for national and subnational level staff to discuss how findings affect TB programming. There is often inadequate funding to implement the recommendations resulting from supplemental activities. Therefore, there is also a need to target specific stakeholders like policy makers and the Minister of Health to improve sensitization about the identified needs and recommendations and to have continuous conversations.

  While there are opportunities to engage and share findings with subnational level TB staff, not all subnational level staff are adequately informed and they often miss out on dissemination opportunities, especially those working at the facility level. There is a need to find the right channel to appropriately share relevant information to each level, so that findings can also be translated into action at service delivery points.

- **Remaining data gaps for programmatic planning:** While Kenya's routine data system (TIBU Health) provides a lot of data, it is understood that routine surveillance systems cannot capture all data needed for programmatic planning. It would be helpful if the NTLP could access the TB data from the Integrated Diseases Surveillance and Response system (IDSR) so that it could be compared with TB program data. There is also a desire for TB cases referred by community health workers to be better streamlined for monitoring. Other data that would be helpful include socioeconomic status, malnutrition and location of areas with high incidence of TB/HIV data that's collected and reported at subnational level.

The case study was an opportunity for Kenya's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Kenya's MOH look at how these supplemental activities have been used in the past and to help them prioritize TB data activities in the future. However, findings from this case study are not meant to stand alone; they have been compiled with findings from the four additional country case studies, global-level interviews and desk review and the NTP manager survey. The triangulated findings are being used to develop a framework that will help countries prioritize TB data-related activities and develop a timeline for these activities. This framework is currently under development in partnership with the World Health Organization (WHO).

MAIN REPORT

Project Background

Overview of the overall project

Currently there are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist in the collection of and use of TB-related data. While these TB data activities provide important information, they are often supplemental to routine data collection and implementation of such activities can place an extensive burden on ministries of health (MOH), national TB programs (NTPs) and partners, and may not occur in an optimized and efficient manner.

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of "supplemental" TB data activities from both the country and global partner perspectives. For this assessment, "supplemental" TB data activities are those that go above and beyond routine data activities. These activities may include, but are not limited to, TB prevalence surveys (TBPS), drug resistance surveys (DRS), inventory studies, patient cost surveys (PCS), TB service delivery costing studies, care cascade analyses, One Health Tool for TB budgeting (OHT), diagnostic network optimization (DNO), epidemiological modeling, mapping and analysis for tailored disease control and health system strengthening (MATCH approach), patient pathway analysis (PPA), people-centred framework (PCF), quality of TB services assessment (QTSA), TB diagnostic network assessment (DNA), private sector drug analysis, screen-TB and epidemiological reviews including standards and benchmarks. The goal of the "TB Data Optimization" project, was to document experiences from countries and global stakeholders in implementing "supplemental" TB data activities and use this information to develop effective and efficient approaches to optimizing TB data-related activities for program planning.

This assessment was conducted from January 2021 through August 2023 by the U.S. Centers for Disease Control and Prevention (CDC) and the CDC Foundation (a non-profit organization affiliated with the CDC), and funded by the Bill & Melinda Gates Foundation.

Overall project objectives

1. Summarize existing evidence and global partner perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
2. Summarize country perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
3. Map and align objectives and metrics across supplemental TB data- and evidence-related activities.
4. Synthesize findings into a set of recommendations for the optimization of data generation, review and analysis efforts.

This mixed-methods assessment was conducted in three phases as shown in Figure 1. Refer to Annex 1 for more details on the project phases.

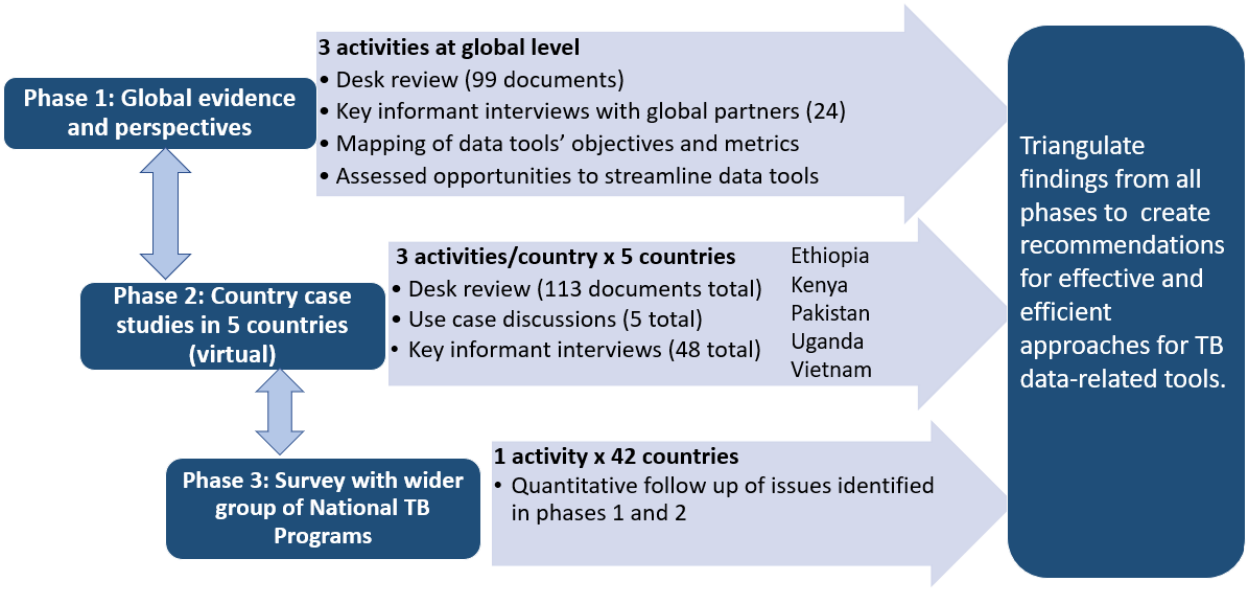


Figure 1. Three phases of the project

This report summarizes the activities and findings of the Kenya country case study and is intended for the Kenya NTLP and their partners.

A comprehensive report with findings and recommendations from all three phases of the project, including the five country case studies, will be shared by the project team when complete.

Country case study objectives

1. Review existing evidence related to Kenya's use of TB data tools and activities (desk review).
2. Conduct a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade.
3. Conduct key informant interviews on the use and usefulness of supplemental TB data activities implemented in Kenya.

Country Case Study Methods

Desk review

A list of supplemental TB data activities that Kenya has implemented was obtained from the WHO. The list of activities was shared with the NTLP and confirmed. The documents reviewed were obtained through the MOH/NLTP website, e-journals or shared by NTLP staff.

Twenty-five supplemental TB data activity reports, publications and strategic planning documents from the last 10 years were reviewed. A standardized template (see Annex 2) was used to abstract information. Lessons learned were abstracted from activity reports while evidence of the use of the activities' findings/recommendations was abstracted from strategic planning documents such as National Strategic Plans and Global Fund applications. From these, an overall summary with main takeaways was synthesized.

Documents reviewed:

1. 4th National Anti-Tuberculosis Drug Resistance Survey 2014-15 (report)
2. 4th National Anti-tuberculosis Drug Resistance Survey in Kenya (journal publication)
3. Epidemiological review in Kenya, February 20-24, 2017 (report)
4. Kenya Virtual TB Epidemiological Review Report May 2021
5. Under-Reporting of Sputum Smear-Positive Tuberculosis, Kenya, July 2015 (report)
6. Under-reporting of sputum smear-positive tuberculosis cases in Kenya (journal publication)
7. Mapping and Analysis for Tailored disease Control and Health system strengthening, MATCH-TB, Kenya, November 2018 (report)
8. Epidemiological modelling package for NSP 2019-2023: Budget Package Scenarios 2018-2025 (word document), Incremental cost effectiveness ratios (presentation), Incidence and mortality reductions in Kenya under selected scenarios of intervention (presentation)
9. Kenya TB Patient Pathway Analysis (PPA), Draft Version, 2017 (presentation)
10. Patient Pathway Analysis for DSD of TB in Kenya, 2018 (presentation)
11. Using Patient-Pathway Analysis to Inform a Differentiated Program Response to Tuberculosis: The Case of Kenya (journal publication)
12. Kenya Tuberculosis Prevalence Survey 2016 Survey Report
13. Kenya tuberculosis prevalence survey 2016: Challenges and opportunities of ending TB in Kenya (journal publication)
14. Kenya Tuberculosis Prevalence Survey 2016 Findings (1-page brief)
15. 'If not TB, what could it be?' Chest X-ray findings from the 2016 Kenya Tuberculosis Prevalence Survey (journal publication)
16. Diagnostic network optimization as part of a data-driven national strategic planning process in Kenya, 2018 (presentation)
17. The First Kenya Tuberculosis Patient Cost Survey 2017 (report)
18. People-Centred Planning Framework in Action: The Kenyan NSP Experience (case study)
19. Cost of TB services in healthcare facilities in Kenya (journal publication)

20. Mid-Term Review of the National Tuberculosis, Leprosy & Lung Health Unit of the Ministry of Health, Kenya, 28 February – 12 March 2014 (report)
21. Report of an independent Mid-Term Review of the Implementation of the Kenya National Tuberculosis, Leprosy and Lung Disease Programmatic Strategic Plan 2015-2018, March 9-20, 2017
22. National Strategic Plan for Tuberculosis, Leprosy and Lung Health 2015-2018
23. National Strategic Plan for Tuberculosis, Leprosy and Lung Health 2019-2023
24. The Global Fund TB and HIV Concept Note, funding request 2015-2017
25. The Global Fund Funding Request Form, Allocation period 2020-2022, funding request 2021-2024

Use case discussion

The purpose of the use case discussion was to better understand how TB data activities have helped the National TB Program and TB partners to:

1. Estimate the burden of TB in Kenya
2. Understand and address specific gaps in the TB care cascade
3. Make both short- and long-term plans for the TB program

"Use case" questions were developed with the aim to understand how the countries have used the various supplemental TB data tools and activities for the three purposes above (see Annex 3 for the use case discussion guide). Each set of questions was related to a section of the project's data framework (see Figure 2 below). Figure 2 shows the TB-related data activities that have been conducted in Kenya that may have been used to better understand each section of the data framework.

A 90-minute group discussion with three NTLP staff and TB partners was conducted virtually over Zoom in April 2022. The NTLP focal person was asked to select participants within the NTLP and TB partners who were closely involved in implementing and/or using the data from the supplemental activities and/or involved in the development of the most recent National Strategic Plan and Global Fund Application. The discussion was audio recorded and transcribed using NVivo's automated transcription software. Two project staff reviewed the notes and audio recording of the discussion and summarized responses for each section of the data framework. The summaries were compared to ensure consistency and accuracy.

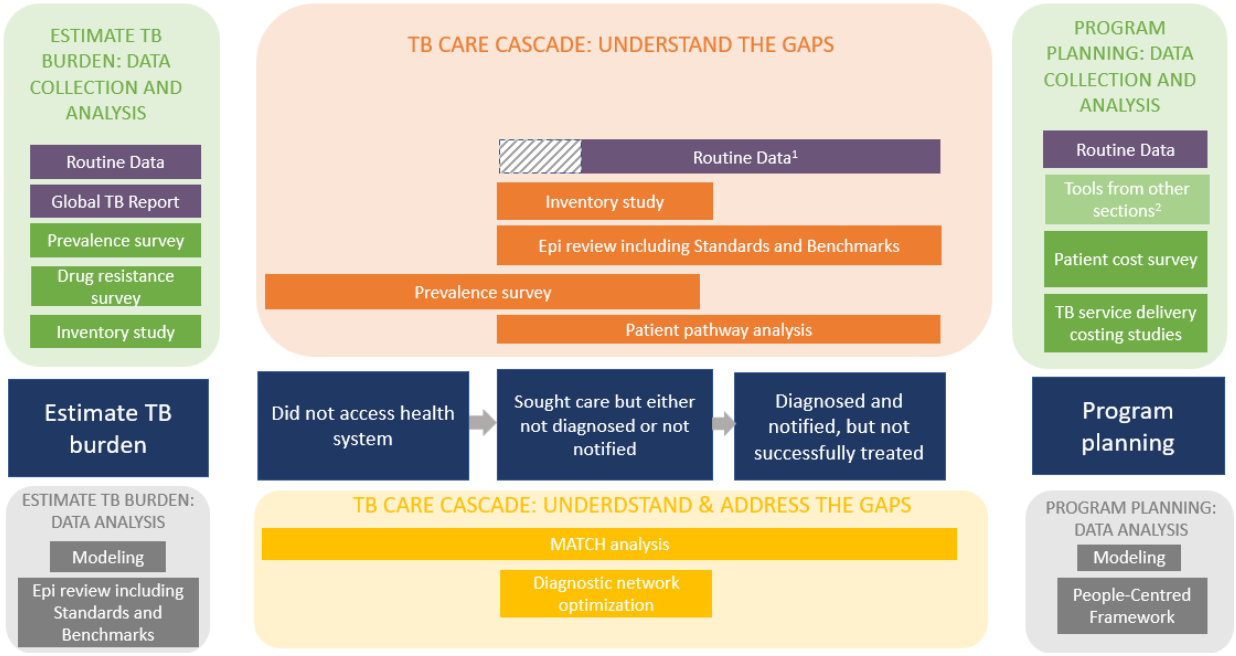


Figure 2. Framework for use of data activities in different aspects of TB program evaluation and planning adapted to the Kenya setting

[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

[2]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Key informant interviews

The purpose of the key informant interviews was to better understand the use and usefulness of the supplemental TB data activities.

Individual interviews were conducted with ten persons that work at the national or sub-national levels. At the national level, NTLP staff and persons at partner organizations that supported conduct of TB data activities or use TB data were interviewed. At the subnational level, TB program staff at the county level were interviewed. The interviews were approximately 60- to 90-minutes long.

Interviews were audio recorded, then transcribed verbatim using NVivo's automated transcription software. The transcripts were reviewed and coded by two project team members using NVivo. All codes were reviewed and agreed upon by project team members. Content analysis was conducted and key emerging themes (if at least 25 percent of respondents discussed a topic) were summarized.

Country Case Study Findings

Desk review

Desk review summary by TB data activity:

Supplemental TB data activity	Evidence of use of findings in National Strategic Plans (NSP)	Evidence of use of findings in Global Fund applications	Evidence of use of findings in program reviews
TB prevalence survey (TBPS) 2015-16	*2019-2023 NSP*: Findings were highlighted throughout the NSP. It was noted as a key successful survey. The findings and recommendations were used to inform and support several initiatives/interventions the country implemented to find missing TB cases. *2015-2018 NSP:* The TBPS was listed as an ongoing operational research priority at the national level. The survey was planned and conducted during this NSP period. It was noted that results from the survey would provide more information for the NTLP and inform programmatic planning and guide the program's priorities.	*2020-2022 application:* Findings were used for context and to highlight interventions and key activities for funding request. *2015 concept note:* It was noted that the NTLP was planning to conduct a national prevalence survey starting in 2015 mostly supported by The Global Fund.	*2017 midterm review:* It was noted that the TBPS was a key achievement and was successfully completed, though final results were not released yet; estimates used in the report were from WHO's 2016 Global TB report. Key challenges were identified and recommendations were made based on the results of the TBPS, including revising the NSP. *2014 midterm review:* Evaluate financial barriers for TB patients as part of the prevalence survey was listed as an operational research idea. It was recommended that preparations and data collection for the TBPS start as soon as possible.
Drug resistance survey (DRS) 4th DRS: 2014-15	*2019-2023 NSP*: The 4th DRS was listed as a major achievement and was successfully completed. Findings were used for context.	*2020-2022 application:* Findings were used for MDR-TB context. Funding request to conduct a repeat DRS.	*2017 midterm review:* It was noted that the DRS was a key achievement and was successfully completed.

	DRS was listed as a research priority under thematic area "Programmatic Management of Drug-Resistant Tuberculosis". *2015-2018 NSP:* The DRS was listed as an ongoing operational research priority at the national level. Development of the final DRS report and a meeting to disseminate findings of the DRS to stakeholders were planned during this NSP period.	*2015 concept note:* No evidence.	Findings were highlighted and used for context throughout the report. *2014 midterm review:* It was noted that funding for the DRS has been secured and it is scheduled to start in 2014 with preparations underway. It was recommended to conduct the DRS before staring the TBPS.
Inventory study (IS) 2014-15	*2019-2023 NSP*: Findings were used to highlight underreporting to TIBU (the electronic TB patient-management and recording system). It was noted that under this NSP, TIBU will be linked to the national database for social protection programs. Findings were used to highlight priority gaps: diagnosed but not notified and/or not started on treatment; low case notification from private sector; lack of a unique patient identifier. IS was listed as a research priority under thematic area "Data for Programmatic Monitoring and Planning". *2015-2018 NSP:* It was noted that an IS is needed to confirm the steady decline of TB case notifications. An IS was part of the monitoring and evaluation operational plan.	*2020-2022 application:* No evidence. *2015 concept note:* It was noted that Global Fund resources had been allocated to implementing an IS, which was ongoing.	*2017 midterm review:* Under summary of results, it was noted that an IS has been completed. Findings were highlighted under Strategy 2: Identify and Treat All Cases. *2014 midterm review:* Conducting an inventory study was listed as a recommendation and listed as one of the operational research ideas resulting from the review.
Patient pathway analysis (PPA) 2017	*2019-2023 NSP*: The PPA was noted as a key successful survey. Findings were highlighted throughout the NSP, used to	*2020-2022 application:* The PPM Action Plan 2017-2020 is a key reference document, which was developed in line with PPA	*2017 midterm review:* It was noted that the PPA was successfully completed.

	highlight priority gap: Underreporting and inconsistent TB case notification by private sector, and findings supported Strategic Intervention: Engage private sector care providers. The PPM Action Plan 2017–2020 was developed to guide the involvement of the private sector in TB prevention and care in line with the PPA findings. It was noted that the PPA has been useful in determining service provision and care seeking behavior for TB patients within the health system. *2015-2018 NSP:* No evidence.	findings; the action plan is reference throughout the application. *2015 concept note:* No evidence.	Findings were used as context for recommendations and to highlight key challenges. A key recommendation was to review the results of the PPA and TBPS to identify private providers to be prioritized.
People-centred framework (PCF) 2019	*2019-2023 NSP*: The PCF was used as the approach for data consolidation and prioritization during NSP development. The approach and findings are presented throughout the NSP.	*2020-2022 application:* Not directly mentioned in the application, but the PCF was used for NSP development.	*2017 midterm review:* No evidence since the PCF wasn't used until the 2019-2023 NSP.
Epidemiological (epi) review, including standards and benchmarks 2013 2017 2021	*2019-2023 NSP*: Findings from the 2017 epi review were used to highlight priority gaps. *2015-2018 NSP:* It was noted that the 2014 epidemiologic assessment and impact evaluation (epi review) served as critical background for the midterm review of the previous NSP (2011-2015). Findings from the 2014 epidemiologic assessment and impact evaluation (epi review) were highlighted in the epidemiology of TB section.	*2020-2022 application:* It was noted that epidemiologic analysis was used to guide the prioritization of interventions. *2015 concept note:* It was noted that an epidemiologic assessment and impact evaluation (epi review) was conducted prior to the development of the concept note.	*2017 midterm review:* The S andB and epi review methods were described and results were summarized; findings were used to highlight key policy-related challenges. An epi review was listed as completed since the 2014 midterm review. *2014 midterm review:* An objective of the review was to review the findings of the epidemiologic assessment (epi review); it was noted that the assessment informed the review.

Patient cost survey (PCS) 2017	*2019-2023 NSP*: Findings were used as context throughout the NSP and to highlight priority gaps. The PCS was listed as surveys conducted during the previous NSP (2013-2018) and was highlighted as a major achievement/major impact survey. It was noted that following the recently disseminated PCS, the NTLD-P enhanced advocacy towards getting more resources committed towards mitigating direct non-medical costs, particularly food expenses and nutritional supplements. It was listed as a national research priority to conduct a follow-up survey of TB Patient Cost survey in 2023. *2015-2018 NSP:* No evidence. However, one of the impact targets was to reduce the proportion of families facing catastrophic costs due to TB.	*2020-2022 application:* The PCS was listed as a key reference for country context; findings were used for TB context. *2015 concept note:* No evidence.	*2017 midterm review:* It was noted that a national catastrophic cost survey has been designed and there are ongoing preparations to conduct the survey.
Diagnostic network assessment (DNO) 2018	*2019-2023 NSP*: Findings were used to highlight priorities and interventions that have worked and should be sustained/scaled. *2015-2018 NSP:* No evidence.	*2020-2022 application:* Findings used to support intervention for funding request. *2015 concept note:* No evidence.	*2017 midterm review:* No evidence.
Epidemiological modelling 2019	*2019-2023 NSP*: Modelling done during the NSP development process was described and potential epidemiological impacts and cost-effectiveness of different measures in this NSP was presented. *2015-2018 NSP:* No evidence.	*2020-2022 application:* Strengthen analytic modelling and analytic capacity at program level is one of the proposed activities under intervention: analysis, evaluations, reviews and transparency.	*2017 midterm review:* No evidence.

Mapping and analysis for tailored disease control and health system strengthening (MATCH) 2018	*2019-2023 NSP*: MATCH (population and facility mapping) analysis was listed as an activity each county used to determine local priorities and approaches. *2015-2018 NSP:* No evidence.	*2020-2022 application:* No evidence.	*2017 midterm review:* No evidence.
TB service delivery costing study (Value TB) 2019	*2019-2023 NSP*: No evidence. The Value TB costs in Kenya were not yet finalized. *2015-2018 NSP:* No evidence.	*2020-2022 application:* No evidence.	*2017 midterm review:* No evidence.

Overall findings

Priority TB data activities and research:

Documented evidence of the need for TB data activities was observed for three data activities. The drug resistance survey was listed as a research priority in the 2019-2023 NSP and there was a funding request to conduct a repeat survey in the Global Fund application for allocation period 2020-2022. An inventory study and follow-up patient cost survey were also listed as research priorities in the 2019-2023 NSP, but there was no evidence of any funding request for the study in the Global Fund application for allocation period 2020-2022. Since the patient cost survey is not planned for until 2023, perhaps a funding request will be made in the next funding cycle application. Although Kenya has conducted many TB data activities, little evidence of incorporating plans for these activities in NSPs and funding applications was observed.

Supplemental TB data activities that were important for program planning: There was evidence that findings from the data activities were important in informing program planning and prioritizing interventions. Findings from these data activities were highlighted throughout the NSPs as evidence to highlight priority gaps and support proposed interventions and activities for the planning period. The people-centred framework and epidemiological modelling were especially useful during the NSP development process. There was no evidence of costs from the TB service delivery costing study being used to cost the 2019-2023 NSP, because costs have not yet been finalized during NSP development.

Supplemental data activities that were used or referenced in the Global Fund applications as rationale for funding include: the prevalence survey, drug resistance survey, epidemiologic analysis, patient cost survey and diagnostic network optimization.

Supplemental data activities that were important, used for or influenced the recommendations of the 2017 mid-term review include: the prevalence survey, drug resistance survey, inventory study, patient pathway analysis and epidemiological review. Several of the data activities had not been completed prior to the 2017 mid-term review but were mentioned as being ongoing activities.

Findings from almost all the data activities were highlighted and used as evidence for support in the NSPs, global fund applications and program reviews, but the findings from the prevalence survey, drug resistance survey, patient pathway analysis and patient cost survey were most frequently used. Mathematical modelling was used for the most recent NSP (2019-2023), but not in the previous NSPs.

Use case discussion

Respondent characteristics

Three NTLP staff consented to and participated in the use case discussion. All three participants were male.

Key findings from each section of the data framework

	Most critical and/or useful sources of data	Other data or tools that would be useful

Estimation of TB burden	• For DS-TB:
	  ○ 2015-16 prevalence survey showed twice the burden of the WHO estimate.
	  ○ Annual WHO estimates using modelling based on prevalence survey and annually reported routine indicators.
	• For DR-TB:
	  ○ Drug resistance survey.
	  ○ WHO estimates using modelling based on drug resistance survey and annually reported routine indicators.
	• For target setting:
	  ○ Routine surveillance data.
	  ○ WHO estimates.
		• Subnational level data to do modelling, identify interventions and set targets.
		• Socioeconomic status, malnutrition, areas with high incidence of TB/HIV.
		• TB data from IDSR (integrated disease surveillance and response, part of the Kenya health information system), which other ministries use to monitor outbreaks; would be good to compare IDRS TB data with TB program data.

People with TB who do not access the health system	• Prevalence survey and patient pathway analysis gave insight into health seeking behavior (e.g. challenges with men seeking health care, people seeking care in private sector). • Barriers to care/KAP survey with health care workers. • Use routine reporting, but there is a huge deficit at service delivery	• Reporting tools are under development to better capture whether presumptive cases identified in the community are captured at diagnostic facilities. • Want to be able to capture data on ALL steps/gaps in the TB care cascade and have this data flow into the national reporting system.

	points. Reporting system also includes data from contact investigation and contact tracing.	
People with TB who presented to health facilities but were not diagnosed and/or not notified	• Prevalence survey showed people who sought care but not diagnosed at facility level. • Inventory study identified people who were diagnosed but not notified. • The symptom screening tool has been rolled out nationally and is used to screen people presenting at a health facility; NTP staff do support supervision visits to facilities to provide technical assistance. • DHIS (Kenya Health Information System) has facility level data to track how many end up in the presumptive register, then how many cases are investigated/tested, then how many start on treatment. • Standards and benchmarks showed that the routine surveillance system can assess most of the needed indicators. • Diagnostic network optimization identified sites that require additional or new diagnostic tools and sites where GeneXpert is underutilized to optimize and ensure access to TB diagnostics.	• Trying to improve the TIBU system to ensure health facilities can report on the full TB care cascade. • Need a repeat inventory study to see if there has been any improvement but want an easier and less costly approach.
People with TB who were diagnosed but not successfully treated	• Review of quarterly routine data. Data are also shared with county coordinators to look at outcomes to try to understand cause of death, but not all needed information is collected. • A mortality audit tool helped to identify probable cause of death of TB patients who died while on treatment. • Epi review looked at treatment outcomes, with age/sex stratification.	• No suggestions.
TB program planning	• National TB Strategic Plan (NSP) development:	• Repeat drug resistance survey.

	○ Prevalence survey was critical. It informed where missed TB cases are in the care cascade and helped with procurement distribution. ○ People centred framework was done at national and subnational levels. ○ Prevalence survey and patient pathway analysis informed the linkage between lab diagnosis and notification and between lab and availability of clinical services. ○ Epi review helped identify gaps along the TB care cascade. ○ Patient cost survey informed strategies to mitigate catastrophic cost for TB patients. ○ Inventory study identified the gap of TB patients who were not notified. ○ WHO treatment success rates and NTP estimates to look at TB patients who were unsuccessfully treated. ○ Routine data was used to identify high burden areas to allocate resources where needed. • Global Fund proposal: ○ Based on the NSP; includes M&E targets in the NSP. ○ Mid-term and end-term program reviews identified gaps that needed to be addressed. • Routine program planning: ○ Annual NTP work plan and annual MOH work plan are both derived from the NSP. ○ Subnational level planning: used people centred framework matrix to identify gaps existing at national and subnational level; priority setting was done at county level – it was the	• Repeat use of people centred framework in the next NSP cycle. • Need additional assessment to assess current situation since epi reviews cannot provide all the information. • Strengthen costing of TB services by going through the entire care cascade from prevention to treatment. • Improved OneHealth tool for TB budgeting. • Additional modelling focusing on quantification to determine targets and procurement needs but need technical assistance to perform modelling.

	same interventions as national level but different priorities depending on county.	

Key takeaways

- The NTLP extensively used the findings from the supplemental activities to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but also relied extensively on routine data as an important source of information.
- The prevalence survey and drug resistance survey were key and established baseline estimates which were then used in modelling along with routinely reported indicators to provide yearly estimates.
- The people-centred framework was important in helping to guide NSP development. It was applied at both national and subnational level. The NTLP plans to use the people-centred framework in the planning process for the next NSP to have both a national plan and county operational frameworks.
- MATCH was completed but results have not been recently used. One reason cited was that the person who was involved with the analysis left the TB program.
- The NTLP would like a repeat drug resistance survey and inventory study. It would be helpful if there was an easier and less costly approach to the inventory study.
- Kenya's TIBU system already provides a lot of data, but improvements could be made to ensure that health facilities can report on the full TB care cascade. Other improvements to existing data systems or data that would be helpful include: provide NTLP access to the TB data from the IDSR so that it could be compared with TB program data, record and report data such as socioeconomic status, malnutrition and areas of high incidence of TB/HIV at subnational level, better capture whether presumptive cases identified in the community are captured at diagnostic facilities, capacity for data on all gaps in the TB care cascade to flow into the national reporting system.

Key informant interviews

Respondent characteristics

Of the ten key informants, half were NTLP staff and the other half were in-country TB partners (Figure 3, middle). On average, the respondents have been doing TB-related work for 11.7 years (standard deviation = 3.1). Respondents were 60 percent male and 40 percent female (Figure 3, left) and mostly worked at the national level (80%) (Figure 3, right). The majority of respondents were familiar with (either were involved in implementing and/or planning and/or heard the results of findings) all the following supplemental TB data activities: the prevalence survey, patient cost study, patient pathway analysis, drug resistance survey, epidemiological reviews including standards and benchmarks, epidemiological modelling, inventory study, diagnostic network optimization, people-centred framework, service delivery costing study (Value TB) and MATCH (Figure 4).

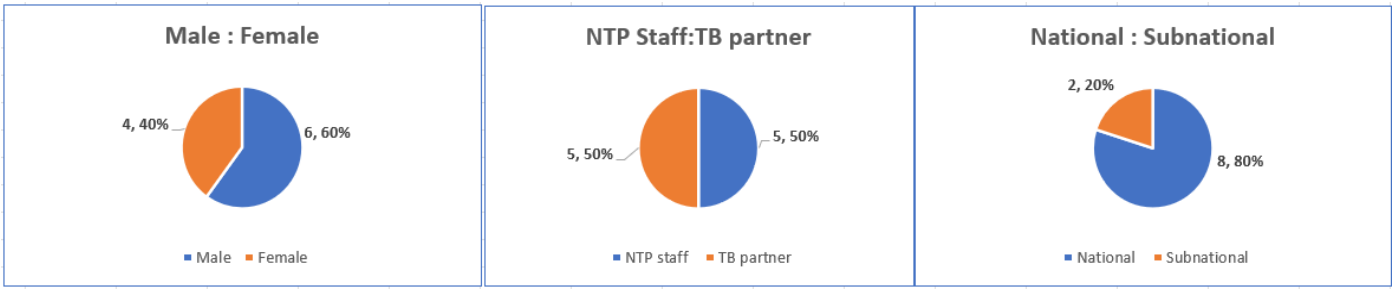


Figure 3. Characteristics of key informants (left: male to female ratio; middle: NTLP staff to partner ratio; right: national to subnational level ratio)

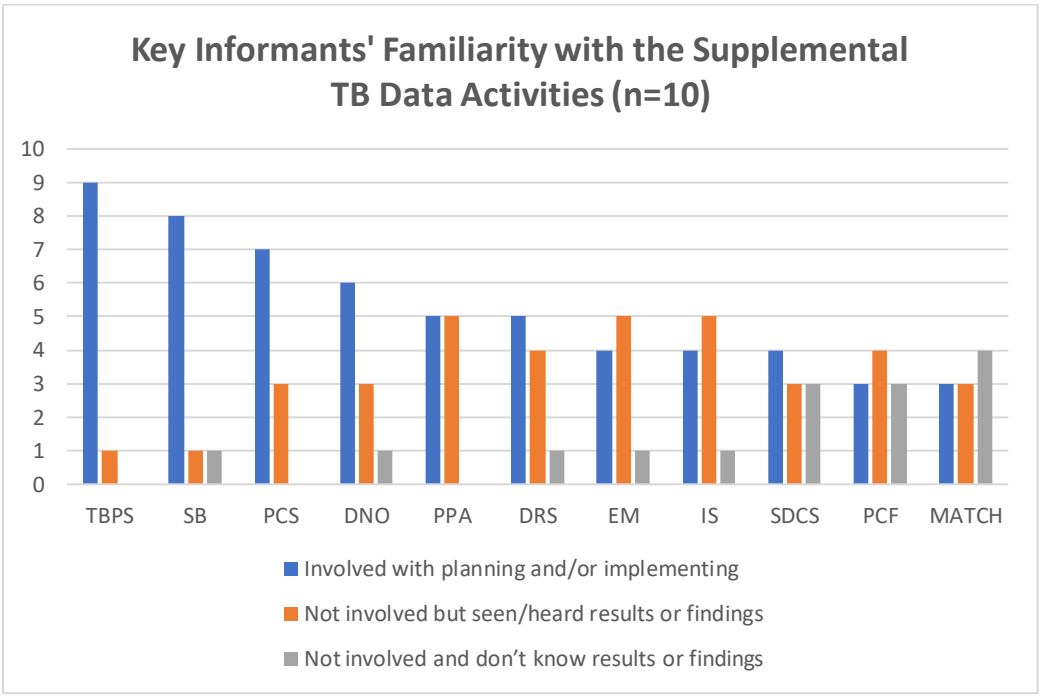


Figure 4. Key informants' familiarity with the supplemental TB data activities implemented in Kenya

TBPS = TB prevalence survey; SB = epidemiological review, including standards and benchmarks; PCS = patient cost survey; DNO = diagnostic network optimization; PPA = patient pathway analysis; DRS = drug resistance survey; EM = epidemiological modelling; IS = inventory study; SDCS = service delivery costing study (Value TB); PCF = people centred framework; MATCH = mapping and analysis for tailored disease control and health system strengthening.

Key emerging themes

The following key themes emerged from the key informant interviews.

Theme: Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan.

- Respondents expressed that Kenya's electronic routine data system (TIBU) is sufficient and collects high quality data albeit some data are not collected in the routine system. Supplemental TB data activities that have been particularly useful in filling in these data gaps include the patient cost survey, prevalence survey, patient pathway analysis, diagnostic network optimization and inventory study. Other important activities include epidemiological modelling, people-centred framework, drug resistance survey and epidemiological reviews.
- **Patient cost survey** was the most frequently mentioned activity that was particularly useful, especially on impacting policy/schemes and resource mobilization. The survey informed schemes (e.g. cash transfer) to assist TB patients with costs and nutritional supplements. The findings also helped the NTLP advocate for roll-out of a national health insurance and convince insurance to pay for TB services.
- **Prevalence survey** was very often mentioned generally as a key or critical activity, but especially in guiding interventions and informing the NSP. Findings also provided evidence for funding requests to reduce the TB burden and to strengthen investment in diagnostics and treatment. Additionally, findings influenced resource allocation at subnational level.
- **Patient pathway analysis** was often mentioned as important in understanding health care seeking behavior and gaps in the TB care cascade and informed how to address these gaps. Findings also informed allocation of resources to areas/facilities that have the greatest need and informed private sector engagement.
- **Diagnostic network optimization** was often mentioned as important for strengthening the diagnostic network and informing the placement of diagnostic tools, like GeneXpert; however, a few respondents believe more can still be done, especially with newer diagnostic tools being used.
- **Inventory study** was often mentioned as critical for identifying the leakages in the TB care cascade and addressing the gap by ensuring the linkage between diagnosis and treatment (e.g. registration/notification at diagnosis).

Illustrative quotes:

"The strategic plan really benefited fully from the use of these activities because the information was brought together to inform that strategic plan. But more importantly, this information has also been used and referenced for planning, resource mobilization and grant requests, for example, global fund grant requests. We often reference the reports and the findings and recommendations of these activities." – Key Informant, National level, Kenya

Theme: Challenges with funding

- Most, if not all, supplemental TB data activities are funded by external donors; big surveys (e.g. TBPS) are very costly.
- Funding is often inadequate to support implementation of supplemental TB data activities, especially the implementation of the recommendations that result from these activities.
- Funding does not always align with the country's priorities; ensure investment is in prioritized activities.
- The routine data system and routine TB program activities are only partially funded by the government, the remainder is funded by donors.

- Many respondents believe the government should invest more into the routine systems, but that donors should keep funding supplemental activities. One respondent believes domestic resources should be raised to ensure that the key supplemental activities are funded and implemented.

Illustrative quotes:

"The unfortunate thing with funding is, especially funding from international stakeholders or donors, sometimes the funding does not always align with the country level priorities. Maybe in this strategic period, this is where the donor's priorities are and those do not match the national TB program's priorities in that specific year. But then towards maybe the end of the strategic period, it's very clear that all these supplemental activities should have taken place. So you find that you have multiple activities happening at the same time because this list of activities needed to have taken place in this five year strategic period. Alignment is extremely important, but the importance of the actual activities cannot be overemphasized." – Key informant, National level, Kenya

"The challenge at county level, we are so dependent on the national level and partners on the implementation of the supplemental activity. The recommendations can be given from the survey, but the implementation has a cost attached to it. The counties are told these are the problems they [the activity] identified, these are the solutions, this is what you're supposed to do and these are the guidelines and how you are going to go about it. But the challenge is, the county usually thinks a partner is supposed to fund and implement that particular activity, so we, due to lack of resources and the national TB program is also stretched, you find that we have integrated them into our county work plans, but they are not implemented because there were no resources that were located by the county." – Key Informant, Subnational level, Kenya

"The challenge would be the finances to implement many of these supplementary activities. Many of these are not routinely captured in the regular funding streams. Funding for TB programming, the government will largely take care of commodities, Global Fund will largely take care of the routine program activities. If you are able to sneak in one or two surveys, the better for you. But by the time the Global Fund grants are being written, not everything is clear. Even if you have some ideas of what some of these research or surveys could be, funding levels will largely limit you, because preference would be given to routine programmatic activities. Same with funding streams from USAID. They may not have adequate or even earmarked and protected funds to be able to carry out some of the supplemental activities. So there needs to be very high and very deliberate effort to be able to carry out, to be able to fund these supplemental activities." – Key Informant, National level, Kenya

"There's a lot of value that comes with the investments into strengthening the routine systems…The concern I have is because of [donor] funding, sometimes we do not know how we can ensure that the routine systems are moving in the direction of the future, digitizing data collection, ensuring that the electronic reporting system begins from the grassroots level and is not depend on various input by various human resources. Because of that, the investment in strengthening routine systems is a lot more than it needs to be…We've had a lot more investments through various technical and implementing partners, but without that support many of these supplemental activities would've had trouble being implemented. So

I'm a big proponent of raising domestic resources to ensure that some of these very important activities are funded." – Key Informant, National level, Kenya

Theme: Timing and coordination of supplemental activities is important

- There are challenges with coordinating supplemental TB data activities, there are multiple stakeholders involved.
  - Coordinating planning and implementation of an activity: The NTLP and partners have to agree on concept note development, planning, etc., without leaving the NTLP staff behind.
  - Coordinating planning and implementation of multiple activities: There needs to be a consensus on what activities to prioritize, what activity is needed now.
  - Coordination between the NTLP and county TB programs to plan and implement supplemental activities: different counties have specific challenges/needs.
- External partners should coordinate timing with the NTLP to ensure that supplemental activities are implemented at the right time - which activities the country needs/wants to focus on in the current strategic period and which to prioritize for the next strategic planning period.
  - Work with the NTLP during the early stages of developing the NSP so these activities do not disorient the programs in the middle of a strategic period; the collective information from the supplemental activities inform the development of the NSP, so activities need to be completed before writing the NSP and subsequently writing grant applications (e.g. Global Fund application).
  - External partners can ask to be a part of the quarterly review meetings to present any proposals for TB-related data activities.

Illustrative quote:

"Of course, they [the NTLP] wouldn't want to be left behind in this activity. So, putting things together when we are developing the concept, the pre-study preparations and all that is easier once we've agreed on what we are planning." – Key Informant, National level, Kenya

"Prioritize is this what we need now, must we do this activity now? Must we do a prevalence survey, can it wait? So, the consensus on the reason for doing and when to do it is another big problem, [because] the TB program is part of the Ministry of Health." – Key Informant, National level, Kenya

"Work closely with the national TB program to ensure that there's always an opportunity to think about. For example, [for] this particular strategic year what supplemental activities do we feel as a country we need to focus on? Then in the next year, which supplemental activities do we need to prioritize in the five-year strategic period, we need these five supplemental activities to take place, rather than leaving the timeline open. We can determine what would happen when, so that timing can be informed by the various activities happening in the country. That would really go a long way in ensuring that each of the various activities happens at the right time." – Key Informant, National level, Kenya

Theme: Important to build local capacity, but technical assistance is still needed

- Supplemental TB data activities have provided an opportunity for capacity building of TB program staff.
  - Program staff can learn research methods, protocol development, data analysis and translating findings into policy from external technical partners.
- For future implementation of supplemental activities, respondents would like to further build capacity of TB program staff, both technical capacity and its workforce.
  - Hire additional staff (e.g. survey coordinator) and/or assign specific program officers especially for big surveys (e.g. TBPS, DRS); there are challenges with high workload and competing priorities for TB program staff, who are running programmatic activities and supplemental activities at the same time. Respondents believe the challenge is not necessarily a lack of data analytic skills but more so taking time to decide what to do with the data due to competing priorities and lack of funding to implement recommendations.
  - It is desired that the NTLP can eventually implement supplemental activities without external technical assistance; building technical capacity will allow for less dependence on external experts to implement supplemental activities and the TB program will be able to implement certain activities more routinely without waiting for technical assistance (e.g. DNO, modelling, MATCH, PPA).
- There is a desire to build a research culture and technical capacity among subnational level staff so that they can conduct their own local surveys and studies.
- There is a desire to have south-south support to invest in building capacity in countries.

Illustrative quote:

"An opportunity would be if this is done routinely, holding the hands of the routine program officers would help build their capacity and skills to be able to look beyond routine activities and into thinking scientifically, which will essentially translate into better programming. It will build their capacity on how to analyze the data and how to approach some aspects in a systematic manner… If some of these skills are learned extremely well, it can be applied by the routine program officers to carry out future [supplemental] activities on their own or being the lead without having to wait for externals to come teach the process." – Key Informant, National level, Kenya

"So, we have the diagnostic network, epidemiological modelling and match analysis. I think those would be very, very important to build capacity so that we can routinely implement these activities." – Key Informant, National level, Kenya

"I've always proposed that we have inter-country meetings to share these experiences. African cities can coordinate or WHO AFRO who can link these people together. They can share what is happening, what is their experience, how can we work best towards all of us achieving [for] the good of the patient, but also efficiently. We are always trying to fill a gap, but we could try to fill the gap from learning from each other." – Key informant, National level, Kenya

Theme: Dissemination of results and recommendations

Dissemination practices:

- Dissemination of findings and recommendations from supplemental TB data activities are done at various levels.
- At national level

- Conferences: Findings are presented at conferences or forum with various TB stakeholders, partners and the Ministry of Health.
- Review meetings: Findings are presented at mid-term and end-term review meetings with external reviewers.
- Findings are released in hard copy and/or soft copy (e.g. reports, one-page brief) to county-level and other stakeholders.
- Findings are disseminated through the National Strategic Plan.
- Majority of NTLP staff are well-informed on findings from recent surveys or activities if staff were involved in the implementation and dissemination of the activity and/or the discussion of results.
- Challenge with passing on information when there is staff turnover; newer staff may not be caught up on findings.
- Partners are adequately informed since they support the planning and implementation of the activity and are invited to dissemination activities.

- At subnational level
  - Meetings: Findings are shared during TB coordinators' meeting, support supervision meetings or other engagements with counties and sub-counties; findings inform decisions at the lower levels.
  - Guidelines: Findings are shared through new guidelines and/or training materials distributed to subnational level.
  - Peer to peer: TB coordinators at county level are usually well-informed, they have regular meetings with national level staff. They then pass the information down to lower levels.
  - Shortcomings: Not all subnational level staff are adequately informed and often miss out on dissemination opportunities, especially staff implementing/supporting activities at the facility level/service delivery points; there is a need to find the right channel to appropriately package the information so action can be taken at the lower level.
- Shared widely
  - Findings are published in the quarterly bulletin.
  - Findings are shared on the NTLP website (e.g. reports, publications, NSP).
  - Published articles in journals.
  - The radio is used to communicate key findings and messages to the public.
- Supplemental TB data activities that are most widely disseminated/shared:
  - Prevalence survey, drug resistance survey and patient cost survey results have been shared widely, while findings from other activities are presented, for example, in the National Strategic Plan.

Illustrative quotes:

"For the prevalence survey, the feedback on the results and the dissemination of the results was done quite perfectly, because a lot of people are interested in that data, all the partners and the national TB program. We had dissemination meetings and physical meetings where the feedback was relayed, and the results were also printed out and distributed [and] being cascaded downwards. Then for the rest of the studies, like the patient pathway analysis, the patient cost survey, the diagnostic network optimization, some of them were integrated into the National Strategic Plan…Apart from the National Strategic Plan, they do county profiling. For example, you get a snapshot of the indicators and some of the results needed to be implemented in the county…they made a one-pager or a two-pager county profile document as part of the dissemination." – Key Informant, Subnational level, Kenya

"After each supplemental activity just sit down and the findings are disseminated and digested and start thinking about how that affects programming. We don't quite have that, we need this. [For example], someone just [quoted] the inventory study indicated that we were losing 21 percent of our clients. So what do we put in and what measures do you put in place to be able to [address] this?" – Key Informant, National level, Kenya

Suggestions for improvement from respondents

- Subnational level estimates: there is a need for subnational level estimates since counties have varying populations and socio-cultural issues. One respondent suggested smaller subnational prevalence surveys every five years. Another respondent suggested that inventory studies could be conducted by subnational level staff if capacity building is done.
- Build capacity of TB program staff at national and subnational level to be able to implement supplemental TB data activities with less dependence on external experts.
- Frequency of the activities is not clear; there is a need for guidelines or recommendations on when countries are supposed to implement each activity.[1]
- Suggestions for specific activities:
  - Prevalence survey: more inclusive/wider sampling (e.g. include other congregate settings such as schools and prisons).
  - Epidemiological review: include qualitative methods to capture quality of care.
  - Epidemiological modelling: review inputs.
- Suggestions for improving dissemination:
  - Need a dedicated forum involving staff from national level and subnational level to sit down after dissemination and think about how findings affect TB programming.
  - Need continuous dissemination, not just a one-time release of information to remind TB program staff at subnational level.
  - Need a plan to target stakeholders like policy makers and Minister of Health to improve sensitization and have continuous conversations.

Overall findings

When the findings from the case study's three activities were jointly analyzed, several overall themes emerged and are described below. These triangulated findings are the same as those presented in the executive summary.

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the national strategic plan (NSP):** The different supplemental activities that Kenya conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and develop interventions and strategies for national strategic planning, but the country also relied extensively on routine data. Activities that have been particularly useful include the prevalence survey, drug resistance

[1]The key informant interviews were conducted before the WHO "Compendium of data and evidence-related tools for use in TB planning and programming" was completed and published.

surveys, patient cost survey, patient pathway analysis, diagnostic network optimization, people-centred framework and inventory study. Other important activities included epidemiological reviews and epidemiological modelling. For the next NSP development period, the NTLP plans to use the people-centred framework again in the planning process for both the national and county level. The NTLP would like to do additional modelling to help determine targets and identify procurement needs but would need technical assistance for this. The NTLP would also like to conduct a repeat drug resistance survey and inventory study but would prefer an easier and less costly approach to the inventory study. Respondents indicated a need for subnational level data and estimates to identify interventions and set targets at lower levels, the desire to strengthen costing of TB services by costing all aspects of the TB care cascade and would like for the OneHealth tool for TB budgeting to be strengthened.

- **Timing, coordination and availability of funding of supplemental activities are critical:** Timing and coordination of a supplemental TB data activity or with multiple activities can be challenging, especially when there are multiple stakeholders involved with planning and implementation. External partners and the NTLP should coordinate to ensure prioritized supplemental activities for the next strategic planning period are implemented at the right time and in time to inform development of the next NSP. In general, there is inadequate domestic funding for TB-related activities and almost all supplemental activities are funded by external donors. In the past, there was a challenge with alignment of funding with the country's priorities in a strategic period. As a result, multiple supplemental activities were being implemented at the same time at the end of the strategic period rather than over five years. Moving forward, it will be important to plan the order and timing of data activities, rather than keeping the timeline open.

- **Important to build local capacity to be able to implement supplemental activities without dependence on external technical assistance:** While supplemental TB data activities have provided opportunities for capacity building for TB program staff in the country, there is desire to further build capacity to be able to eventually implement supplemental activities in country without external technical assistance. Part of the challenge is the high workload and competing priorities for TB program staff who are running routine programmatic activities and implementing supplemental activities at the same time, so there is also a desire to build the workforce and hire additional staff for supplemental activities. Furthermore, there is a desire to build more of a research culture as well as technical capacity among subnational level TB staff to implement certain supplemental activities in their own counties. Respondents believe that investment in south-south support is important to helping build capacity in the country.

- **Dissemination of results and recommendations:** Dissemination of findings and recommendations is done at various levels. NTLP staff and partners are often adequately informed since they are involved in planning and implementation of the supplemental activities and are invited to dissemination events. After dissemination, there is a need to have a dedicated time as well as a forum for national and subnational level staff to discuss how findings affect TB programming. There is often inadequate funding to implement the

recommendations resulting from supplemental activities. Therefore, there is also a need to target specific stakeholders like policy makers and the Minister of Health to improve sensitization about the identified needs and recommendations and to have continuous conversations.

While there are opportunities to engage and share findings with subnational level TB staff, not all subnational level staff are adequately informed and they often miss out on dissemination opportunities, especially those working at the facility level. There is a need to find the right channel to appropriately share relevant information to each level, so that findings can also be translated into action at service delivery points.

- **Remaining data gaps for programmatic planning:** While Kenya's routine data system (TIBU) provides a lot of data, it is understood that routine surveillance systems cannot capture all data needed for programmatic planning. It would be helpful if the NTLP could access the TB data from the Integrated Diseases Surveillance and Response system (IDSR) so that it could be compared with TB program data. There is also a desire for TB cases referred by community health workers to be better streamlined for monitoring. Other data that would be helpful include socioeconomic status, malnutrition and location of areas with high incidence of TB/HIV data that's collected and reported at subnational level.

Conclusion and next steps

This country case study was conducted to learn from Kenya's experience with planning and implementing supplemental TB data activities and to better understand how these activities have helped the NTLP and TB partners to: gain insight of the TB burden in the country, better understand gaps in the TB care cascade and design interventions to address those gaps, and make both short- and long-term plans for the TB program.

The case study was an opportunity for Kenya's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Kenya's MOH look at how these supplemental activities have been used in the past, which may help them prioritize TB data activities in the future. Key takeaways from the Kenya case study will be factored into the overall recommendations coming out of the project, which will cover both general aspects of planning and implementing supplemental TB data tools as well as tool-specific recommendations.

Findings from Kenya have been compiled with findings from the four additional country case studies, global-level interviews and global desk review, and the NTP manager survey to develop a framework to help countries prioritize TB data-related activities. This framework is currently under development in partnership with the World Health Organization (WHO).

Annex 14: Pakistan Country Case Study Report

Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning:

Pakistan Country Case Study Report

Project implemented by the CDC Foundation and Centers for Disease Control and Prevention (CDC) with funding from the Bill & Melinda Gates Foundation

July 2023

List of abbreviations

BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
CMU	Common Management Unit
DNA	TB Diagnostic Network Assessment
DNO	Diagnostic Network Optimization
DRS	Drug Resistance Survey
GIS	Geographic information system
IS	Inventory Study
MATCH	Mapping and Analysis for Tailored disease Control and Health system strengthening
M&E	Monitoring and Evaluation
NHSRC	Ministry of National Health Services, Regulations and Coordination
NRL	National Reference Laboratory
NSP	National Strategic Plan
NTP	National TB Control Program
PCF	People-Centred Framework
PPA	Patient Pathway Analysis
PSRx	Private Sector Drug Sales Analysis
TB	Tuberculosis
TBPS	National TB Prevalence Survey
WHO	World Health Organization

Project team and participants

Project Team

Miranda Bodfish	Associate Vice President, Infectious Disease Programs, CDC Foundation
Christina Braccio	Health Scientist, Global Tuberculosis Branch, U.S. CDC
Anand Date	Branch Chief, Global Tuberculosis Branch, U.S. CDC
Rachel Fiorillo	Project Manager, Infectious Disease Programs, CDC Foundation
Jennifer Harris	SIA Team Lead, Global Tuberculosis Branch, U.S. CDC
Eveline Klinkenberg	Consultant, Connect TB, the Netherlands
Stephanie O'Connor	Epidemiology Fellow, Global Tuberculosis Branch, U.S. CDC
Victoria Tully	Public Health Analyst, Global Tuberculosis Branch, U.S. CDC

Project Steering Committee

Sevim Ahmedov	USAID
Kenneth Castro	Emory University and USAID
Daniel Chin	Bill & Melinda Gates Foundation
Kathy Fiekert	KNVC Tuberculosis Foundation
Harry Hausler	TB HIV Care
Fukushi Morishita	World Health Organization, Western Pacific Region
Nnamdi Nwaneri	The Global Fund to Fight AIDS, Tuberculosis and Malaria
Suvanand Sahu	Stop TB Partnership
Charalampos (Babis) Sismanidis	World Health Organization
Stavia Turyahabwe	Tuberculosis and Leprosy Program, Ministry of Health Uganda

Pakistan participants

Razia Fatima	Acting Advisor TB Chief, Research and Surveillance, National TB Control Program, Common Management Unit (HIV/AIDS, TB & Malaria)
Abdul Ghafoor	USAID, Pakistan
Sabira Tahseen	National TB Reference Laboratory, National TB Control Program, Common Management Unit (HIV/AIDS, TB & Malaria)
Sobia Faisal	MDR-TB Unit, National TB Control Program, Common Management Unit (HIV/AIDS, TB & Malaria)
Faheem Jan	Research Unit, National TB Control Program, Common Management Unit (HIV/AIDS, TB & Malaria)
Aashifa Yaqoob	Research Unit, National TB Control Program, Common Management Unit (HIV/AIDS, TB & Malaria)
Sarmad Wahaj Siddiqui	Provincial TB Control Program, Punjab

Syed Saleem Hassan Kazmi	Provincial TB Control Program, Sindh
Khawaja Laeeq Ahmad	World Health Organization, Pakistan
Adeel Tahir	Mercy Corps, Pakistan
Aamna Rashid	Mercy Corps, Pakistan
Farah Naureen	Mercy Corps, Pakistan

EXECUTIVE SUMMARY

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of TB data activities outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these activities are referred to as "supplemental" TB data activities. This project took place from January 2021 through August 2023 and had three phases:

1) Global-level desk review and key informant interviews
2) Country case studies in five countries
3) Online survey of National TB Program (NTP) managers in countries that had substantial experience with supplemental TB data activities

This report summarizes the activities and findings of the Pakistan case study (conducted August 2022 to February 2023) and is intended for the Pakistan National TB Control Program (NTP) and their partners. This country case study consisted of three parts 1) a desk review of existing evidence related to Pakistan's use of supplemental TB data tools and activities; 2) a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade; 3) a series of key informant interviews on the use and usefulness of supplemental TB data activities implemented in Pakistan.

The following overall themes emerged from the combined analyses for Pakistan:

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of National Strategic Plans (NSPs):** The different supplemental activities that Pakistan conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and develop interventions and strategies for the TB national strategic plan, though the country also relied extensively on routine TB data from the routine surveillance system. Supplemental TB data activities that have been particularly useful include the prevalence survey, drug resistance survey, patient pathway analysis, inventory studies (adult and childhood TB), epidemiological reviews and epidemiological modelling. While conducting the people-centred framework, TB staff from both the national and provincial levels participated in the workshop, which was useful for strategic planning at both levels of the health care system; the TB program would like to

repeat this activity for the next national strategic planning cycle, but it is not a budgeted activity for NSP development. The MATCH and private sector drug sales analyses were primarily used by the private sector; less by the national TB program/public sector. Implementation of the TB diagnostic network assessment and diagnostic network optimization were still underway at the time of the case study, but it is anticipated that their findings will provide important information for planning and making the diagnostic network more efficient. The country is planning a second prevalence survey, which aims to be powered to provide subnational level estimates to allow for planning at the provincial level; the protocol has been developed, but funding has not been secured yet. There are also plans to conduct a TB patient cost survey.

- **Timing, coordination and funding for supplemental TB data activities are challenging but critical:** Supplemental TB data activities are most useful when they are implemented at the right time to provide important information for program/strategic planning, decision making and writing grant applications. Therefore, it is important to align implementation of data activities with the country's need at the time and with their strategic planning and Global Fund cycle. However, it can be challenging to align certain activities with the country's strategic period, because planning, implementation, analysis and interpretation can take a long time. Additionally, acquiring external funding for supplemental TB data activities can be a huge challenge, as it may not be available or adequate when the country needs it. For example, a protocol for a second prevalence survey which aims to be powered to provide subnational level estimates has been developed, but there is a struggle to secure funding to implement this large survey. Funding challenges also occur with implementing recommendations that result from the activity. In general, there is a lack of domestic funding for TB-related activities. There is a desire to increase domestic funding for the national and provincial TB programs, but it is unfortunately not realistic with other emergencies happening in the country (e.g. floods) which also need external funding support.

- **Important to build local capacity, but technical assistance is still needed:** Supplemental TB data activities have provided the opportunity to build technical capacity in the country. TB program staff at both national and subnational level have learned to implement supplemental activities, learned from field work and developed research skills further. The country is in a favorable position to have a group of NTP staff and TB partners with institutional memory, which will be helpful for implementation of future supplemental activities, such as a second prevalence survey. Subnational level staff expressed interest in a closer collaboration with NTP staff to build technical capacity and be more engaged in implementing data activities; subnational level staff would like to further develop their technical capacity to use their own data for decision making.

- **Dissemination of results and recommendations:** Dissemination of findings and recommendations are typically done at the national level through a variety of ways (e.g. meetings, seminars, workshops, publications, reports) and trickles down to the subnational levels. National and provincial TB program staff, external and internal implementing partners

and funders are generally invited and adequately informed since they are involved in planning, implementing and dissemination events. However, proper dissemination to different audiences is not currently being done and could be improved; there is a desire to ensure dissemination is tailored to different audiences (e.g. policy makers, academia, facility level service providers) to get the message across more effectively and ensure findings are being translated into action. Subnational level dissemination could also be improved since many subnational level TB staff are not as engaged during implementation of supplemental TB data activities; it is especially important to engage the provincial TB program staff from the beginning since they have their own provincial strategic plans. Most importantly, optimally implementing recommendations resulting from these activities could be improved. In some cases, recommendations were not implemented due to lack of ownership or lack of resources; there should be a mechanism for following up on recommendations. Some respondents suggested that the NTP could help push/ensure that both the public and private sectors are using the findings and implementing the recommendations.

- **Remaining data gaps for programmatic planning:** While the country's electronic routine TB data system provides a lot of key data, it is understood that it cannot capture all the needed data for burden estimation, understanding and addressing gaps in the TB care cascade and for TB program planning. It is perceived that once the NTP transitions to case-based surveillance data, it will enable better analysis of the routine data for understanding and addressing gaps in the TB care cascade. It would also be helpful if the NTP could access and use data from other data sources or data systems in the country which also collect TB data, such as the Pakistan Social Living Services Survey which is done at the local levels. It would also be helpful if data from private providers were linked with the NTP database/public sector data.

This case study was an opportunity for Pakistan's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Pakistan's Ministry of National Health Services, Regulations and Coordination (NHSRC) look at how these supplemental activities have been used in the past and to help them prioritize TB data activities in the future. However, findings from this case study are not meant to stand alone; they have been compiled with findings from the four additional country case studies, global-level interviews and desk review and the NTP manager survey. The triangulated findings are being used to develop a framework that will help countries prioritize TB data-related activities and develop a timeline for these activities. This framework is currently under development in partnership with the World Health Organization (WHO).

MAIN REPORT

Project Background

Overview of the overall project

Currently there are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist in the collection of and use of TB-related data. While these TB data activities provide important information, they are often supplemental to routine data collection and implementation of such activities can place an extensive burden on ministries of health (MOH), national TB programs (NTPs) and partners, and may not occur in an optimized and efficient manner.

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of "supplemental" TB data activities from both the country and global partner perspectives. For this assessment, "supplemental" TB data activities are those that go above and beyond routine data activities. These activities may include, but are not limited to, TB prevalence surveys (TBPS), drug resistance surveys (DRS), inventory studies, patient cost surveys (PCS), TB service delivery costing studies, care cascade analyses, One Health Tool for TB budgeting (OHT), diagnostic network optimization (DNO), epidemiological modeling, mapping and analysis for tailored disease control and health system strengthening (MATCH), patient pathway analysis (PPA), people-centred framework (PCF), quality of TB services assessment (QTSA), TB diagnostic network assessment (DNA), private sector drug analysis (PSRx), screen-TB and epidemiological reviews including standards and benchmarks. The goal of the "TB Data Optimization" project, was to document experiences from countries and global stakeholders in implementing "supplemental" TB data activities and use this information to develop effective and efficient approaches to optimizing TB data-related activities for program planning.

This assessment was conducted from January 2021 through August 2023 by the U.S. Centers for Disease Control and Prevention (CDC) and the CDC Foundation (a non-profit organization affiliated with the CDC) and funded by the Bill & Melinda Gates Foundation.

Overall project objectives

1. Summarize existing evidence and global partner perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
2. Summarize country perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
3. Map and align objectives and metrics across supplemental TB data- and evidence-related activities.
4. Synthesize findings into a set of recommendations for the optimization of data generation, review and analysis efforts.

This mixed-methods assessment was conducted in three phases as shown in Figure 1. Refer to Annex 1 for more details on the project phases.

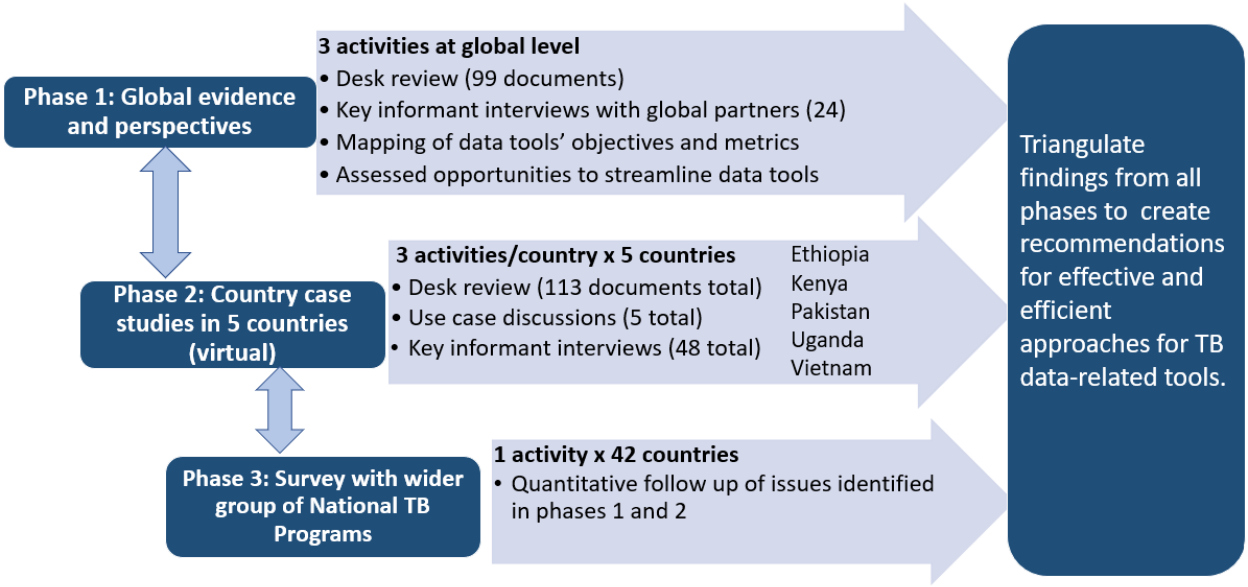


Figure 1. Three phases of the project

This report summarizes the activities and findings of the Pakistan country case study and is intended for the Pakistan NTP and their partners.

A comprehensive report with findings and recommendations from all three phases of the project, including the five country case studies, will be shared by the project team when complete.

Country case study objectives

1. Review existing evidence related to Pakistan's use of TB data tools and activities (desk review).
2. Conduct a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade in the country.
3. Conduct key informant interviews on the use and usefulness of supplemental TB data activities implemented in Pakistan.

Country Case Study Methods

Desk review

A list of supplemental TB data activities that Pakistan has implemented was obtained from the WHO. The list of activities was shared with the NTP and confirmed. The documents reviewed were obtained through e-journals or shared by NTP staff.

Twenty-one supplemental TB data activity reports, publications and strategic planning documents from the last 10 years or more were reviewed. A standardized template (see Annex 2) was used to extract information. Lessons learned were extracted from activity reports while evidence of the use of the activities' findings/recommendations was extracted from strategic planning documents such as National Strategic Plans and Global Fund applications. From these, an overall summary with main takeaways was synthesized.

Documents reviewed:

1. Prevalence of pulmonary tuberculosis among the adult population of Pakistan 2010-2011 (report)
2. Population Based National Tuberculosis Prevalence Survey among Adults (>15 Years) in Pakistan, 2010-2011 (publication)
3. Investigation of presumptive tuberculosis cases by private health providers: lessons learnt from a survey in Pakistan (publication)
4. Estimating tuberculosis burden and case detection in Pakistan (publication)
5. Use of Xpert MTB/RIF assay in the first national anti-tuberculosis drug resistance survey in Pakistan (publication)
6. Inventory study in Pakistan (presentation)
7. Measuring and addressing the childhood tuberculosis reporting gaps in Pakistan: The first ever national inventory study among children (publication)
8. Child TB Inventory Study Pakistan, 2018 (presentation)
9. Size and Usage Patterns of Private TB Drug Markets in the High Burden Countries (publication)
10. Estimation of Adult TB Patients treated in the private sector in Pakistan through ATT medicine sales: National, Province and District level analysis and results, 2019 (report)
11. Finding gaps in TB notifications: spatial analysis of geographical patterns of TB notifications, associations with TB program efforts and social determinants of TB risk in Bangladesh, Nepal and Pakistan (publication)
12. Delivering Patient-Centred Care in a Fragile State: Using Patient-Pathway Analysis to Understand Tuberculosis-Related Care Seeking in Pakistan (publication)
13. Meeting Report: National Workshop on Data and Evidence for Policy Actions Towards Ending TB in Pakistan, Islamabad, 16-18 January 2019
14. Modelling the impact of COVID-19 disruptions on TB burden in Pakistan (report)
15. National TB epidemiological review, Pakistan 3-11 January 2019 (presentation)
16. Epidemiological review of TB in Pakistan, November 2013 (report)
17. National END TB Strategic Plan 2017-2020
18. National Tuberculosis Control Program Strategic Plan (2020-2023)

19. Funding Request Application Form Full Review (2018-2020)
20. Funding Request Form Allocation Period 2021-2023
21. The Pakistan TB Joint Program Review Mission February 11-23, 2019 Review Mission Report

Use case discussion

The purpose of the use case discussion was to better understand how TB data activities have helped the National TB Program and TB partners to:

1. Estimate the burden of TB in Pakistan
2. Understand and address specific gaps in the TB care cascade in the country
3. Make both short- and long-term plans for the TB program

"Use case" questions were developed with the aim to understand how the countries have used the various supplemental TB data tools and activities for the three purposes above (see Annex 3 for the Pakistan use case discussion guide). Each set of questions was related to a section of the project's data framework (see Figure 2 below). Figure 2 shows the TB-related data activities that have been conducted in Pakistan that may have been used to better understand each section of the data framework.

A 90-minute group discussion with seven NTP staff and TB partners was conducted virtually over Zoom in September 2022. The NTP focal person was asked to select participants within the NTP and TB partners who were closely involved in implementing and/or using the data from the supplemental activities and/or involved in the development of the most recent National Strategic Plan and Global Fund Application. The discussion was audio recorded and transcribed using NVivo's automated transcription software. Two project staff reviewed the notes and audio recording of the discussion and summarized responses for each section of the data framework. The summaries were compared to ensure consistency and accuracy.

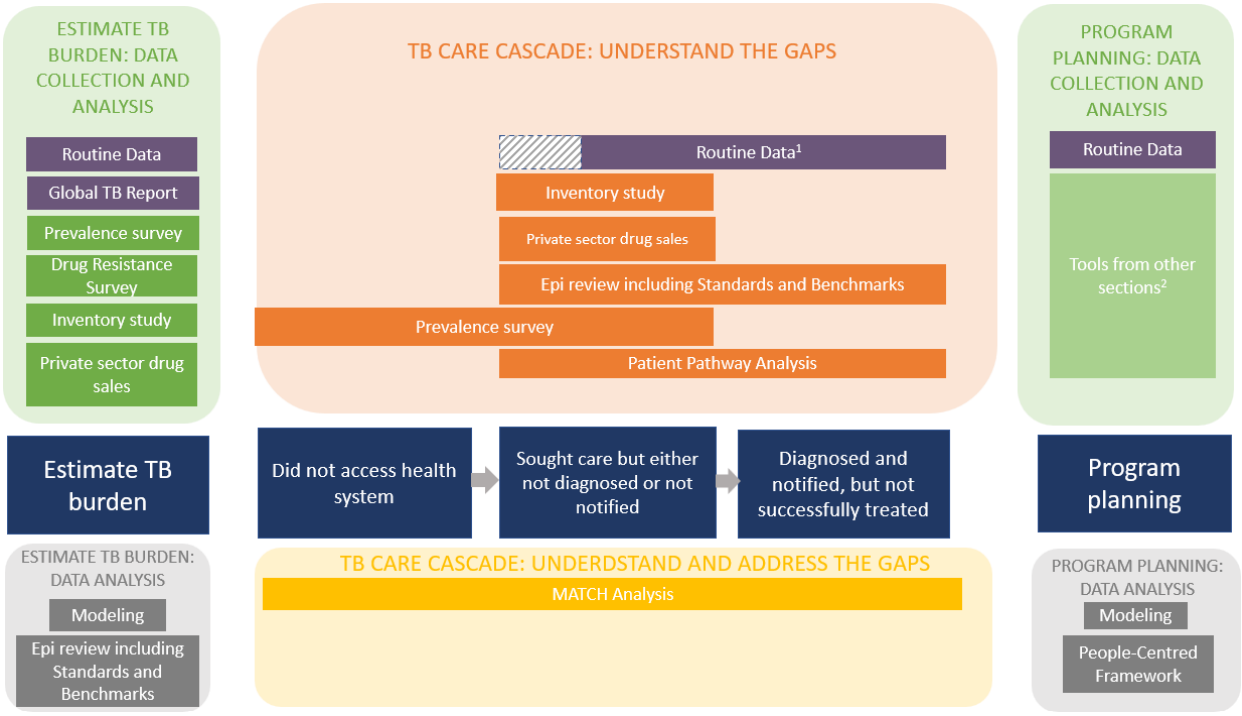


Figure 2. Framework for use of data activities in different aspects of TB program evaluation and planning adapted to the Pakistan setting

[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

[2]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Key informant interviews

The purpose of the key informant interviews was to better understand the use and usefulness of the supplemental TB data activities.

Individual interviews were conducted with nine persons that work at the national or subnational levels. At the national level, NTP staff and persons at partner organizations that supported conduct of TB data activities or use TB data were interviewed. At the subnational level, provincial TB program staff were interviewed. All interviews were conducted in English and were approximately 60- to 90-minutes long.

Interviews were audio recorded, then transcribed verbatim using NVivo's automated transcription software. The transcripts were reviewed and coded by two project team members using NVivo. All codes were reviewed and agreed upon by project team members. Content analysis was conducted and key emerging themes (if at least 25 percent of respondents discussed a topic) were summarized.

Country Case Study Findings

Desk review

Desk review summary by TB data activity:

Supplemental TB data activity	Evidence of use of findings in National Strategic Plans (NSP)	Evidence of use of findings in Global Fund applications	Evidence of use of findings in program reviews
TB prevalence survey (TBPS) 2010-2011	*2020-2023 NSP*: Findings were highlighted to provide context for the national TB situation. The TBPS was highlighted as an achievement of the NTP research unit in the last few years. A plan is outlined for a 2nd TBPS to reassess the TB burden and it will be powered to provide estimates at the provincial level. *2017-2020 NSP:* Findings were highlighted to provide context for the national TB situation and used in the SWOT (strength, weaknesses, opportunities, threats) analysis. The TBPS was highlighted as an achievement of the NTP research unit. A plan was outlined for a 2nd TBPS in 2018 to re-estimate the TB burden in the country.	*2021-2023 application:* The 2nd TBPS was listed as a key intervention/activity for the provinces. It was noted that a protocol development workshop with the support of WHO consultants had been conducted in February 2020 to initiate the process, but funding for the survey still needs to be secured. *2018-2020 application:* Findings were highlighted in several sections under Context and Epidemiology of TB in Pakistan, including TB epidemiology, missing DS-TB cases, and gender, age and vulnerable groups.	*2019 Joint Program Review:* The TBPS report was listed as one of the main documents reviewed.
Drug resistance survey (DRS) 2012-2013	*2020-2023 NSP*: Findings were highlighted to provide context for the national TB situation and current epidemiological status. *2017-2020 NSP:* It was noted that the DRS was used to revise epidemiological estimates, targets and	*2021-2023 application:* Not mentioned. *2018-2020 application:* The DRS was listed as a reference document for the epidemiological profile; findings were highlighted in the TB epidemiology and multi-	*2019 Joint Program Review:* Not mentioned.

	objectives of the 2014-2020 NSP.	drug resistance TB sections.	
Patient pathway analysis (PPA) 2017	*2020-2023 NSP*: Findings were highlighted and provided context for the national health structure and public private mix sections. *2017-2020 NSP:* Not mentioned, the PPA was completed in 2017.	*2021-2023 application:* The PPA findings are not directly referenced, but the 2019 Joint Program Review report is referenced to highlight PPA findings on the private health sector. *2018-2020 application:* Not mentioned.	*2019 Joint Program Review:* The PPA was listed as one of the main documents reviewed. Findings were highlighted in the situation analysis of the private health sector.
People-centred framework (PCF) 2019	*2020-2023 NSP*: The PCF workshop was listed as a milestone achieved during the NSP development process. *2017-2020 NSP:* Not mentioned, the PCF was not completed yet.	*2021-2023 application:* Not mentioned. *2018-2020 application:* Not mentioned.	*2019 Joint Program Review:* The PCF workshop slide deck was listed as one of the main documents reviewed.
Mapping and analysis for tailored disease control and health system strengthening (MATCH) 2017 2018 2019	*2020-2023 NSP*: Not mentioned. *2017-2020 NSP:* Not mentioned, MATCH had not been conducted yet.	*2021-2023 application:* Not mentioned. *2018-2020 application:* Not mentioned, MATCH had not been conducted yet.	*2019 Joint Program Review:* Not mentioned.
Epidemiological (Epi) review, including standards and benchmarks 2013 2019	*2020-2023 NSP*: It was noted that an epidemiological analysis was completed through the 2019 joint program review prior to NSP development. *2017-2020 NSP:* Not mentioned.	*2021-2023 application:* Epi review 2019 was not mentioned. *2018-2020 application:* Epi review 2013 and 2016 was listed as a reference document for the epidemiological profile.	*2019 Joint Program Review:* The 2019 epi review slide deck was listed as one of the main documents reviewed.
Inventory study (IS) 2012 (adult) 2016 (children)	*2020-2023 NSP*: Findings from the IS on childhood TB were highlighted in the TB in children section. The two IS were highlighted as an achievement of the NTP research unit in the last few years.	*2021-2023 application:* Not mentioned. *2018-2020 application:* Findings from both IS were highlighted in the missing TB cases/treated in the private sector but not notified section.	*2019 Joint Program Review:* Not mentioned.

	2017-2020 NSP: Findings from the IS on childhood TB were highlighted in the TB in children section. The two IS were highlighted as an achievement of the NTP research unit in the last few years.		
Epidemiological modelling 2019	*2020-2023 NSP*: The results for three TIME Model scenarios were presented. *2017-2020 NSP*: Not mentioned, mathematical modelling was not used.	*2021-2023 application:* Not mentioned. *2018-2020 application:* Not mentioned.	*2019 Joint Program Review:* It was a recommendation for the NTP and provincial TB programs to use a scenario-based approach (modelling) to prioritize and budget interventions in the development of the next TB-NSP to make best use of the available resources.
Private sector drug sales analysis (PSRx) 2011 2019	*2020-2023 NSP*: Not mentioned. *2017-2020 NSP:* Not mentioned.	*2021-2023 application:* Referenced the 2019 Joint Program Review report to highlight PSRx findings on the private health sector. *2018-2020 application:* Not mentioned.	*2019 Joint Program Review:* Findings from the 2011 PSRx were highlighted in the situation analysis of the private health sector.

Overall findings from the desk review

Priority TB data activities and research:

There was a plan to conduct a second TB prevalence survey in 2018 to re-estimate the TB burden in the country, but it is now planned during the 2020-2023 strategic planning period. The second survey aims to be powered to provide subnational level estimates for each of the provinces. A protocol development workshop with the support of WHO consultants was conducted in 2020, but the NTP is still trying to secure funding.

Supplemental TB data activities that were important for NSP development and program planning:

Findings from the TB prevalence survey, drug resistance survey, patient pathway analysis and the 2016 inventory study on childhood TB were highlighted to provide context in the 2020-2023 NSP. The methods used and projections for the three TIME Model scenarios were presented in the 2020-2023 NSP to justify the prioritization of interventions and used to inform funding applications. Findings from the TB prevalence survey and the 2016 inventory study on childhood TB were highlighted to provide context in the 2017-2020 NSP; other supplemental TB data activities had not been implemented yet at that time.

Supplemental data activities that were used or referenced in the Global Fund applications as rationale for funding:

Findings from the TB prevalence survey, drug resistance survey, both inventory studies (adult and childhood TB) and epidemiological reviews (2013 and 2016) were highlighted in the 2018-2020 Global Fund application. Findings from supplemental TB data activities were not directly referenced or highlighted in the 2021-2023 Global Fund application, but they were indirectly referenced through the 2019 Joint Program Review and/or 2020-2023 NSP.

Supplemental data activities that were important, used for or influenced the recommendations of the 2019 Joint Program Review:

The TB prevalence survey report, patient pathway analysis, people-centred framework workshop slide deck and 2019 epidemiological review slide deck were listed as main documents that were reviewed during the 2019 Joint Program Review Mission. It was a recommendation in the 2019 Joint Program Review for the NTP and provincial TB programs to use a scenario-based approach (modelling) to prioritize and budget interventions during the development process for the 2020-2023 NSP to make the best use of resources.

Instances where there was no evidence of the findings from the supplemental TB data activity being used:

Implementation of the TB diagnostic network assessment and diagnostic network optimization were still in progress (at the time of the case study) and therefore there were no documents to review. There was no mention of results from the MATCH analysis in the 2020-2023 NSP, 2021-2023 Global Fund application or 2019 Joint Program Review.

Use case discussion

Respondent characteristics

Seven NTP staff and TB partners consented to and participated in the use case discussion. Most of the participants (71.4%) were female. Five participants (71.4%) were NTP-CMU staff and two were from a TB partner organization.

Key findings from each section of the data framework

	Most critical and/or useful sources of data	Other data or tools that would be useful
Estimation of TB burden	• For DS-TB: ○ TB prevalence survey is the most important survey; indicators have been based on survey estimates for many years, but national estimates	• A repeat prevalence survey would provide updated burden estimates and could provide subnational level estimates. • Would be useful to use data from the Pakistan Social Living

	are not adequate, there is a need for subnational level estimates. ○ Use of routine reporting, which is based on standard WHO indicators. • For DR-TB: ○ Use estimates from the 2012 drug resistance survey; estimates were revised in 2018 using routine surveillance data. ○ Use routine and laboratory surveillance data to estimate DR-TB in previously treated cases. • For target setting: ○ Use incidence from WHO Global TB report for target setting and planning. ○ Use epidemiological modelling for target setting in epidemiological reviews. ○ Use information and recommendations from epidemiological reviews.	Services Survey for epidemiological reviews since the survey is done at local levels and includes some questions about TB.
People with TB who do not access the health system	• Mostly use qualitative assessments to understand the needs of the population and care seeking behavior; qualitative assessments are more useful than surveys to understand this gap. • Use active case finding geo mapping data for hotspot identification to find TB patients in the community through community health workers. • The prevalence survey questionnaire asked health care seeking questions, however, the data were not cleaned or analyzed at that time.	• TB Care cascade analysis and the screen-TB tool could potentially be useful.
People with TB who presented to health	• Use routine TB data from health facilities to understand gap, but this data is not routinely analyzed.	• It was a recommendation in the last epidemiological review to map[2] all the health facilities and

[2] This mapping activity may be part of the TB Diagnostic Network Assessment and Diagnostic Network Optimization tool that was ongoing during the time of the case study.

facilities but were not diagnosed and/or not notified	• The inventory study was useful for assessing underreporting in the public and private sector, but the data is now outdated; current assumptions are based on the inventory studies (adult and childhood TB) and private sector drug sales analysis.	to compare the master list of health facilities with case notifications to quantify how many TB patients are missed (not diagnosed and/or not notified); will need to link data from private providers with public sector data/NTP database.
People with TB who were diagnosed but not successfully treated	• Use data from the most recent epidemiological review and routine reporting; the epidemiological review completed a detailed analysis of routine data from DHIS2. • Of note: because Pakistan has a high TB treatment success rate, this gap is not a priority to be investigated, even though there are some success variations across the districts.	• Case-based surveillance data will be able to provide a better analysis of the routine data to understand this gap.
TB program planning	• National TB Strategic Plan (NSP) development: ○ Use epidemiological modelling extensively to look at impact of interventions and for target setting. ○ Use the epidemiological review extensively. ○ Use the OneHealth tool for TB budgeting for costing the NSP. ○ People-centred framework was used once and was not a budgeted activity for the next NSP in 2023 but would like to use it again if the budget was available. ○ Patient pathway analysis results were referenced in the last NSP (2020-2023) ○ Use prevalence survey and drug resistance survey as basis for target setting for planning interventions. • Funding applications: Use all the routine and supplemental data available for NSP development	• Will be doing a cost effectiveness analysis and modelling following the most recent epidemiological review; the additional information will be useful for NSP development. • In the process of completing the diagnostic network optimization and TB diagnostic network assessment, which will be useful to make the diagnostic network more efficient. • Starting to plan the patient cost survey and will be getting technical assistance from WHO; however, results will likely not be available before the next NSP development period in 2023.

	and subsequently for writing the Global Fund application. • Routine program planning: Based on NSP. Use routine reporting.	

Key takeaways from the use case discussion

- The NTP used the findings from the supplemental activities to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but also relied extensively on routine TB data. Once case-based surveillance data is available, it will allow for better analysis of the routine data to help understand gaps in the TB care cascade.
- Other than using routine TB reporting, the TB prevalence survey was the most critical data source for estimating DS-TB burden in the country, but national estimates are not adequate, there is a desire for subnational level estimates. A repeat prevalence survey is being planned to be powered for subnational level estimates for the provinces. The first prevalence survey in 2010-2011 also included questions on health care seeking, however, this data was not cleaned and analyzed. The reason provided was that the survey was paper-based and given the huge amount of work required for data entry and cleaning, they did not get to the behavioral questions.
- Other than using routine TB and laboratory data, the TB drug resistance survey from 2012 was an important data source for estimating DR-TB burden in the country. Since the 2012 drug resistance survey is outdated, DR-TB estimates were revised using routine surveillance data in 2018.
- Epidemiological modelling and epidemiological reviews provided important information for target setting, understanding the gap in people with TB who were diagnosed but not successfully treated and program planning. Epidemiological reviews provided good recommendations that the NTP plans on implementing, such as mapping all the health facilities and comparing the master list of health facilities with TB case notifications to quantify missed TB patients that were not diagnosed and/or not notified and running a cost-effective analysis/modelling before developing the next NSP in 2023.
- It is anticipated that findings from the diagnostic network optimization and TB diagnostic network assessment will be useful for optimizing the allocation and utilization of the GeneXpert machines in the country. Additionally, there are ongoing discussions for a patient cost survey, but results will likely not be ready for NSP development in 2023.
- The people-centred framework was a detailed workshop attended by both the NTP and provincial TB program staff, which included a root cause analysis. The PCF approach was used once; however, it is not a budgeted activity for the next NSP in 2023. The PCF will not be used going forward, but the NTP would repeat it for NSP development if they had the budget for this activity because the PCF was useful.
- The MATCH approach was completed but was not used by the TB program as it should have been. KIT Institute supported Mercy Corps in completing MATCH, which Mercy Corps is using, but it is not used much by the NTP.

Key informant interviews

Respondent characteristics

Of the nine key informants, six were TB program staff (national and provincial level) and three were in-country TB partners (Figure 3, left). On average, the respondents have been doing TB-related work for almost 17 years (standard deviation = 9.0). Respondents were 56 percent female (Figure 3, middle) and mostly worked at the national level (77.8%) (Figure 3, right). The majority of respondents were familiar with (either were involved in implementing and/or planning and/or heard the results of findings) the epidemiological review including standards and benchmarks, TB prevalence survey, people-centred framework, TB drug resistance survey, inventory studies (adult and/or childhood TB), patient pathway analysis, epidemiological modelling and private sector drug sales analysis (Figure 4). Respondents in general were less familiar with the MATCH approach (Figure 4).

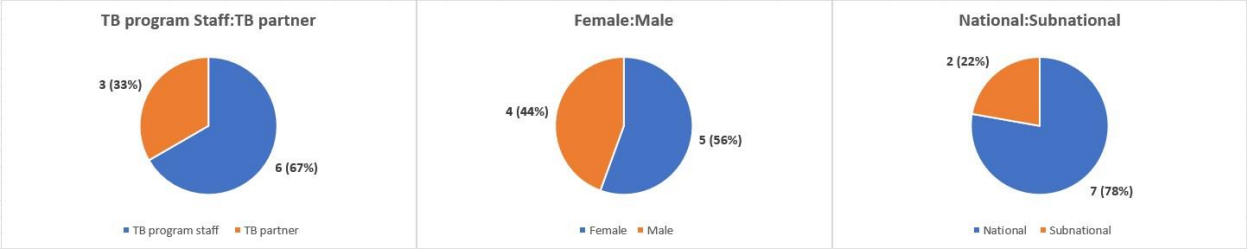


Figure 3. Characteristics of key informants (left: TB program staff to partner ratio; middle: female to male ratio; right: national to subnational ratio)

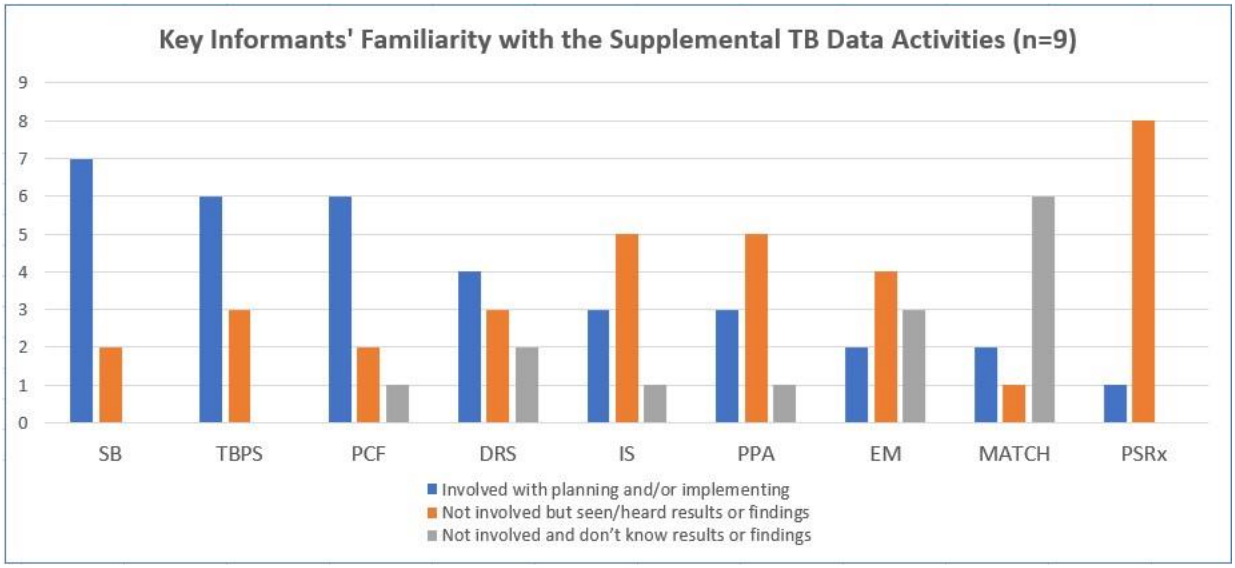


Figure 4. Key informants' familiarity with the supplemental TB data activities implemented in Pakistan

SB = epidemiological review, including standards and benchmarks; TBPS = TB prevalence survey; PCF = people centred framework; DRS = TB drug resistance survey; IS = inventory study; PPA = patient pathway analysis; EM = epidemiological modelling; Mapping and analysis for tailored disease control and health system strengthening = MATCH; PSRx = private sector drug sales analysis

Key emerging themes

The following key themes emerged from the key informant interviews.

Theme: Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan.

- Pakistan has an electronic routine TB data system (DHIS2) at the national, provincial and district levels that collects key information, but recording is still paper-based at facility level, not yet case-based and the country still uses conventional quarterly reporting. While the priority is to strengthen and integrate DHIS2 with other data systems, in the meantime, supplemental TB data activities provide important information such as true TB burden estimates and patient costs that are not captured by routine data systems and strong evidence for decision making and TB program planning. The TB programs in both the public and private sector use the findings from all the data activities for TB program planning, designing interventions, National and Provincial Strategic Plan development, writing funding applications and resource allocation. Data activities that were particularly useful include: prevalence survey, drug resistance survey, epidemiological reviews and patient pathway analysis.
- **Prevalence survey:** It is the most important activity. Data provided TB incidence and prevalence estimates in the country and estimates are used every year and used for Global Fund targets; everyone is interested to know the TB burden, even the provinces. The survey also informed what diagnostic tools to use for TB screening.
- **Drug resistance survey:** Data provided DR- and MDR-TB estimates in the country. The NTP did not agree with the most recent Global TB report MDR-TB estimates, so the NTP requested the WHO TB Monitoring and Evaluation unit to review it based on available MDR data in the country, which is why it is important to have estimates via the DRS. Findings also informed development of new regimens and prescriptions for DR- and MDR-TB.
    - The NTP tried to strengthen and use the routine surveillance system so that they would not have to implement another drug resistance survey, but decided that another survey is needed after all, because certain information (e.g. Isoniazid resistance, fluoroquinolone resistance in rifampin-susceptible TB patients) are not captured by the routine surveillance system.
- **Epidemiological reviews:** This activity is very important, as it feeds into other activities such as program reviews. Findings showed which standards and benchmarks the TB program has improved on, data use and discrepancies of data reporting versus actual burden in the district. It also identified gaps in the routine data system.
- **Patient pathway analysis:** Findings informed where patients first sought care in the private and public sector and which diagnostic services are provided at those facilities; findings showed the majority of patients were going to the private sector, which informed the need for further private sector engagement to increase TB case notifications and expand public private mix services. However, the private sector has not implemented the findings of the PPA yet, but one of the recommendations from the recent (2022) joint

program review mission is for the private sector to conduct an in-depth PPA to help understand patient preferences in care seeking so the right interventions can be used.

- Other important data activities that were mentioned were inventory studies (adult and childhood TB) and people-centred framework.
    - The people-centred framework workshop was very useful, but findings and recommendations were not fully utilized or implemented due to lack of ownership and accountability.
- Findings from MATCH and private sector drug sales analysis were mostly used by the private sector and less so in the public sector.
    - Hotspots identified using MATCH informed active case finding activities in the private sector; mobile vans equipped with digital x-ray went to identified hotspot areas to find TB cases in the community.
    - Findings from the private sector drug sales analysis informed interventions targeted towards pharmacies/referral from pharmacies to increase TB case notifications.
- Although the findings were initially very useful, findings and estimates from the prevalence survey (2010-2011), drug resistance survey (2012) and inventory studies (2012 and 2016) are outdated, so they are not being used/referenced anymore.

Illustrative quotes:

"The **epidemiological reviews** were very important, because they provided key information about the data trends in the past. And then we use this information for the NSPs and in the grant writing, as well as for planning. So this is the most important, I think, in this cascade of activities for the grant writing." – Key Informant, National level, Pakistan

"The **private sector drug sales analysis** was quite helpful, but it is not yet part of planning. And the **people centred framework**, it is somehow always part of the provincial strategic plan, no matter to what extent we are able to achieve the goals…most of the supplemental activities are part of our current provincial strategic plan." – Key Informant, Subnational level, Pakistan

Theme: Challenges with funding

- Funding is a huge challenge for supplemental activities and is highly dependent on external donors, and the support received over the many years is appreciated.
- There may be a need for a supplemental activity, but it depends on whether funding is available to implement it.
  - Funding was provided by Global Fund to develop a protocol for a second prevalence survey. The country has developed a protocol which aims to have a large enough sample for subnational estimates, but they are struggling to secure funding to implement the survey.
  - The NTP would like to implement a repeat inventory study, but there are no financial resources to do so, and it is believed not to be a priority for donors.
- Funding challenges to implement findings and recommendations after implementation of a supplemental activity.
  - WHO provided support for the people-centred workshop to help plan provincial TB programs, but the provinces have no funding to implement the findings/ recommendations.
  - There are funding constraints at the provincial level to address gaps identified in the epidemiological review.
- It is perceived that donors prioritize activities such as the prevalence survey, drug resistance survey, epidemiological reviews and epidemiological modelling, but not activities such as the inventory study and MATCH, which the NTP would like to implement again.
- There is a desire for domestic funding to be increased to support TB-related activities at both national and provincial levels, but it is not realistic with other emergencies happening in the country, e.g. floods, which also need donor support.

Illustrative quotes:

"For example, the **TB prevalence survey**. We have the protocol; we have done preparation of everything. The preparation was funded by the Global Fund, but we don't have any funds for execution. The budget is 4.1 million USD, but we don't have resources committed. I'm worried about it, because we have done a lot of hard work in preparing that protocol and sample size. Everything was scientifically done with KIT and WHO support. So we should have resources, even more resources, because it would be a digital survey this time. 10 years ago, it was paper-based and we had a lot of issues with data validation and data cleaning. But this time it has to be digital, so more resources are definitely needed. Similarly for the **inventory study**, we don't have any resources. For **drug resistance survey**, we don't have any resources." – Key Informant, National level, Pakistan

"Availability of funds to make sure that these activities happen when they are required and not when the funds are available. I think that's very important that these activities happen timely, so that we can actually get benefit out of the recommendations that come from these activities." – Key informant, National level, Pakistan

Theme: Timing and coordination of supplemental activities is important

- Supplemental activities are useful when done at the right time, providing important information that the routine system does not provide that is critical for planning/NSP development, designing interventions, resource allocation and grant writing.
- It is important to align supplemental activities with the country's need and with their NSP and Global Fund cycle so findings can be used during preparation.

- It is challenging to align big surveys (e.g. prevalence survey, drug resistance survey) with a strategic planning period, since the planning, implementation and analysis of those surveys take a long time/years.

Illustrative quotes:

"Things that we like our international stakeholders and donors to know is that these [supplemental activities] are important and need to be done at the appropriate times and should be properly structured and supported." – Key Informant, National level, Pakistan

"Before making strategic plans, we need to have as much information and as much the actual picture in hand for better planning. So they [supplemental activities] should be done before strategic plan development." – Key Informant, National level, Pakistan

"I think the **drug resistance survey** took us around one year for planning, one and a half year for implementation and one and a half years for final analysis and report writing. So the **drug resistance survey** and the **prevalence survey** is difficult to link them to the strategic plan. So when they are complete, the results would be incorporated into the next strategic plan." – Key Informant, National level, Pakistan

Theme: It is important to build capacity in country, but technical assistance is still needed

- Value capacity building for TB staff to be able to implement supplemental activities and develop research skills.
  - Need technical assistance/appreciate support from external partners to implement supplemental activities and build capacity for and train TB staff at both the national and provincial levels.
  - There is a group of NTP staff and TB partners who have institutional memory, which is helpful for implementation of future supplemental activities.
  - Subnational level TB staff would like closer collaboration with NTP staff to build capacity, be more engaged with the supplemental activities and have the capacity to be able to use their own provincial data for decision making.
- Supplemental data activities provide the opportunity for capacity building for in-country TB staff.
  - Trained staff to implement the surveys/learned from field work, developed research capacity of staff.
  - Participatory workshop for the people centred framework involved both national and provincial staff.
  - Learned about sample transport and drug sensitivity testing for a large number of samples from **prevalence survey** to improve proficiency of staff (same staff will be doing the next survey).

Illustrative quote:

"We tried so many things doing that [**prevalence] survey** in 2010. I mentioned specimen transportation. It was really a big undertaking by the National Reference Laboratory and we use that opportunity to have our proficiency in doing the DST for this number of specimens…the advantage is that the staff really improved their skills and [competency]. That same team is available now to do another survey after the lapse of 10 years. So these were the opportunities." – Key Informant, National level, Pakistan

Theme: Dissemination of results and recommendations

Dissemination practices:

- At national level
  - Findings and recommendations are typically disseminated at an event at the national level, (e.g. seminars, workshops, specific meetings); MOH, TB, HIV and malaria colleagues, provincial TB coordinators and private partners are invited.
  - Findings are shared at regular quarterly meetings or other internal MOH meetings.
  - NTP staff, implementation partners and funders are generally interested and well-informed of the results from supplemental TB data activities since they have been engaged since the inception of the activity through dissemination; there was not much focus on partners previously, but now even private sector partners like Mercy Corps are part of the technical working groups and dissemination events.
  - Challenge with staff turnover: new NTP staff or partners may not be as informed as those who have been working for the TB program or partner organization for many years. However, the NTP does have several staff who have been there for many years and have institutional memory.
  - A few respondents believe that proper dissemination is not currently being done; dissemination should be tailored to different audiences (e.g. policy makers, academics, facility level providers) to get the right message across.
- At subnational level
  - Findings and/or guidelines disseminated at intra-provincial meetings, where all provincial TB coordinators/managers meet quarterly (e.g. epidemiological modelling, epidemiological reviews, surveys).
  - District level officers are informed of the findings and given suggestions for the next strategic plan at intra-district meetings rather than having specific dissemination events at the district level.
  - Most respondents agree that staff at the provincial level are well-informed but there was mixed agreement on whether staff at district level are well-informed:
    - Provincial level staff are normally invited to meetings at the national level and have been involved in implementing the activities; additionally provincial strategic plans are made every three years and results from supplemental activities are considered.
    - Some respondents believe district level staff are not informed since they are usually not engaged during implementation, while others believe district coordinators are informed during intra-district meetings; one subnational level staff believes there isn't a culture of disseminating information to lower levels since they are not part of the planning process and are more concerned with service delivery, while another subnational level staff believes provincial level trickles down information to the district level/basic management units (BMUs)/doctors through intra-district meetings.
- Shared widely
  - Journal publications for some activities (e.g. prevalence survey, inventory studies, MATCH).
  - Reports on final results are written and shared for some activities (e.g. epidemiological reviews, modelling).
  - Publications and reports are typically on the NTP website, which everyone can access.
  - Findings are presented at national and international conferences.

- Results of the drug resistance survey was disseminated to the public via the radio to increase awareness and the status of DR-TB in the country; the DR-TB unit of the NTP and DR-TB surveillance unit of WHO headquarters spoke on the radio program.

Illustrative quotes:

"The **epidemiological modeling** or any **survey** will be discussed at intra-provincial meetings, where all the provinces [meet for] the quarterly surveillance meeting… all the survey and activities are discussed with district BMU doctors to inform district level officials of the results. We inform them about the results of the activity and give advice [on] how they will act in the next strategic plan." – Key Informant, Subnational level, Pakistan

"Ideally, the way these things should be disseminated is completely different from what is actually happening. For dissemination of your findings and recommendations, you don't need always to have big seminars. Whenever we have seminars, we have a budget, we say that we have a dissemination plan. But the real dissemination to staff is to build capacity, to explain the lessons learned from that activity, to share the analysis and results in a way that is appropriate for all different [cadres] of people working on TB. Like people who are working at the treatment site, they need the information in a way that is useful for them. If we have a detailed report analysis, it's a 70 - 80 pages document and you are having a seminar and distributing that [report] book and everybody's giving their speech on how important this survey…Should we call it a dissemination of findings? I don't think so. Dissemination of findings means that the findings of that report are translated into multiple different types of presentations for different stakeholders who can use that information. For academia we need different types of information, we can share the statistical background with them. But for politicians, we don't need how we come up with that analysis, but what should we do with this analysis and how we should translate this into planning. This has not been done." – Key Informant, National level, Pakistan

Suggestions for improvement from respondents

Dissemination practices/Recommendations are not optimally used or implemented:

- National and provincial TB program staff participated in a workshop for the people-centred framework, but nothing was done with the framework after that. Findings and recommendations were not implemented due to lack of ownership and resources; there should be a mechanism for following up on recommendations.
- Some TB data activities would have been even more useful if they were more widely disseminated (e.g. PPA) so that relevant stakeholders could translate findings into action and implement the recommendations resulting from these activities.
- Some respondents would like to see the NTP take leadership of disseminating information and pushing/ensuring both public and private sectors to use the findings and recommendations.
- There is a desire for improved dissemination practices, which has been a focus in the last 1-2 years.
    - There are dissemination events where findings and recommendations are shared but it may not be the most appropriate format for all audiences; there is a need to cater dissemination for different audiences (e.g. providers working at treatment site, academia, policy makers).

There is a desire for subnational level estimates:

- The last prevalence survey provided national TB burden estimates, but provinces want to know the burden in their area, because some provinces/districts had higher TB case notifications than the national estimate, while some were severely under the estimate.

- A protocol has been developed for the next prevalence survey which is proposed to include a large enough sample size to provide subnational level estimates, but this would increase the cost.

There is a desire for supplemental activities to be more inclusive:

- Bottom-up approach: it is important to engage provinces from the beginning, because the country has a devolved health system, provinces are consulted and involved in decision making and have their own provincial strategic plans.
- The last drug resistance survey in 2012 did not include the private sector; there is a plan to include the private sector in the next survey.
- MATCH should also be used in the public sector, not just the private sector.

Overall Findings

When the findings from the case study's three activities were jointly analyzed, several overall themes emerged and are described below. These combined findings are the same as those presented in the executive summary.

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of National Strategic Plans (NSPs):** The different supplemental activities that Pakistan conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and develop interventions and strategies for the TB national strategic plan, though the country also relied extensively on routine TB data from the routine surveillance system. Supplemental TB data activities that have been particularly useful include the prevalence survey, drug resistance survey, patient pathway analysis, inventory studies (adult and childhood TB), epidemiological reviews and epidemiological modelling. While conducting the people-centred framework, TB staff from both the national and provincial levels participated in the workshop, which was useful for strategic planning at both levels of the health care system; the TB program would like to repeat this activity for the next national strategic planning cycle, but it is not a budgeted activity for NSP development. The MATCH and private sector drug sales analyses were primarily used by the private sector; less by the national TB program/public sector. Implementation of the TB diagnostic network assessment and diagnostic network optimization were still underway at the time of the case study, but it is anticipated that their findings will provide important information for planning and making the diagnostic network more efficient. The country is planning a second prevalence survey, which aims to be powered to provide subnational level estimates to allow for planning at the provincial level; the protocol has been developed, but funding has not been secured yet. There are also plans to conduct a TB patient cost survey.

- **Timing, coordination and funding for supplemental TB data activities are challenging but critical:** Supplemental TB data activities are most useful when they are implemented at the right time to provide important information for program/strategic planning, decision making and writing grant applications. Therefore, it is important to align implementation of data activities with the country's need at the time and with their strategic planning and Global

Fund cycle. However, it can be challenging to align certain activities with the country's strategic period, because planning, implementation, analysis and interpretation can take a long time. Additionally, acquiring external funding for supplemental TB data activities can be a huge challenge, as it may not be available or adequate when the country needs it. For example, a protocol for a second prevalence survey which aims to be powered to provide subnational level estimates has been developed, but there is a struggle to secure funding to implement this large survey. Funding challenges also occur with implementing recommendations that result from the activity. In general, there is a lack of domestic funding for TB-related activities. There is a desire to increase domestic funding for the national and provincial TB programs, but it is unfortunately not realistic with other emergencies happening in the country (e.g. floods) which also need external funding support.

- **Important to build local capacity, but technical assistance is still needed:** Supplemental TB data activities have provided the opportunity to build technical capacity in the country. TB program staff at both national and subnational level have learned to implement supplemental activities, learned from field work and developed research skills further. The country is in a favorable position to have a group of NTP staff and TB partners with institutional memory, which will be helpful for implementation of future supplemental activities, such as a second prevalence survey. Subnational level staff expressed interest in a closer collaboration with NTP staff to build technical capacity and be more engaged in implementing data activities; subnational level staff would like to further develop their technical capacity to use their own data for decision making.

- **Dissemination of results and recommendations:** Dissemination of findings and recommendations are typically done at the national level through a variety of ways (e.g. meetings, seminars, workshops, publications, reports) and trickles down to the subnational levels. National and provincial TB program staff, external and internal implementing partners and funders are generally invited and adequately informed since they are involved in planning, implementing and dissemination events. However, proper dissemination to different audiences is not currently being done and could be improved; there is a desire to ensure dissemination is tailored to different audiences (e.g. policy makers, academia, facility level service providers) to get the message across more effectively and ensure findings are being translated into action. Subnational level dissemination could also be improved since many subnational level TB staff are not as engaged during implementation of supplemental TB data activities; it is especially important to engage the provincial TB program staff from the beginning since they have their own provincial strategic plans. Most importantly, optimally implementing recommendations resulting from these activities could be improved. In some cases, recommendations were not implemented due to lack of ownership or lack of resources; there should be a mechanism for following up on recommendations. Some respondents suggested that the NTP could help push/ensure that both the public and private sectors are using the findings and implementing the recommendations.

- **Remaining data gaps for programmatic planning:** While the country's electronic routine TB data system provides a lot of key data, it is understood that it cannot capture all the needed data for burden estimation, understanding and addressing gaps in the TB care cascade, and for TB program planning. It is perceived that once the NTP transitions to case-based surveillance data, it will enable better analysis of the routine data for understanding and addressing gaps in the TB care cascade. It would also be helpful if the NTP could access and use data from other data sources or data systems in the country which also collect TB data, such as the Pakistan Social Living Services Survey which is done at the local levels. It would also be helpful if data from private providers were linked with the NTP database/public sector data.

Conclusion and next steps

This country case study was conducted to learn from Pakistan's experience with planning and implementing supplemental TB data activities and to better understand how these activities have helped the NTP and TB partners to: gain insight of the TB burden in the country, better understand and address gaps in the TB care cascade, and make both short- and long-term plans for the TB program.

The case study was an opportunity for Pakistan's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Pakistan's Ministry of NHSRC look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. Key takeaways from the Pakistan case study will be factored into the overall recommendations coming out of the project, which will cover both general aspects of planning and implementing supplemental TB data tools as well as tool-specific recommendations.

Findings from Pakistan have been compiled with findings from the four additional country case studies, global-level interviews and desk review and the NTP manager survey. The triangulated findings will be used to develop a framework to help countries prioritize TB data-related activities in partnership with WHO.

Annex 15: Uganda Country Case Study Report

Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning: Uganda Country Case Study Report

Project implemented by the CDC Foundation and Centers for Disease Control and Prevention (CDC) with funding from the Bill & Melinda Gates Foundation

May 2023

List of abbreviations

BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
DNA	TB Diagnostic Network Assessment
DRS	Drug Resistance Survey
GIS	Geographic information system
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NTP	National Tuberculosis Program
NSP	National Strategic Plan
PCF	People-Centred Framework
PCS	Patient Cost Survey
PPA	Patient Pathway Analysis
QTSA	Quality of TB Services Assessment
TB	Tuberculosis
TBPS	National TB Prevalence Survey
WHO	World Health Organization

Project team and participants

Project Team

Miranda Bodfish	Associate Vice President, Infectious Disease Programs, CDC Foundation
Christina Braccio	Health Scientist, Global Tuberculosis Branch, U.S. CDC
Anand Date	Branch Chief, Global Tuberculosis Branch, U.S. CDC
Rachel Fiorillo	Project Manager, Infectious Disease Programs, CDC Foundation
Jennifer Harris	SIA Team Lead, Global Tuberculosis Branch, U.S. CDC
Eveline Klinkenberg	Consultant, Connect TB, the Netherlands
Stephanie O'Connor	Epidemiology Fellow, Global Tuberculosis Branch, U.S. CDC
Victoria Tully	Public Health Analyst, Global Tuberculosis Branch, U.S. CDC

Project Steering Committee

Sevim Ahmedov	USAID
Kenneth Castro	Emory University and USAID
Daniel Chin	Bill & Melinda Gates Foundation
Kathy Fiekert	KNVC Tuberculosis Foundation
Harry Hausler	TB HIV Care
Fukushi Morishita	WHO WPRO
Nnamdi Nwaneri	The Global Fund
Suvanand Sahu	Stop TB Partnership
Charalampos (Babis) Sismanidis	WHO
Stavia Turyahabwe	Tuberculosis and Leprosy Program, Ministry of Health Uganda

Uganda participants

Moses Arinaitwe	National Tuberculosis and Leprosy Program, Ministry of Health Uganda
Geofrey Amanya	National Tuberculosis and Leprosy Program, Ministry of Health Uganda
Raymond Byaruhanga	National Tuberculosis and Leprosy Program, Ministry of Health Uganda
Pamela Donggo	JSI, Uganda
Deus Lukoye	CDC Uganda
Robert Majwala	National Integrated Sentinel Surveillance, Ministry of Health Uganda
Mary Mudiope	Infectious Diseases Institute, College of Health Sciences, Makerere University
Abel Nkolo	University Research Co., LLC, Center for Human Services

Mandela Okudotnel	Regional Tuberculosis and Leprosy Program
Philip Tumwesigye	Infectious Diseases Institute, College of Health Sciences, Makerere University
Stavia Turyahabwe	National Tuberculosis and Leprosy Program, Ministry of Health Uganda
Ebony Quinto	National Tuberculosis and Leprosy Program, Ministry of Health Uganda
Damalie Waiswa	Regional Tuberculosis and Leprosy Program

EXECUTIVE SUMMARY

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of TB data activities outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these activities are referred to as "supplemental" TB data activities. This project took place from February 2021 through July 2023 and had three phases:

4) Global-level desk review and key informant interviews
5) Country case studies in five countries (Ethiopia, Kenya, Pakistan, Uganda, Vietnam)
6) Online survey of NTP managers in countries that had substantial experience with supplemental TB data activities

This report summarizes the activities and findings of the Uganda case study (conducted February to October 2022) and is intended for the Uganda National TB Control Program (NTP) and their partners. This country case study consisted of three parts 1) a desk review of existing evidence related to Uganda's use of supplemental TB data tools and activities; 2) a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade; 3) a series of key informant interviews on the use and usefulness of supplemental TB data activities implemented in Uganda.

The following overall themes emerged from the combined analyses for Uganda:

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the NSP:** The different supplemental activities that Uganda conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and for developing interventions and strategies for the national strategic plan, but the country also relied extensively on routine data. Activities that have been particularly useful include the prevalence survey, patient cost study, TB diagnostic network assessment and the patient pathway analysis. Other important activities include the drug resistance survey, people-centred framework and the quality of TB services assessment. It would be helpful if other surveys such as the demographic health survey (DHS) and service availability and readiness assessment (SARA) could include more TB-focused questions to provide data on health seeking behavior and availability of TB

diagnostics and treatment. For the next NSP, the country would like to improve use of the One Health Tool for TB budgeting and epidemiological modelling by building capacity for NTP staff to use those tools. The country also indicated broad-scale mortality audits are needed to monitor treatment outcomes/TB-related mortality. However, there is a need for subnational level estimates for better target setting and resource allocation in different regions.

- **Timing, coordination and funding availability for supplemental activities are critical:** Prioritized activities should be implemented before developing the next National Strategic Plan (NSP) for TB. Results of the TB diagnostic network assessment and quality of TB services assessment were completed after the last NSP was finalized. Frequency and timing of data activities can be less than intended because of the lack of funding availability and other implementation or logistical delays, especially for the surveys (e.g. TB prevalence survey, drug resistance survey). Supplemental activities are almost always funded by donors. In general, there is inadequate domestic funding for TB-related activities in the country. It is important to coordinate with the Global Fund, USAID and other funders on timing of when activities should be implemented to clearly ensure the source of funding and that it is available early enough. Timing of dissemination of findings has been delayed in the past, making it difficult to use the findings for planning purposes.

- **It is important to build local capacity, but technical assistance is still needed:** Lack of human resource capacity was a frequently mentioned challenge. Staff supporting supplemental activities are also supporting routine program activities, which can cause program disruptions. It was suggested that countries and funding agencies involve and draw on capacity of local academic institutions and partners to implement supplemental activities rather than depending on international partners for technical expertise. However, local capacity is not always sufficient yet, and maintaining partnerships can be difficult due to funding constraints.

- **Dissemination of results and recommendations:** The NTP and partners who are involved in implementing activities are well-informed of the findings and recommendations. Though NTP uses opportune engagements to share results with subnational level staff and guide the direction of program implementation, there is room for improvement with dissemination of key findings to lower levels; often it is only TB focal persons at the highest subnational level that are well-informed and trickle down of information to lower levels is inadequate. Subnational level respondents would like to more easily be able to access the findings and have regional level dissemination workshops tailored to the lower levels, so each level understands how to implement the relevant recommendations. There is limited involvement of governance structures of Ministry of Health in some supplemental activities, which leads to ineffective implementation of recommendations at lower programmatic levels. Tailored one-page key findings and fact sheets could be shared as widely as possible, even with other ministries/sectors, the communities, political leaders and religious leaders.

- **Remaining data gaps for programmatic planning:** While there is excitement over the nationwide roll out of the electronic case-based surveillance system, it is understood that

routine surveillance systems cannot capture all data needed for TB program planning. The following were highlighted as additional data or data sources that would be informative for TB program planning: an assessment of stigma associated with TB and whether stigma affects access to care; insight into the capacity of health care workers to provide TB services; a tool to identify data gaps in childhood TB; an assessment of private sector reporting; exit interviews to understand who comes to the health facility and who gets screened for TB; a mortality audit to look at TB-related deathsand a TB service delivery costing study to look at unit costs of TB services.

This case study was an opportunity for Uganda's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Uganda's MOH look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. However, findings from this case study are not meant to stand alone; they have been compiled with findings from the four additional country case studies, global-level interviews and global desk review, and the NTP manager survey. The triangulated findings are being used to develop a framework that will help countries prioritize TB data-related activities and develop a timeline for these activities. This framework is currently under development in partnership with the World Health Organization (WHO).

MAIN REPORT

Project Background

Overview of the full data optimization project

Currently there are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist the collection of and use of TB-related data. While these TB data activities provide important information, they are outside of routine data collection and may not occur in an optimized and efficient manner. They can also place an extensive burden on ministries of health (MOH), national TB programs (NTPs) and partners.

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of "supplemental" TB data activities from both the country and global partner perspectives. For this assessment, "supplemental" TB data activities are those that are outside of routine data activities. These activities may include, but are not limited to the following: TB prevalence surveys (TBPS), drug resistance surveys (DRS), inventory studies, patient cost surveys (PCS), TB service delivery costing studies, care cascade analyses, One Health Tool for TB budgeting (OHT), diagnostic network optimization (DNO), epidemiological modeling, mapping and analysis for tailored disease control and health system strengthening (MATCH analysis), patient

pathway analysis (PPA), people-centred framework (PCF), quality of TB services assessment (QTSA), TB diagnostic network assessment (DNA), private sector drug analysis, screen-TB and epidemiological reviews including standards and benchmarks. The goal of the "TB Data Optimization" project, was to document experiences from countries and global stakeholders in implementing "supplemental" TB data activities and use this information to develop effective and efficient approaches to optimizing TB data-related activities for program planning.

This assessment was conducted from February 2021 through July 2023 by the U.S. Centers for Disease Control and Prevention (CDC) and the CDC Foundation (a non-profit organization affiliated with the CDC) and was funded by the Bill & Melinda Gates Foundation.

Overall project objectives

1. Summarize existing evidence and global partner perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
2. Summarize country perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
3. Map and align objectives and metrics across supplemental TB data- and evidence-related activities.
4. Synthesize findings into a set of recommendations for the optimization of data generation, review and analysis efforts.

This mixed-methods assessment was conducted in three phases as shown in Figure 1. Please refer to Annex 1 for more details on the project phases.

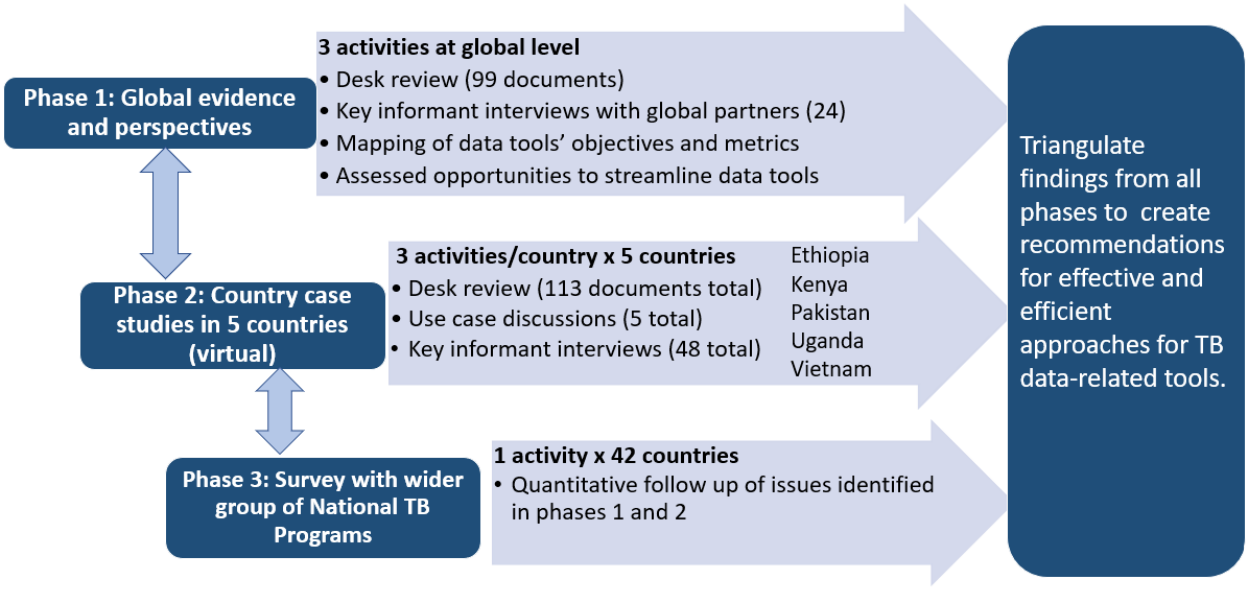


Figure 1. Three phases of the project

This report summarizes the activities and findings of the Uganda country case study and is intended for the Uganda NTP and their partners.

A comprehensive report with findings and recommendations from all three phases of the project, including the five country case studies, will be shared by the project team when complete.

Country case study objectives

1. Review existing evidence related to Uganda's use of TB data tools and activities (desk review).
2. Conduct a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade.
3. Conduct key informant interviews on the use and usefulness of supplemental TB data activities implemented in Uganda.

Country Case Study Methods

Desk review

A list of supplemental TB data activities that Uganda has implemented was obtained from the WHO. The list of activities was shared with the NTP and confirmed. The documents reviewed were obtained through the MOH/NTP website, e-journals or shared by NTP staff.

Fifteen supplemental TB data activity reports, publications and strategic planning documents from the last 10 years were reviewed. A standardized template (see Annex 2) was used to abstract information. Lessons learned were abstracted from activity reports while evidence of the use of the activities' findings/recommendations was abstracted from strategic planning documents such as National Strategic Plans and Global Fund applications. From these, an overall summary with main takeaways was synthesized.

Documents reviewed:

1. Activity report for TB network assessment for Moroto and Napak districts, 23-27 July 2019 (report)
2. Epidemiological review – Uganda, February 4-15, 2019 (report)
3. Joint assessment of the Tuberculosis Diagnostic Network of Uganda, August 25-September 6, 2019 (report)
4. Patient pathway analysis: a process in development of a person-centered national strategic plan, January 13-14, 2020 (presentation)
5. Anti-tuberculosis drug resistance among new and previously treated sputum smear-positive tuberculosis patients in Uganda: Results of the first national survey (journal publication)
6. Comparison of survey results to evaluate the availability, readiness, and quality of Uganda Tuberculosis Diagnostic Network, January 2021 (comparison between the TB diagnostic network assessment and quality of TB services assessment) (report)
7. Quality of Tuberculosis services assessment in Uganda, May 2020 (report)
8. The Uganda national population-based Tuberculosis prevalence survey 2014-2016: summary findings and recommendations (1 page brief)
9. Direct and indirect costs due to Tuberculosis and proportion of Tuberculosis-affected households experiencing catastrophic costs due to TB in Uganda, February 2019 (report)
10. The Uganda national Tuberculosis prevalence survey, 2014-2015 survey report (report)
11. End term review of the 2015/2016-2019/2020 national strategic plan final review report, November 2, 2019 (report)
12. National Tuberculosis and leprosy control programme revise national strategic plan 2015/16-2019/20, June 2017
13. National strategic plan for Tuberculosis and leprosy control 2020/21-2024/25, November 2020
14. The Global Fund funding request application form (2016)
15. The Global Fund funding request form, allocation period 2020-2022

Use case discussion

The purpose of the use case discussion was to better understand how TB data activities have helped the National TB Program and TB partners to:

1. Estimate the burden of TB in Uganda
2. Understand and address specific gaps in the TB care cascade
3. Make both short- and long-term plans for the TB program

"Use case" questions were developed with the aim to understand how the countries have used the various supplemental TB data tools and activities for the three purposes above (see Annex 3 for the use case discussion guide). Each set of questions was related to a section of the project's data framework (see Figure 2 below). Figure 2 shows the TB-related data activities that have been conducted in Uganda that may have been used to better understand each section of the data framework.

A 90-minute group discussion with six NTP staff and TB partners was conducted virtually over Zoom in June 2022. The NTP focal person was asked to select participants within the NTP and TB partners who were closely involved in implementing and/or using the data from the supplemental activities and/or involved in the development of the most recent National Strategic Plan and Global Fund Application. The discussion was audio recorded and transcribed using NVivo's automated transcription software. Two project staff reviewed the notes and audio recording of the discussion and summarized responses for each section of the data framework. The summaries were compared to ensure consistency and accuracy.

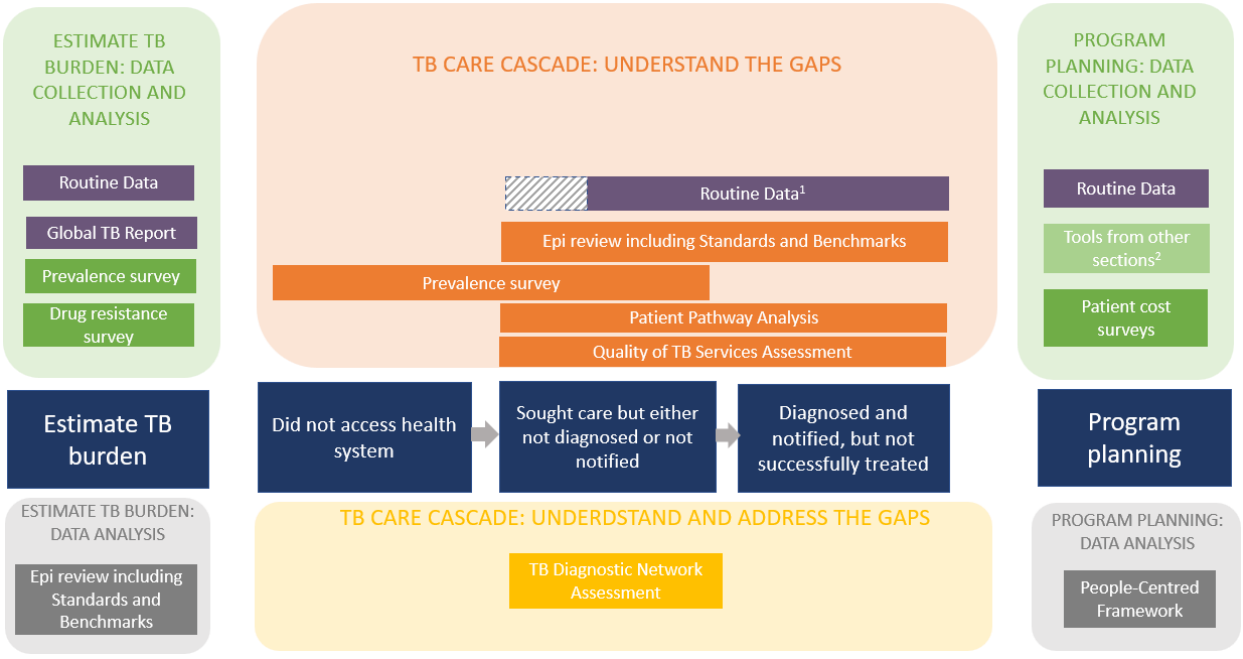


Figure 2. Framework for use of data activities in different aspects of TB program evaluation and planning adapted to the Uganda setting

[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

[2]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Key informant interviews

The purpose of the key informant interviews was to better understand the use and usefulness of the supplemental TB data activities.

Individual interviews were conducted with nine persons that work at the national or sub-national levels. At the national level, NTP staff and partners that supported TB data activities or use TB data were interviewed. At the subnational level, TB program staff at the regional and district level were interviewed. The interviews were approximately 60- to 90-minutes long.

Interviews were audio recorded, then transcribed verbatim using NVivo's automated transcription software. The transcripts were reviewed and coded by two project team members using NVivo. All codes were reviewed and agreed upon by project team members. Content analysis was conducted and key emerging themes (if at least 25 percent of respondents discussed a topic) were summarized.

Country Case Study Findings

Desk review

Desk review summary by TB data activity:

Supplemental TB data activity	Evidence of use of findings in National Strategic Plans (NSP)	Evidence of use of findings in Global Fund applications	Evidence of use of findings in program reviews
TB prevalence survey (TBPS) 2014/15	*2020-2025 NSP*: Main and secondary findings were highlighted throughout the NSP. It was listed as a major achievement and relevant document that was extensively reviewed during NSP development. A repeat prevalence survey was listed as a research priority. *2015/16 – 2019/20 NSP*:	*2021-2023 application:* Findings were highlighted throughout to provide context and rationale for prioritization of several interventions, including high risk populations, behavior change communication and TB care and prevention. Implementation of the survey also provided justification for proposed digital X-rays	*2019 program review*: Findings were presented in the report and highlighted throughout to provide context. The findings were used for target setting. Noted that the government at the highest level is aware of the high TB burden in the country following the results of the TBPS.

	The NSP was revised to include the TBPS. Programmatic implications of the findings and the response to these findings were listed. Findings were used to highlight challenges and gaps in the TB program. It was noted that a repeat TBPS will be needed in 5-7 years.	to contribute to finding missed cases. *2018-2020 application:* Findings were highlighted throughout to provide context and rationale for TB Above Allocation Request for TB Prevention, Care and Treatment/TB Case Finding and Diagnosis.	The TBPS was used for political commitment and to show that increased government financing is required. Conducting a repeat TBPS every 10 years was listed as a recommendation.
Drug resistance survey (DRS) 2009-2011	*2020-2025 NSP:* A repeat DRS was listed under a strategic objective and as a research priority. *2015/16 -2019/20 NSP:* Findings were highlighted in the TB/MDR/RR-TB section. A repeat DRS was listed under the objective to Implement the NTLP-led TB research agenda in collaboration with the Uganda TB research community.	*2021-2023 application:* A repeat DRS was proposed and listed as a priority operational research investment. *2018-2020 application:* Findings were highlighted to provide context. A repeat DRS was proposed.	*2019 program review*: Findings were highlighted in the Operational Objective for DR-TB. Conducting a repeat DRS every 5 years was listed as a recommendation.
Patient pathway analysis (PPA) 2019	*2020-2025 NSP:* Listed as a major achievement and relevant document that was extensively reviewed during NSP development. *2015/16 -2019/20 NSP:* Listed under the objective to implement the NTLP-led TB research agenda in collaboration with the Uganda TB research community.	*2021-2023 application:* Findings were highlighted to provide context and used as justification for prioritizing engagement of private healthcare providers in the request.	*2019 program review:* Findings were presented in the report.
People-centred framework (PCF) 2020	*2020-2025 NSP:* The PCF was used for NSP development. The approach is detailed in the NSP development process section.	*2021-2023 application:* The PCF was not mentioned directly. The application was based on the people-centred NSP.	*2019 program review:* It was noted that the next NSP should be people centred.
Epidemiological (Epi) review, including standards and benchmarks	*2020-2025 NSP:* The 2019 epi review was listed as a major achievement and relevant document that was	No evidence.	*2019 program review*: Noted that the epidemiological review was included in the program review. The

2013 2019	extensively reviewed during NSP development. *2015/16 -2019/20 NSP*, an objective was to strengthen capacity of the NTLP to conduct TB epidemiological assessments.		deeper epi analysis complements the review. The checklist of TB surveillance standards and benchmarks were presented in the report.
Patient cost survey (PCS) 2018	*2020-2025 NSP*: Listed as a major achievement and relevant document that was reviewed during NSP development. Findings were used to highlight gaps which informed strategic interventions and activities. The survey provided a baseline for monitoring and evaluation. *2015/16 -2019/20 NSP*: Listed under two objectives: 1. To advocate for increased financial resources from domestic sources and ensure efficient and effective use of available finances. 2. To implement the NTLP-led TB research agenda in collaboration with the Uganda TB research community.	*2021-2023 application:* Findings were used as rationale to prioritize TB Care and Prevention Treatment and MDR-TB Treatment.	*2019 program review:* It was a recommendation for the NTLP to engage actively in the Universal Health Care discussion, including addressing findings of the PCS.
Quality of TB services assessment (QTSA) 2019	*2020-2025 NSP:* The QTSA was listed as a major achievement. The assessment was not completed prior to the roll out of the NSP.	No evidence. The results of the assessment may not have been ready yet.	No evidence. The assessment was not yet complete.
TB diagnostic network assessment (DNA) 2019	None (likely in National Reference Lab strategic plan). Results were not completed prior to the roll out of the NSP.	*2021-2023 application:* Used as rationale for funding for the intervention TB care and prevention: case detection and diagnosis: request for more machines to optimize sample referral and operationalize the assessment report.	No evidence (the assessment may not have been completed yet).
Epidemiological modelling 2020	*2020-2025 NSP:* Results for six TIME model scenarios were presented in the NSP with full results in the	No evidence.	None (Modelling may not have been completed yet. The TIME model is

	Annex to study the targets. Results informed the target populations and services coverage in the costing approach.		specifically used for NSP development).
OneHealth tool for TB budgeting 2020	*2020-2025 NSP:* Costed using the OHT to reflect the resources needed to meet the targets and interventions. The cost inputs were derived from an extensive review of the program reports, TBPS report, funding proposal data from surveillance reports and operational annual plans, among others.	No evidence.	No evidence (the OHT is specifically used to cost the NSP).

Overall findings

Priority TB data activities and research:

A repeat prevalence survey is a priority for the country. It was noted in the 2015/16 – 2019/20 NSP that a repeat prevalence survey would be needed in 5-7 years (last one was in 2014/15) and was listed as a research priority in the 2020-2025 NSP. It was also recommended in the 2019 program review to repeat the survey every 10 years.

A repeat drug resistance survey is another priority for the country. A repeat drug resistance survey was listed as an objective under the research agenda in the 2015/16 -2019/20 NSP and was listed as a research priority in the 2020-2025 NSP. It was also recommended in the 2019 program review to repeat the survey every five years.

Supplemental TB data activities that were important for program planning:

Supplemental data activities that were listed as relevant or extensively reviewed for NSP development include: the TB prevalence survey, patient pathway analysis, people-centred framework, epidemiological review, patient cost survey and TIME modeling. The OneHealth Tool for TB budgeting was used to cost the 2020-2025 NSP.

Supplemental data activities that were used or referenced in the Global Fund applications as rationale for funding include: the TB prevalence survey, drug resistance survey, patient pathway analysis, patient cost survey and diagnostic network assessment. The Global Fund application is based on the patient-centred NSP.

Supplemental data activities that were important, used for or influenced the recommendations of the 2019 end-term review include: the prevalence survey, drug resistance survey, patient pathway analysis, epidemiological review and patient cost survey.

The quality of TB services assessment and TB diagnostic network assessment were not yet complete prior to the development of the 2020-2025 NSP, therefore, findings were not used much, if at all, during that time to inform the NSP and subsequent Global Fund application.

Findings from the prevalence survey and patient cost survey were most frequently highlighted in the NSPs, global fund applications and program reviews. The drug resistance survey was referenced in the previous planning and funding cycles (2015/16 – 2019/20 NSP and 2018-2020 funding cycle), but not in the most recent funding cycles (2020-2025 NSP and 2021-2023 funding cycle). The 2015/16 – 2019/20 NSP was revised to include the prevalence survey when the results were available since the findings have several programmatic implications. The TIME model was completed for the most recent NSP, but not in the previous NSPs. The patient pathway analysis, patient cost survey and quality of TB services assessment were planned for in the previous NSP (2015/16 – 2019/20) and were conducted as planned before the development of the next NSP (2020-2025).

Use case discussion

Respondent characteristics

Six NTP staff and TB partners consented to and participated in the use case discussion. Five participants (83.3%) were male and one was female. Five participants (83.3%) were NTP/MOH staff and one was from a TB partner organization.

Key findings from each section of the data framework

	Most critical and/or useful sources of data	Other data or tools that would be useful

Estimation of TB burden	• For DS-TB:
	  ○ Prevalence survey is the closest source to the actual situation.
	  ○ WHO global TB estimates are derived from modelling and used to supplement the prevalence survey.
	  ○ Epidemiological reviews point towards TB burden estimates.
	• For DR-TB:
	  ○ Drug resistance survey is the closest source to the actual situation.
	• For target setting:
	  ○ Modeling projections provided estimates of incident cases over the next five years; these were used to develop targets for DS-TB and DR-TB case notification.
	  ○ Prevalence survey provides the TB burden estimation, which
		• Updated prevalence survey and drug resistance survey.
		• Prevalence survey and drug resistance surveys that provide subnational level estimates.
		• Updated master list of all health facilities.
		• More comprehensive modelling, incorporating it with the One Health Tool for TB estimates and budgeting; local capacity building is needed for this.
		• Roll out the electronic case-based surveillance system nationwide, currently at 11% coverage. It is expected to become a trusted source of data as it improves.
		• Need a private sector assessment to look at private sector reporting.
		• Using Geographic Information Systems (GIS) to look at

	fed into DR-TB target setting, using the estimated proportion of TB cases with DR-TB. ○ Used program data to look at past performance in TB case detection to project performance for the coming year.	clustering of cases would help to understand burden.
People with TB who do not access the health system	• The patient pathway analysis[3] consolidated data from other sources including the prevalence survey and was instrumental for looking at people who don't access care and led to addressing TB awareness to improve health seeking behavior via the community awareness screening and testing campaign and engagement of the private sector, to address the gap and have seen an increase in care seeking and in case notifications. • Hotspot mapping helped identify areas that have a high influx of TB cases (Note: hotspot mapping can be a formal activity with GIS data or a facility-level activity looking for localities that have a lot of TB cases).	• Use of digital technology to find and follow-up all contacts of TB patients. Many contacts are listed but not reached through current contact tracing efforts. • Hotspot surveys to look at TB among high-risk populations (e.g. TB in prisons). • Nationwide rollout of the electronic case-based surveillance system with GIS coordinates embedded. • Include more pointed questions on health seeking behavior for TB in the country's next demographic health survey.
People with TB who presented to health facilities but were not diagnosed and/or not notified	• Patient pathway analysis was important and showed the need to improve diagnostic capacity, especially at lower-level facilities, which led to the GeneXpert Hub System. • Use weekly GeneXpert report to monitor the functionality/capacity and utilization of the machines at the sites and to look at case notification. There is a maximum number of samples that can be tested within a week, which is measured against the number of samples that are coming out and	• Exit interviews to investigate who came to the facility and who got screened for TB. • Full evaluation of the cascade analysis within the diagnostic pathway. It would be helpful to look at what happened to the people who were not screened. • Active case finding has improved screening at health facilities and strengthened reporting; data from active case finding will help inform decision making and planning. • Service availability and readiness assessments (SARA)

[3] Based on the description provided, this may have been a reference to a Care Cascade Analysis rather than a Patient Pathway Analysis.

	the number of results that are being given. • TB diagnostic network assessment was timely and informed network capacity and placement of existing and new diagnostic tools. • Prevalence survey showed where TB cases were being missed, which then informed placement of diagnostic tools. • Prevalence survey also informed that x-rays are a good screening tool, which led to procurement of mobile digital x-rays for outreach. • Program review helped to understand how missing people with TB can be identified. • Routine reporting cannot be overemphasized. It is important to look at the screening cascade; it is helpful to map it alongside GeneXpert utilization and stock.	were helpful but could focus more on equipment for TB diagnosis and TB treatment.
People with TB who were diagnosed but not successfully treated	• Electronic case-based surveillance system has expanded to DS-TB, not just DR-TB. It has been helpful for analyzing key indicators to monitor patients and ensuring everyone who is diagnosed is accounted for. • Patient pathway analysis provided insight into the treatment success rate benchmark and helped with target setting for treatment success rate in the National TB Strategic Plan. • Epidemiological review and the patient pathway analysis helped to analyze where gaps are using epidemiological data. For example, it pointed to stagnating treatment success. All the above efforts led to the Treatment Success Rate Collaborative and the TB program has seen improvements in treatment success rates since.	• Strengthening routine data systems to be more efficient and effective, to have better data harmonization between systems and ensure reporting is clean and thorough at lower levels. The strengthened routine data system could become an important source of data. • Broad-scale mortality audits to monitor outcomes.

TB program planning	• National TB Strategic Plan (NSP) development:
	  ○ Patient pathway analysis and people-centred framework: findings from the PPA were used to develop strategic objectives. Then root cause analysis based on the PCF was used to prioritize interventions.
	  ○ The PCF was the basis/guide for writing the NSP.
	  ○ Prevalence survey findings were used to understand the TB situation in the country.
	  ○ Patient cost survey helped with planning and developing interventions to help reduce catastrophic costs for patients.
	  ○ Epidemiological review.
	  ○ Used budgeting and modelling to prioritize focus areas (started with low hanging fruit then more complicated aspects); we had limitations in the capacity to use the One Health Tool.
	• Global Fund proposal:
	  ○ Used the patient-centred National Strategic Plan for TB (NSP) to prepare the Global Fund application.
	• Routine program planning:
	  ○ Developed annual operational plans based on the NSP.
	  ○ Patient cost survey helped with planning and developing interventions to help patients.
	  ○ Limitations in capacity to use the One Health Tool.
		• TB service delivery costing study
		• Add TB investment case
		• One Health Tool with epidemiological modeling: these were both previously done but they could be adapted to the patient pathway. There were challenges with quantifying and budgeting certain things and newer interventions were not included.
		• MATCH analysis to map care seeking behavior through geographical information and map with GeneXpert utilization.
		• It would be helpful to look at subnational TB estimates and see how interventions are working.
		• The TB diagnostic network assessment and quality of TB services assessment were completed after the 2020/21 – 2024/25 NSP had already been developed and rolled out, so it was not used in that NSP.

Key takeaways

- The NTP extensively used the findings from the supplemental activities to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but also relied extensively on routine data. It is hoped that once the electronic case-based surveillance system is rolled out nationwide, it will become a useful and trusted source of data to estimate TB burden, identify and understand gaps in the TB care cascade and for evidence-based TB program planning.

- The 2014/2015 TB prevalence survey has been very useful and was needed to understand the TB epidemic in the country, however it is becoming outdated and the NTP would like for a repeat prevalence survey. For the next prevalence survey, it is important to include subnational level estimates.
- To estimate DS-TB and/or DR-TB burden in the country, there is a need to repeat the drug resistance survey as the 2009-2011 survey is outdated.
- It would be helpful if other surveys such as the demographic health survey (DHS) and service availability and readiness assessment (SARA) could include more TB-focused questions to provide data on health seeking behavior and availability of TB diagnostics and treatment.
- The patient pathway analysis was very important and helpful to understands gaps in people with TB who do not access the health system and people with TB who sought care but were either not diagnosed and/or not notified. It was also informative for developing interventions and strategies for the national strategic plan.
- The TB diagnostic network assessment has been useful for understanding the network capacity and placement of existing and new diagnostic tools, like GeneXpert and TrueNat, and how utilization could be improved.
- The TB diagnostic network assessment and quality of TB services assessment was completed after the 2020/21-2024/25 NSP had already been developed and rolled out, so the findings and recommendations from those assessments were not used in the current NSP.
- Want to improve use of One Health Tool for TB budgeting with epidemiological modelling for the next NSP by building capacity for NTP staff to use those tools.
- Broad-scale mortality audits are needed to monitor treatment outcomes/TB-related mortality.

Key informant interviews

Respondent characteristics

Of the nine key informants, five were NTP staff and four were in-country TB partners (Figure 3, left). On average, the respondents have been doing TB-related work for 11 years (standard deviation = 4.6). Respondents were mostly male (67%) (Figure 3, middle) and mostly worked at the national level (78%) (Figure 3, right). The majority of respondents were familiar with (either were involved in implementing and/or planning and/or heard the results of findings) the prevalence survey, patient cost study, people-centred framework, patient pathway analysis, quality of TB services assessment, drug resistance survey, TB diagnostic network assessment and epidemiological reviews including standards and benchmarks (Figure 6). Epidemiological modelling was the only activity where less than 50 percent of respondents were familiar with it.

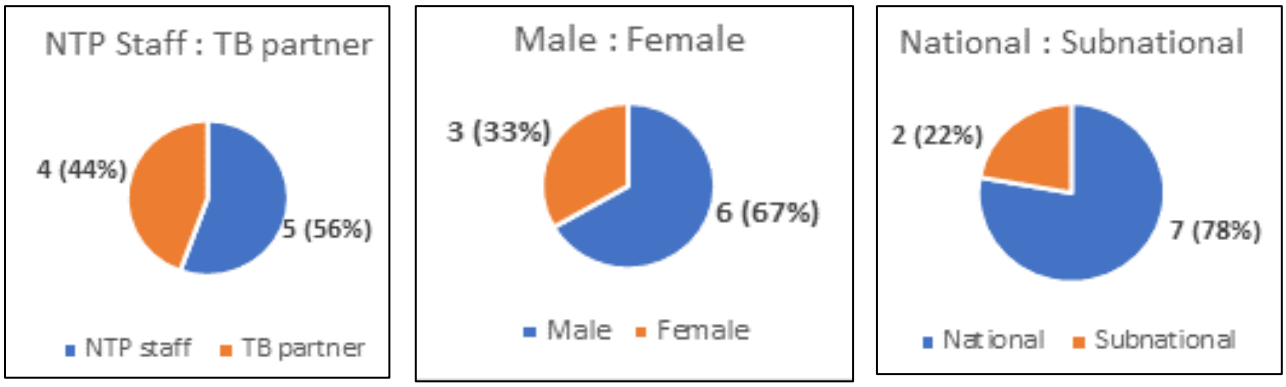


Figure 3. Characteristics of key informants (left: NTP staff to partner ration; middle: male to female ratio; right: national to subnational ratio)

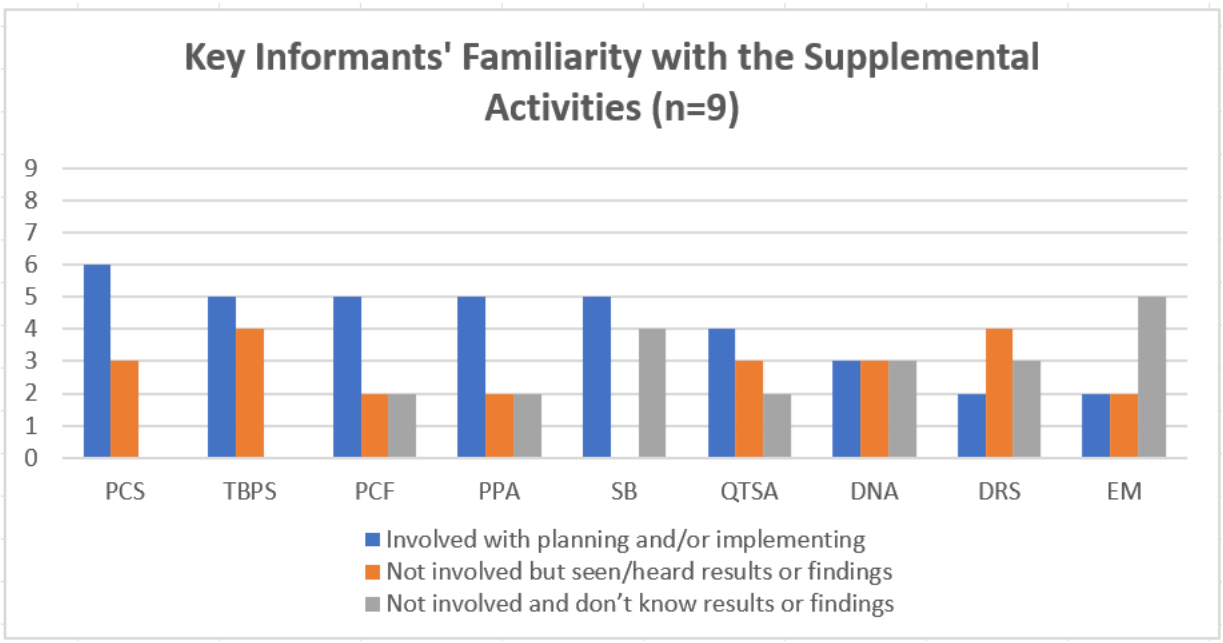


Figure 4. Key informants' familiarity with the supplemental TB data activities implemented in Uganda

PCS = Patient cost survey; TBPS = TB prevalence survey; PCF = people centred framework; PPA = patient pathway analysis; SB = epidemiological review, including standards and benchmarks; QTSA = quality of TB services assessment; DNA = TB diagnostic network assessment; DRS = drug resistance survey; EM = epidemiological modelling

Key emerging themes

The following key themes emerged from the key informant interviews.

Theme: Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan.

- Activities that have been particularly useful include the prevalence survey, patient cost study, TB diagnostic network assessment and the patient pathway analysis. Other important activities include the drug resistance survey, people-centred framework and the quality of TB services assessment.
- The **prevalence survey** provided national TB prevalence which informed the TB incidence estimates developed by WHO. It helped with target setting, showed missing TB cases and highlighted gaps and delays in diagnosis. These findings informed scale-up of TB prevention in the community and the need to increase awareness about TB. It also informed the need for case finding and using x-rays to find missing people with TB. However, the survey did not have enough power to provide subnational level estimates, which are needed for sub-national target setting.
- The **patient cost survey** estimated the percentage of TB patients and their households who face catastrophic costs. It also quantified the costs that TB patients and their households incur from seeking TB services, including indirect costs such as transportation and food supplements and highlighted key barriers to care. Findings informed strategies/interventions to help patients complete treatment and to increase access to care and treatment by providing patients with food supplements and transport costs. The findings were especially important in informing the enabler program to reduce costs for DR-TB patients. However, there were mixed sentiments among respondents on whether the interventions that came out of the survey were implemented successfully or not – some mentioned these interventions were taken up, some mentioned there is no funding to implement these interventions and others uncertain about whether Global Fund provided some support for these interventions.
- A **TB diagnostic network assessment** was conducted at the right time to inform the National TB Reference Laboratory's strategic plan. It helped to understand the diagnostic network and showed how well laboratories are working and where there were challenges. It guided the placement of existing diagnostic tools and where more diagnostic tools were needed to increase access and coverage across the nation. It helped with advocacy to the Global Fund for the addition of more tools to the diagnostic network. The findings also helped to improve the sample transport system.
- **Patient pathway analysis** informed where patients seek care and get diagnosed, and where the gaps and missed opportunities are in the TB care cascade. Results of the analysis indicated that the majority of patients sought care at private facilities first but were not notified to the NTP. The findings informed the need to engage the private sector and public-private mix (PPM) to enhance case finding. It informed development of a "one stop shop" model to help patients access all needed TB services at once. The aforementioned results also informed the development of the 2020/21 – 2024/25 NSP.

Illustrative quotes:

"**TB prevalence survey**, I think that was a big game changer for us, because it highlighted the gaps in TB diagnoses, of finding the TB cases. Previously we were really focusing on facility interventions to improve TB diagnosis, ensuring people are screened and focusing on the lab systems. But the prevalence survey highlighted the missed opportunities in the community...also missed cases in health facilities. It showed that by the time a patient is diagnosed, they have had several interactions with health facilities already." – Key Informant, National level, Uganda

"**TB diagnostic network assessment**, very helpful for knowing where to place our diagnostic tools, where do we leverage diagnostic tools that we have - microscopes, GeneXpert – adding more tools to the diagnostic network, especially TrueNat machines and TB-Lam. This assessment has been very helpful with critical information we need to know for where to place and how to utilize the diagnostic tools." – Key Informant, National level, Uganda

"The **patient pathways analysis** has been very helpful, especially engaging the private sector for case finding and diagnosis, and that has led us to know where we should put a number of diagnostic tools, or where do we engage, and what kind of private sector in terms of healthcare." – Key Informant, National level, Uganda

"**Patient cost survey** provided numbers but then these socio-economic activities related to the catastrophic costs are not implemented. Health insurance has issues and where people are getting enablers [e.g. food supplements, transport costs] is not well structured." – Key Informant, National level, Uganda

Patient cost survey: "What is lacking is to see them [recommendations] implemented at all levels of care. Currently, social protection, we have yet [to see] any legislative policies on this. Very good recommendation [though]. Seeing that these patients are linked to income generating activities, we know where social protection services are, but reinforcing them is not happening yet. Social insurance as a country is not yet operational. So the recommendations were there, but the implementation is still wanting." – Key Informant, Subnational level, Uganda

Theme: Challenges with funding

- In general, there is inadequate domestic funding for TB-related activities in the country. Supplemental activities are almost always funded by donors.
- The biggest push for supplemental activities is through the NTP. If the NTP decides to do a supplemental activity, they will request support from partners and look for funding. However, the ability to implement these activities depends on funding availability and who is providing the funding and what their interests are.
- Frequency and timing can be off because of the lack of funding availability, especially for the surveys (e.g. TBPS, DRS). Need repeat TBPS and DRS because they are outdated, but there is a delay due to funding availability.
- Funding is already a challenge, so resources may be inadequate to combine activities into something even bigger; when funding is available for a particular activity, just take the opportunity, because the country cannot directly control the resources.
- More domestic funding for routine activities is needed.
    - If routine systems are not improved, additional supplemental activities will not provide any new or useful information.
    - More funds should be allocated domestically for sustainable improvement in routine data systems.

Illustrative quotes:

"I think there are different interests or different funders; some of them are WHO guided, some of them are guided by the program to find what our situation is in country. I do think that it's not a standard that all these supplemental activities are done, but it may be driven by funding or by who is invested in that activity." – Key Informant, National level, Uganda

"I think the biggest problem that we've had is funding, which is largely external because without funding from CDC, Global Fund, we've not had a lot of in-country commitments from government…We tend to rely on external funding and of course, we deal with the sometimes changing landscape of funding, we are not able to get these funds in time sometimes." – Key Informant, National level, Uganda

Theme: Timing and coordination of supplemental activities is important

- Activities should be implemented before developing the next NSP. It is important to coordinate with the Global Fund/USAID on timing of when activities should be implemented to ensure source of funding clearly and early enough.
- Timing of dissemination of findings has been delayed in the past, making it difficult to use the findings for planning.
- Plan how to stagger activities funded by different donors/stakeholders; need to agree on timing and budgeting of implementation.

Illustrative quote:

"I would like for donors to know that these supplemental activities are important, they need to be planned well, they need to be funded for us if we are to end the TB epidemic, we need these to be conducted timely and for the data to be used. The international stakeholders also a similar message. We need to come together, the national TB program with the international stakeholders. Plan well for these activities, but also dialogue with the donors to make sure that funds are available to execute these activities." – Key Informant, National level, Uganda

Theme: Important to build local capacity, but technical assistance is still needed

- Lack of human resource capacity was a frequently mentioned challenge:
  - Inadequate number of staff to support supplemental activities; often staff supporting supplemental activities are also supporting routine program activities, which can cause program disruptions; need to rely on external partners to provide support.
  - Lack of technical expertise in the ministry, specifically around research activities and reports; need to rely on external expertise and technical assistance.
- Involve and draw on capacity of local academic institutions and partners to implement supplemental activities rather than depending on international partners for technical expertise, but local capacity is not there yet.
  - Partnering with academic institutes and universities can also assist in building in-country capacity for research and analysis; but difficult to maintain due to funding constraints.
- Need to increase professional development and transfer of skills for health care workers and field staff who will be supporting supplemental activities.
- Need to grow data skills and technical expertise of local staff to support analysis and interpretation of results and recommendations at all levels.
- The country appreciates support from international donors and technical partners. There is a need of technical assistance for report writing, not just planning and implementation.

Illustrative quote:
"The other common challenge is usually because these are research activities you find they need to be done and the capacity is not within the national TB program. Then the other one that is also a common challenge, when we say it will be the researchers or the technical personnel, but also the numbers of personnel that need to be available, sometimes the personnel are there, but the numbers are not adequate." – Key Informant, National level, Uganda

Theme: Dissemination of results and recommendations

Dissemination practices:

- At national level
  - Several national fora to share findings and recommendations from the supplemental activities: quarterly national coordination committee meeting (includes different stakeholders and implementing partners), bi-annual multi-sector framework for TB, national performance review meetings, data review meeting for the activity (findings are reviewed by consultants and stakeholders to ensure agreement), annual National TB meeting/conference, TB research forums, World TB Day, technical working group.
  - Findings and recommendations are shared at the dissemination meeting, workshop or conference for the specific activity, which are attended by a wide range of stakeholders (e.g. funders, technical partners, WHO, ministry officials, implementing partners).
  - Findings and recommendations for some activities are written up in a report and shared.
  - Respondents agree that both the NTP and partners who are involved in implementation and dissemination are well-informed of the findings and recommendations.
- At subnational level
  - Usually invited to attend national dissemination meeting, workshop or conference; mixed responses on whether subnational level staff go or not; there is no specific subnational level dissemination.
  - The NTP uses any opportune engagements to share results with subnational level staff and guide the direction of program implementation (e.g. TBPS, DRS, PCS), such as at regional and district performance review meetings, joint planning meetings, trainings.
  - One pager brief with key points is shared with subnational level staff (e.g. TBPS, PCS)
  - Respondents agree that it is mostly only TB focal persons at the highest subnational level who are often well-informed, and they trickle down the information to lower levels but not adequately.
- Shared widely
  - Published findings in journals and can be found online (e.g. TBPS, DRS, PCS)
  - International conferences (e.g. The Union Conference)
  - Reports for certain activities can be found online/on NTP website
  - WHO dissemination (e.g. TBPS, PCS): WHO has a combined report/book with results from several countries for comparison and lessons learnt and guidance booklet on how the surveys were conducted.
- Supplemental TB data activities that are most widely disseminated/shared
  - Prevalence survey
  - Drug resistance survey

- Patient cost survey

Suggestions for improvement

- Involve relevant stakeholders: There is limited involvement of governance structures of Ministry of Health in some supplemental activities that leads to ineffective implementation of recommendations at lower programmatic levels.
- Subnational level respondents would like to more easily be able to access the findings; suggestions include: have the full findings or report be included in the annex of the TB guidelines they are given by the national level team so that they can refer to the findings easily; have regional level dissemination workshops and tailor it to the regional and lower levels so each level understands how to implement the recommendations; have fact sheets be more accessible to health facility level staff.
- One pager key findings and fact sheets should be shared as widely as possible, even with other ministries/sectors, the communities, political leaders and religious leaders, depending on which supplemental activity.

Illustrative quotes:

"We have our quarterly National Coordination Committee, which is chaired by the Director General of Health Services, but it is composed of several stakeholders and technical partners. That's where we submit the findings and recommendations for the studies and the supplementary activities. We have also developed the [multi-sector...] framework for TB. This is chaired by the Office of the Prime Minister and co-chaired by the Permanent Secretary. During these bi-annual meetings, we also submitted the findings and recommendations from some of the studies, assessments and surveys… For subnational level and community level, we depended heavily on national level dissemination, where we have different stakeholders up to community level to see that the findings and recommendations reach out to the sub-national level and community level. For example, at the National Coordination Committee, we have all the implementing partners who implement at sub-national level, so we use that opportunity to disseminate the findings and recommendations and we hope and believe that they then take these recommendations and the findings to the sub-national level." – Key Informant, National level, Uganda

"At the regional level, you're coming up every quarter looking at your performance as a region and comparing the national performance. Any new idea or new recommendations are brought in that meeting, because we have representatives from the National TB and Leprosy Program and the National TB Reference Laboratory. That is where we really learn these sorts of things." – Key Informant, Subnational level, Uganda

"There is a TB performance review, joint planning with the districts. There are opportunities to incorporate some of these activities and their findings in trying to guide the direction of the implementation of programming, be at facility or district level or regional level or even in the communities." – Key Informant, National level, Uganda

Suggestions for improvement from respondents

- Need subnational level estimates for better target setting and resource allocation in different regions. Some regions struggle to meet targets while some are overshooting their targets.
- Involve relevant stakeholders:

    - Involve in-country academic institutions and universities in supplemental activities more
    - Partnering with academic institutions and universities can also assist in building in-country capacity for research and analysis; but difficult to maintain due to funding constraints
    - Limited involvement of governance structures of Ministry of Health in some supplemental activities leads to ineffective implementation of recommendations at lower programmatic levels.
- Subnational level respondents would like to more easily be able to access the findings; suggestions include: have the full findings or report be included in the annex of the TB guidelines they are given by the national level team so that they can refer to the findings easily; have regional level dissemination workshops and tailor it to the regional and lower levels so each level understands how to implement the recommendations; have fact sheets be more accessible to health facility level staff.
- One pager key findings and fact sheets should be shared as widely as possible, even with other ministries/sectors, the communities, political leaders and religious leaders, depending on which supplemental activity.
- Coordinate with Global Fund and/or USAID on timing of when tools should be implemented to ensure source of funding clearly and early.
- Share results and learn from each other's experiences:
    - Cannot eliminate TB in isolation, TB crosses borders and countries need to know what others are doing and learn from each other's programs.
    - By learning from each other, create a network of expertise across countries (south-south).

Overall Findings

When the findings from the case study's three activities were jointly analyzed, several overall themes emerged and are described below. These combined findings are the same as those presented in the executive summary.

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the NSP:** The different supplemental activities that Uganda conducted were extensively used to estimate the TB burden, understand gaps in the TB care cascade and for developing interventions and strategies for the national strategic plan, but the country also relied extensively on routine data. Activities that have been particularly useful include the prevalence survey, patient cost study, TB diagnostic network assessment and the patient pathway analysis. Other important activities include the drug resistance survey, people-centred framework and the quality of TB services assessment. It would be helpful if other surveys such as the demographic health survey (DHS) and service availability and readiness assessment (SARA) could include more TB-

focused questions to provide data on health seeking behavior and availability of TB diagnostics and treatment. For the next NSP, the country would like to improve use of the One Health Tool for TB budgeting and epidemiological modelling by building capacity for NTP staff to use those tools. The country also indicated broad-scale mortality audits are needed to monitor treatment outcomes/TB-related mortality. However, there is a need for subnational level estimates for better target setting and resource allocation in different regions.

- **Timing, coordination and funding availability for supplemental activities are critical:** Prioritized activities should be implemented before developing the next National Strategic Plan (NSP) for TB. Results of the TB diagnostic network assessment and quality of TB services assessment were completed after the last NSP was finalized. Frequency and timing of data activities can be less than intended because of the lack of funding availability and other implementation or logistical delays, especially for the surveys (e.g. TB prevalence survey, drug resistance survey). Supplemental activities are almost always funded by donors. In general, there is inadequate domestic funding for TB-related activities in the country. It is important to coordinate with the Global Fund, USAID and other funders on timing of when activities should be implemented to clearly ensure the source of funding and that it is available early enough. Timing of dissemination of findings has been delayed in the past, making it difficult to use the findings for planning purposes.

- **It is important to build local capacity, but technical assistance is still needed:** Lack of human resource capacity was a frequently mentioned challenge. Staff supporting supplemental activities are also supporting routine program activities, which can cause program disruptions. It was suggested that countries and funding agencies involve and draw on capacity of local academic institutions and partners to implement supplemental activities rather than depending on international partners for technical expertise. However, local capacity is not always sufficient yet, and maintaining partnerships can be difficult due to funding constraints.

- **Dissemination of results and recommendations:** The NTP and partners who are involved in implementing activities are well-informed of the findings and recommendations. Though NTP uses opportune engagements to share results with subnational level staff and guide the direction of program implementation, there is room for improvement with dissemination of key findings to lower levels; often it is only TB focal persons at the highest subnational level that are well-informed and trickle down of information to lower levels is inadequate. Subnational level respondents would like to more easily be able to access the findings and have regional level dissemination workshops tailored to the lower levels, so each level understands how to implement the relevant recommendations. There is limited involvement of governance structures of Ministry of Health in some supplemental activities, which leads to ineffective implementation of recommendations at lower programmatic levels. Tailored one-page key findings and fact sheets could be shared as widely as possible, even with other ministries/sectors, the communities, political leaders and religious leaders.

- **Remaining data gaps for programmatic planning:** While there is excitement over the nationwide roll out of the electronic case-based surveillance system, it is understood that routine surveillance systems cannot capture all data needed for TB program planning. The following were highlighted as additional data or data sources that would be informative for TB program planning: an assessment of stigma associated with TB and whether stigma affects access to care; insight into the capacity of health care workers to provide TB services; a tool to identify data gaps in childhood TB; an assessment of private sector reporting; exit interviews to understand who comes to the health facility and who gets screened for TB; a mortality audit to look at TB-related deaths; and a TB service delivery costing study to look at unit costs of TB services.

Conclusion and next steps

This country case study was conducted to learn from Uganda's experience with planning and implementing supplemental TB data activities and to better understand how these activities have helped the NTP and TB partners to: gain insight of the TB burden in the country, better understand gaps in the TB care cascade and design interventions to find the missing cases, and make both short- and long-term plans for the TB program.

The case study was an opportunity for Uganda's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Uganda's MOH look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. Key takeaways from the Uganda case study will be factored into the overall recommendations coming out of the project, which will cover both general aspects of planning and implementing supplemental TB data tools as well as tool-specific recommendations.

Findings from Uganda have been compiled with findings from the four additional country case studies, global-level interviews and global desk review and the NTP manager survey to develop a framework to help countries prioritize TB data-related activities. This framework is currently under development in partnership with the World Health Organization (WHO).

Annex 16: Viet Nam Country Case Study Report

Optimizing TB data analytics and evidence tools to improve data use in TB programmatic planning:

Viet Nam Country Case Study Report

Project implemented by the CDC Foundation and Centers for Disease Control and Prevention (CDC) with funding from the Bill & Melinda Gates Foundation

July 2023

List of abbreviations

BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
DNA	TB Diagnostic Network Assessment
DNO	Diagnostic Network Optimization
DRS	Drug Resistance Survey
GIS	Geographic information system
IS	Inventory Study
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NSP	National Strategic Plan
PCF	People-Centred Framework
PCS	Patient Cost Survey
PPA	Patient Pathway Analysis
PSRx	Private Sector Drug Sales Analysis
QTSA	Quality of TB Services Assessment
TB	Tuberculosis
TBPS	National TB Prevalence Survey
VNTP	Viet Nam National Tuberculosis Program
WHO	World Health Organization

Project team and participants

Project Team

Miranda Bodfish	Associate Vice President, Infectious Disease Programs, CDC Foundation
Christina Braccio	Health Scientist, Global Tuberculosis Branch, U.S. CDC
Anand Date	Branch Chief, Global Tuberculosis Branch, U.S. CDC
Rachel Fiorillo	Project Manager, Infectious Disease Programs, CDC Foundation
Jennifer Harris	SIA Team Lead, Global Tuberculosis Branch, U.S. CDC
Eveline Klinkenberg	Consultant, Connect TB, the Netherlands
Stephanie O'Connor	Epidemiology Fellow, Global Tuberculosis Branch, U.S. CDC
Victoria Tully	Public Health Analyst, Global Tuberculosis Branch, U.S. CDC

Project Steering Committee

Sevim Ahmedov	USAID
Kenneth Castro	Emory University and USAID
Daniel Chin	Bill & Melinda Gates Foundation
Kathy Fiekert	KNVC Tuberculosis Foundation
Harry Hausler	TB HIV Care
Fukushi Morishita	World Health Organization, Western Pacific Region
Nnamdi Nwaneri	The Global Fund to Fight AIDS, Tuberculosis and Malaria
Suvanand Sahu	Stop TB Partnership
Charalampos (Babis) Sismanidis	World Health Organization
Stavia Turyahabwe	Tuberculosis and Leprosy Program, Ministry of Health Uganda

Viet Nam participants

Do Hoang Nam	Viet Nam National TB Program
Alyssa Finlay	CDC, Viet Nam
Le Thi Hong Ngoc	Can Tho TB and Lung Hospital
Le Tho	USAID, Viet Nam
Luong Anh Binh	Viet Nam National TB Program
Khieu Thi Thuy Ngoc	Viet Nam National TB Program
Nguyen Binh Hoa	Viet Nam National TB Program
Nguyen Dinh Tuan	Viet Nam National TB Program
Giang Nguyen	Friends for International Tuberculosis Relief (FIT)/IRDVN
Nguyen Thi Minh Khai	Pham Ngoc Thach Hospital, Ho Chi Minh
Nguyen Van Hoi	District 6 Health Center, Ho Chi Minh

Nguyen Viet Hai	Viet Nam National TB Program
Nguyen Viet Nhung	Viet Nam National TB Program
Truong Thanh Huyen	Viet Nam National TB Program
Tuan Luu	FHI 360, Viet Nam
Quang Hieu Vu	World Health Organization, Viet Nam
Luan Vo	Friends for International Tuberculosis Relief/Institut de Recherche pour le Developpement (FIT/IRD Viet Nam)

EXECUTIVE SUMMARY

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of TB data activities outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these activities are referred to as "supplemental" TB data activities. This project took place from January 2021 through August 2023 and had three phases:

1. Global-level desk review and key informant interviews
2. Country case studies in five countries
3. Online survey of national TB program (NTP) managers in countries that had substantial experience with supplemental TB data activities

This report summarizes the activities and findings of the Viet Nam case study (conducted November 2021 to August 2022) and is intended for the Viet Nam National TB Control Program (VNTP) and their partners. This country case study consisted of three parts 1) a desk review of existing evidence related to Viet Nam's use of supplemental TB data tools and activities; 2) a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade; 3) a series of key informant interviews on the use and usefulness of supplemental TB data activities implemented in Viet Nam.

The following overall themes emerged from the combined analyses for Viet Nam:

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan (NSP):** The different supplemental activities that Viet Nam conducted were extensively used to help estimate the TB burden, better understand gaps in the TB care cascade and develop interventions and strategies for the TB NSP, but the country also relied extensively on routine data from the VNTP's electronic routine surveillance system, VITIMES. Supplemental activities that have been particularly useful include the two prevalence surveys, the patient cost survey, patient pathway analysis, people-centred framework, modelling, the four drug resistance surveys and inventory study. Other important activities included the diagnostic network

optimization, TB diagnostic network assessment and epidemiological reviews. Once a more comprehensive patient pathway analysis and Mapping and Analysis for Tailored disease Control and Health system strengthening (MATCH) have been completed, findings can further contribute to estimating the current TB burden and help TB program planning. For the near future, the VNTP and partners would like to repeat the people-centred framework, patient pathway analysis, inventory study and modelling with updated data for the development of the next NSP due in 2025. Conversely, there has been discussions in the country on whether a third TB prevalence survey is needed. The country would like to be able to estimate the TB burden based on analysis of case-based routine data, especially once VITIMES has been strengthened and integrated throughout the country. The country has already conducted two prevalence surveys ten years apart and is able to compare findings over time. Drug resistance (DR) surveys have been conducted four times and a fifth survey was planned for 2016/2017, but the VNTP decided to use routine DR-TB surveillance data, including that from the GeneXpert network, instead. The goal is to use DR-TB routine surveillance data moving forward, but it has been a challenging transition. The VNTP and partners would like operational guidance from the global level that instructs countries how to transition using routine DR-TB surveillance data for DR-TB estimates.

- **Timing, coordination and availability of funding for supplemental TB data activities is critical:** The VNTP and TB partners always welcome the opportunity to work with and receive technical and financial support from external partners and donors. However, it is important that proposed activities align with the VNTP's priorities and are timely. The timing of activity implementation should also be coordinated with the VNTP. Sometimes, a lack of funding availability hinders the implementation of an activity and/or implementation of the recommendations resulting from the activity; findings and recommendations are then not readily available for use in TB program planning and decision making when needed. The majority of the funding for TB-related activities in Viet Nam comes from The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and other external donors, since government funding for TB-related activities is limited. Some respondents believe that better use could be made of the findings from supplemental TB data activities to advocate for domestic TB funding, but external funding would still be needed for strengthening the routine systems and implementing supplemental TB data activities.

- **Important to build local capacity, but technical assistance is still needed:** There is technical capacity within the VNTP and subnational level staff for implementation of supplemental data activities. However, there is an inadequate number of staff to implement activities that require field work and competing priorities exist with running routine TB program activities. Additionally, not all TB program staff have the relevant skills for various supplemental activities, so there is a limited number of staff with the right skills to support the activity. Supplemental data activities provided opportunities for VNTP and subnational TB staff to learn to plan and implement these types of activities, which improved job performance and enhanced technical skills for some. However, subnational level staff voiced desire for the VNTP to provide more opportunities to participate in supplemental activities and more technical support from the national team to develop regional/provincial strategic plans. Even though there is capacity within the country, respondents felt that technical support

from external partners is still needed throughout the life of a supplemental activity (from proposal development to data analysis and report writing), especially for activities such as modelling. Local TB partners already have a good working relationship with the VNTP, but more collaboration is needed to reduce overlap in operational research and other data activities and to save costs and time.

- **Dissemination of findings and recommendations:** Disseminations of findings and recommendations are typically organized and held at the national level, but relevant VNTP staff, local TB partners, external partners and donors, laboratory staff and subnational level staff are invited to attend. Additionally, VNTP staff have routine meetings with subnational level staff where they present and discuss findings and recommendations from supplemental TB data activities in addition to routine work. VNTP staff and external partners and donors are typically informed of findings since they were involved in planning, implementing and disseminating the supplemental TB data activities. There is mixed sentiment on whether subnational level staff are adequately informed due to varying access to dissemination events and language barriers. Subnational level staff would like to see improvement on dissemination so that local TB programs can use the findings and recommendations for planning TB activities in their local area. There is general agreement that information stays mainly at the national level, though some findings are published in academic journals. However, others are written in reports or presentation slides that are not always published or available online, so partners and staff outside the VNTP must request the results, which can be difficult to access as there is no direct point of contact.

  After dissemination, it is also important to follow up on implementation of the recommendations. There is often inadequate funding to implement the recommendations resulting from supplemental TB data activities at both national and subnational levels.

- **Remaining data gaps for programmatic planning:** While VITIMES is an electronic case-based data system that provides a lot of data for key indicators, it is understood that it cannot capture all the needed data for burden estimation, understanding and addressing gaps it the TB care cascade, and for TB program planning. It would be helpful if the VNTP could access TB-related data from other data systems in the country, such as the Electronic Communicable Disease Surveillance System (ECDS) and Access to Care Information System (ACIS), and ideally these systems would be linked to VITIMES. Additionally, VITIMES is used only for DS-TB, it has not yet been fully integrated with e-TB Manager, which is the data system for DR-TB. Other data that could be useful include assessing public-private mix and private sector engagement since the private sector treats many TB patients, analyzing cost effectiveness of TB interventions and activities, and assessing the quality of TB care and services.

This case study was an opportunity for Viet Nam's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Viet Nam's MOH look at how these supplemental

activities have been used in the past and to help them prioritize TB data activities in the future. However, findings from this case study are not meant to stand alone; they have been compiled with findings from the four additional country case studies, global-level interviews and desk review, and the NTP manager survey. The triangulated findings are being used to develop a framework that will help countries prioritize TB data-related activities and develop a timeline for these activities. This framework is currently under development in partnership with the World Health Organization (WHO).

MAIN REPORT

Project Background

Overview of the overall project

Currently there are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist in the collection of and use of TB-related data. While these TB data activities provide important information, they are often supplemental to routine data collection and implementation of such activities can place an extensive burden on ministries of health (MOH), national TB programs (NTPs) and partners, and may not occur in an optimized and efficient manner.

The "Optimizing TB analytics and evidence tools to improve data use in TB programmatic planning" project, in short, the "TB Data Optimization" project, assessed the use and usefulness of "supplemental" TB data activities from both the country and global partner perspectives. For this assessment, "supplemental" TB data activities are those that go above and beyond routine data activities. These activities may include, but are not limited to, TB prevalence surveys (TBPS), drug resistance surveys (DRS), inventory studies (IS), patient cost surveys (PCS), TB service delivery costing studies, care cascade analyses, One Health Tool for TB budgeting (OHT), diagnostic network optimization (DNO), epidemiological modeling, mapping and analysis for tailored disease control and health system strengthening (MATCH analysis), patient pathway analysis (PPA), people-centred framework (PCF), quality of TB services assessment (QTSA), TB diagnostic network assessment (DNA), private sector drug analysis, screen-TB and epidemiological reviews including standards and benchmarks. The goal of the "TB Data Optimization" project, was to document experiences from countries and global stakeholders in implementing "supplemental" TB data activities and use this information to develop effective and efficient approaches to optimizing TB data-related activities for program planning.

This assessment was conducted from January 2021 through August 2023 by the U.S. Centers for Disease Control and Prevention (CDC) and the CDC Foundation (a non-profit organization affiliated with the CDC) and funded by the Bill & Melinda Gates Foundation.

Overall project objectives

1. Summarize existing evidence and global partner perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.

2. Summarize country perspectives on the use and usefulness of supplemental TB data- and evidence-related activities.
3. Map and align objectives and metrics across supplemental TB data- and evidence-related activities.
4. Synthesize findings into a set of recommendations for the optimization of data generation, review and analysis efforts.

This mixed-methods assessment was conducted in three phases as shown in Figure 1. Refer to Annex 1 for more details on the project phases.

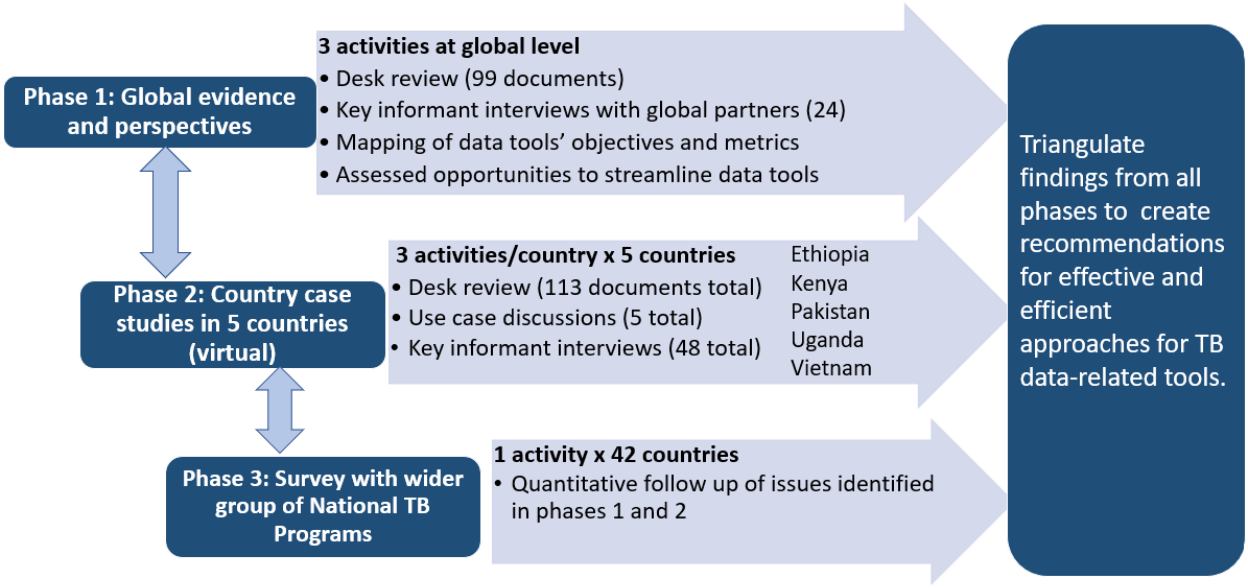


Figure 1. Three phases of the project

This report summarizes the activities and findings of the Viet Nam country case study and is intended for the Viet Nam NTP and their partners.

A comprehensive report with findings and recommendations from all three phases of the project, including the five country case studies, will be shared by the project team when complete.

Country case study objectives

1. Review existing evidence related to Viet Nam's use of TB data tools and activities (desk review).
2. Conduct a use case discussion to understand how supplemental data activities have contributed to TB burden estimation, program planning and estimation of gaps in the TB care cascade.
3. Conduct key informant interviews on the use and usefulness of supplemental TB data activities implemented in Viet Nam.

Country Case Study Methods

Desk review

A list of supplemental TB data activities that Viet Nam has implemented was obtained from the WHO. The list of activities was shared with the VNTP and confirmed. The documents reviewed were obtained through e-journals or shared by VNTP staff.

Thirty-four supplemental TB data activity reports, publications and strategic planning documents from the last 10 years or more were reviewed. A standardized template (see Annex 2) was used to abstract information. Lessons learned were abstracted from activity reports while evidence of the use of the activities' findings/recommendations was abstracted from strategic planning documents such as National Strategic Plans and Global Fund applications. In addition, it was noted whether supplemental activities were planned for, or funding requested in NSPs and Global Fund applications. From these, an overall summary with main takeaways was synthesized.

Documents reviewed:

1. Diagnostic Network Optimization Vietnam Final Presentation, October 2021
2. The Fourth National Anti-Tuberculosis Drug Resistance Survey in Viet Nam (publication)
3. The Fourth National Anti-Tuberculosis Drugs Resistance Survey in Vietnam, 2011 (report)
4. Prevalence of resistance to second-line tuberculosis drug among multidrug-resistance tuberculosis patients in Viet Nam, 2011 (publication)
5. Evaluation of TB surveillance in Viet Nam Mission Report, January 14-18, 2013
6. Epidemiological Review Viet Nam: Analysis and evaluation of the tuberculosis surveillance system mission report, 25 February – 08 March 2019
7. Measuring the level of under-reporting and estimating incidence for tuberculosis in Viet Nam Protocol, March 16, 2016
8. Measuring the level of under-reporting and estimating incidence for tuberculosis in Viet Nam: interim report as of Apr 05, 2018 (presentation)
9. Measuring the level of under-reporting and estimating incidence for tuberculosis in Viet Nam: results of the joint inventory data review workshop 22-26 January, 2018 (presentation)
10. Modelled projections of trends in TB burden: modelling section for epi review 2019
11. TIME model fit and intervention scenarios, 2017 (presentation)
12. The Financial Burden of Tuberculosis for Patients in the Western-Pacific Region (publication)
13. Measuring catastrophic costs due to tuberculosis in Viet Nam (publication)
14. National tuberculosis patients cost survey: research findings lead to change in policy and practice, Viet Nam (publication)
15. Vietnam Patient Pathway Analysis early results (figure)
16. Assessment of the Tuberculosis Diagnostic Network of Vietnam 2020 (report)
17. Draft Report National Tb Prevalence Survey In Vietnam, 2006 – 2007

18. First national tuberculin survey in Viet Nam: characteristics and association with tuberculosis prevalence (publication)
19. Diagnosis and Treatment of Tuberculosis in the Private Sector, Vietnam (publication)
20. Health-seeking behaviour among adults with prolonged cough in Vietnam (publication)
21. Household expenditure and tuberculosis prevalence in Viet Nam: prediction by a set of household indicators (publication)
22. National survey of tuberculosis prevalence in Viet Nam (publication)
23. Yield of interview screening and chest X-ray abnormalities in a tuberculosis prevalence survey (publication)
24. Viet Nam Second National Tuberculosis Prevalence Survey, October 2017 – February 2018: Technical Report
25. The second national tuberculosis prevalence survey in Vietnam (publication)
26. Decline of Tuberculosis Burden in Vietnam Measured by Consecutive National Surveys, 2007–2017 (publication)
27. End term review 2015 (report)
28. Vietnam National TB Control Programme: Joint Review End-term evaluation for the performance period from 2016-2020 (report)
29. NTP Strategic Plan of Period 2011-2015
30. National Strategic Plan on Tuberculosis Control For The Period 2015-2020
31. Vietnam National Tuberculosis Program National Strategic Plan 2021-2025
32. The Global Fund Proposal Form Round 9 (2009)
33. The Global Fund Funding Request Application Form (2018-2020)
34. The Global Fund Funding Request Form Allocation Period 2020-2022

Use case discussion

The purpose of the use case discussion was to better understand how TB data activities have helped the National TB Program and TB partners to:

1. Estimate the burden of TB in Viet Nam
2. Understand and address specific gaps in the TB care cascade
3. Make both short- and long-term plans for the TB program

“Use case” questions were developed with the aim to understand how the countries have used the various supplemental TB data tools and activities for the three purposes above (see Annex 3 for the use case discussion guide). Each set of questions was related to a section of the project’s data framework (see Figure 2 below). Figure 2 shows the TB-related data activities that have been conducted in Viet Nam that may have been used to better understand each section of the data framework.

A 90-minute group discussion with six VNTP staff and TB partners was conducted virtually over Zoom in May 2022. The NTP focal person was asked to select participants within the VNTP and TB partners who were closely involved in implementing and/or using the data from the supplemental activities and/or involved in the development of the most recent National Strategic Plan and Global Fund Application. The discussion was audio recorded and transcribed using NVivo’s automated transcription software. Two project staff reviewed the notes and audio

recording of the discussion and summarized responses for each section of the data framework. The summaries were compared to ensure consistency and accuracy.

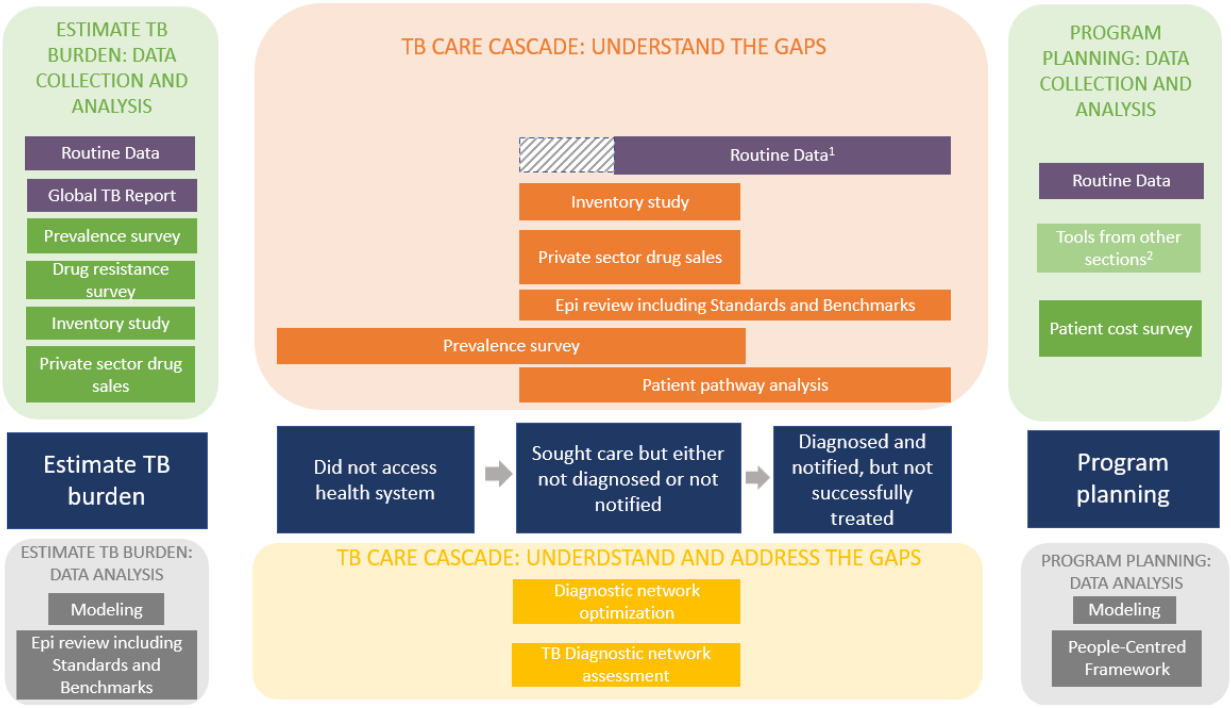


Figure 2. Framework for use of data activities in different aspects of TB program evaluation and planning adapted to the Viet Nam setting

[1]Shaded area = While routine data can provide some information on patients who presented to health facilities but were not diagnosed (e.g. screening data), TB program data often starts only with diagnoses or notifications.

[2]Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Key informant interviews

The purpose of the key informant interviews was to better understand the use and usefulness of the supplemental TB data activities.

Individual interviews were conducted with eleven persons who work at the national or sub-national levels. At the national level, VNTP staff and persons at partner organizations that supported conduct of TB data activities or use TB data were interviewed. At the subnational level, TB program staff at provincial and district level hospitals were interviewed. A Vietnamese translator was present at all the interviews. The interviews were approximately 60- to 90-minutes long.

Interviews were audio recorded, then transcribed verbatim using NVivo's automated transcription software. The transcripts were reviewed and coded by two project team members using NVivo. All codes were reviewed and agreed upon by project team members. Content analysis was conducted and key emerging themes (if at least 25 percent of respondents discussed a topic) were summarized.

Country Case Study Findings

Desk review

Desk review summary by TB data activity:

Supplemental TB data activity	Evidence of use of findings in National Strategic Plans (NSP)	Evidence of use of findings in Global Fund applications	Evidence of use of findings in program reviews
TB prevalence survey (TBPS) 1st (2006-2007) 2nd (2017-2018)	*2021-2025 NSP*: Findings from the 2nd TBPS were presented and cited throughout the NSP and compared with results from the 1st TBPS. The 2nd TBPS was used as a data source to complete the PPA and root cause analysis. The National Action Plan to end TB by 2030 developed by the VNTP was based on the results of the 2nd TBPS, among other TB-related data activities. Publications on the findings from the 2nd TBPS have been used in the preparation of this NSP. It was noted that the Global Fund's Key Performance Indicator on Investment Efficiency (KPI 4) showed that Viet Nam is undertaking a significant change in strategic direction as a result of the 2nd TBPS findings. *2015-2020 NSP:*	*2020-2022 application:* Findings from the 2nd TBPS were used as rationale for prioritization of funding for case detection and diagnosis interventions. TB burden estimates from the 2nd TBPS were used to prioritize NSP interventions for funding. The funding request aims to address barriers that emerged from the 2nd TBPS, among other TB-related data activities. Findings from the 2nd TBPS were highlighted in the background section for Matching Funds. *2018-2020 application:* It was noted that the 2nd TBPS was ongoing. The 1st TBPS was listed as a reference	*2020 end-term review:* Findings from the 2nd TBPS were used to highlight achievements, challenges and gaps in the TB program. Findings from the 2nd TBPS were compared with the findings from the 1st TBPS to document progress made in reducing the TB epidemic in the ten years following the 1st survey in 2006-2007. It was highlighted that Global Fund has committed to increasing funding for TB in Viet Nam based on the country's past performance and the urgency for intensified intervention revealed by the 2nd TBPS. *2015 end-term review:* It was noted that funding had not yet been secured for the

	Findings from the 1st TBPS were used to re-assess TB burden in Viet Nam. Findings from the 1st TBPS were cited throughout the NSP. The 1st TBPS was listed as an activity that provided evidence for TB program planning. The 2nd TBPS was listed as one of the main activities to be conducted during this strategic period. *2011-2015 NSP:* Findings from the 1st TBPS were highlighted throughout the NSP and used as background information for several of the NSP objectives. The 1st TBPS was used as a data source for the SWOT analysis. There was a plan for the 2nd TBPS to be conducted in 2014.	document for the proposal and findings were highlighted. *GF proposal round 9 (2009):* Findings from the 1st TBPS were used as rationale for scaling up several interventions aimed to increase case finding and supported several objectives of the Mid-Term Development Plan for 2007-2011 (now known as the NSP). Findings from the 1st TBPS were used to support the financial needs in this strategic period.	2nd TBPS and it was recommended to secure funding to implement the planned survey with technical assistance from WHO and other partners, so that Viet Nam would have the evidence of the impact of the TB program on reducing the TB burden in the country. It was noted that the 2nd TBPS was included in the first-tier prioritization for the above allocation request for Global Fund. The 1st TBPS was listed as an achievement for the VNTP and findings from the survey were highlighted in the report.
Drug resistance survey (DRS) 4th (2011)	*2021-2025 NSP*: Findings from the 4th DRS were used to highlight the proportion of drug resistant TB in key populations. A 5th DRS is a proposed activity. *2015-2020 NSP:* DR-TB estimates were cited; the TB epidemiological and control situation was informed by the 4th DRS. A desire for a repeat DRS in 2014/15 was expressed to follow up the drug resistance trend and inform decision making on possible new regimens; a protocol to include new drugs to be tested was planned.	*2020-2022 application:* No mention of a funding request for the 5th DRS. Note: the 5th DRS will be in the 2024-2026 funding request as implementation is planned for 2025. *2018-2020 application:* The 4th DRS was one of the reference documents for the epidemiological profile, with findings used to provide country context. *GF proposal round 9 (2009):* Findings from the 3rd DRS were used to	*2020 end-term review:* Findings of the 4th DRS were highlighted and compared to findings from previous DRSs. Findings from the 4th DRS were used as evidence that Viet Nam had achieved its goal of sustaining the MDR-/RR-TB incidence rate. *2015 end-term review:* Findings of the 4th DRS were highlighted and compared with findings from previous DRSs. It was noted that the DRS was included in the first-tier prioritization for the above allocation

	2011-2015 NSP: Under NSP goals, it was noted that the 4th DRS is in progress and a 5th DRS is planned for in 2016/17. Findings from the 3rd DRS (2006/2007) were used in the background sections of two of the NSP objectives.	support objectives of the 2007-2011 Mid-Term Development Plan. Mentioned plan for a repeat DRS in 2015.	request for Global Fund.
Patient pathway analysis (PPA) 2019	*2021-2025 NSP*: The PPA was noted as one of the activities used to select and prioritize interventions during NSP development; publications, including those presenting PPA results, have been generated during this time and have been used in the preparation of this NSP. Preliminary findings were presented in the Annex. Key findings were used to highlight care-seeking behaviors and reporting gaps in the public non-NTP and private sectors. *2015-2020 NSP:* No mention of a plan to conduct the PPA during this strategic period.	*2020-2022 application:* Findings were used as rationale for prioritization for Global Fund funding for interventions related to engaging all care providers. It was noted that funding requests for new and prioritized interventions were guided by the PPA, among other TB-related data activities; findings were used to illustrate how the funding request reflects value for money. Findings were used in the background section for Matching Funds. *2018-2020 application:* No mention of a funding request to conduct the PPA during this strategic period.	*2020 end-term review:* Findings were used to highlight gaps in adherence to infection prevention and control (IPC) best practices. Findings were used to illustrate successes in conducting TB screening in prisons.
People-centred framework (PCF) 2019	*2021-2025 NSP*: The PCF was noted as one of the activities used to select and prioritize interventions for this strategic period and guide NSP development. The NSP 2021-2025 strategic model is based on the PCF. *2015-2020 NSP:* No mention of a plan to use the PCF for future NSP development.	*2020-2022 application:* It was noted that funding requests for new and prioritized interventions were guided by the PCF, among other TB-related data activities. *2018-2020 application:* No mention of a funding request to	*2020 end-term review:* No mention of the PCF.

		conduct the PCF in the future.	
Epidemiological (Epi) review, including standards and benchmarks 2013 2019	*2021-2025 NSP*: The 2019 epi review report was cited in several sections in the NSP and key findings were highlighted. The 2019 epi review, including standards and benchmarks was listed as an activity that was conducted for NSP development. The National Action Plan to end TB by 2030 developed by the VNTP was based on the results of the 2019 epi-review, among other TB-related data activities. *2015-2020 NSP:* The 2013 Epi review (including standards and benchmarks) informed the TB epidemiological and control situation in the country for the NSP. *2011-2015 NSP:* No mention of a planned epi review for 2013.	*2020-2022 application:* Epidemiologic data from the 2019 epi review were used to prioritize NSP interventions for funding. The funding request aims to address barriers that emerged from the 2019 epi review, among other TB-related data activities. *2018-2020 application:* No mention of prior epi reviews.	*2020 end-term review:* Findings from the 2019 epi review were presented throughout the report. *2015 end-term review:* No mention of findings from the 2013 epi review presented in this report.
Patient cost survey (PCS) 2016	*2021-2025 NSP*: The PCS was a data source for prioritization, root cause analysis and solution optimization. Findings were used to highlight priority gaps and challenges. Publications on the findings from the PCS were used in the preparation of this NSP. There is a plan to conduct a 2nd PCS. *2015-2020 NSP:* No mention of a plan to conduct the PCS in this strategic period.	*2020-2022 application:* The funding application was tailored for the NSP, which included findings from the PCS. *2018-2020 application:* No mention of findings being used to advocate for funding.	*2020 end-term review:* Implementation of the PCS was noted as an achievement. Findings were used to highlight key challenges, gaps and barriers, and the need for interventions and policies. *2015 end-term review:* No mention of a plan to conduct the PCS in 2016.
Inventory study 2018	*2021-2025 NSP*: It was noted that the inventory study was used as a data	*2020-2022 application:* Findings were used as rationale for	*2020 end-term review:* Findings were used to highlight key barriers to

	source for the PPA and the root cause analysis. Findings from the study were used to highlight gaps in TB diagnosis and treatment, as well as reporting gaps, especially in non-NTP public sector and private sector. Publications on findings from the inventory study were used in the preparation of this NSP. *2015-2020 NSP:* No mention of a plan to conduct an inventory study during this strategic period.	prioritization of requested funding for interventions related to engaging all providers. It was noted that funding requests for new and prioritized interventions were guided by the inventory study, among other TB-related data activities. Findings were used in the background section for Matching Funds. *2018-2020 application:* No mention of a funding request for the inventory study in this funding application. Note: The inventory study was funded by WHO.	ending TB and gaps in reaching persons with TB. *2015 end-term review:* A plan to conduct an inventory study was mentioned in the report. It was a recommendation for the NTP in collaboration with partners to conduct an inventory study and a capture-recapture analysis to measure underreporting and to update incidence estimates.
TB diagnostic network assessment (DNA) 2020	*2021-2025 NSP*: Not mentioned/ no cited references to the assessment.	*2020-2022 application:* No mention of findings being used to advocate for funding.	*2020 end-term review:* Findings from the mapping exercise were used to highlight challenges and gaps in GeneXpert diagnostic network management. The DNA was noted as an expanded effort of data analysis and TB program optimization at the sub-national level.
Diagnostic network optimization 2021	*2021-2025 NSP*: Not mentioned. The DNO was not completed until November 2021.	*2020-2022 application:* Not mentioned. The DNO was not completed until November 2021.	*2020 end-term review:* Not mentioned. The DNO was not completed until November 2021.
Epidemiological modelling 2014 2017 2019	*2021-2025 NSP*: TIME modelling was noted as one of the activities used to select and prioritize interventions and predict their impact on TB notification, incidence, prevalence and	*2020-2022 application:* The TIME model results provided rationale for prioritization of requested funding for interventions in key populations.	*2020 end-term review:* TIME modelling illustrated the need for more efforts to scale up diagnosis and treatment to close coverage gaps in MDR-TB.

	mortality; modelling helped guide NSP development. Modelling results were presented in the NSP, including targets based on the modelled trends. *2015-2020 NSP:* The TIME model was used during NSP development to inform decision making on the most effective and affordable interventions for Vietnam to implement over the strategic period. Results helped to form a sound foundation for effective TB control and advocacy for sufficient funding from domestic and international sources to support the efforts. *2011-2015 NSP:* Not mentioned.	Request for funding was guided by TIME modelling results, showing which interventions would have the greatest impact and leading the VNTP to select the full intervention package. *2018-2020 application:* TIME impact projections were presented to show the impact of the expansion of MDR diagnosis and treatment in the previous GF grant (2015-2017), as compared to a scenario without the additional GFATM funding. TIME modelling results were used to justify prioritization of impact and equity interventions, and as rationale for prioritized above allocation funding request for TB Care and Prevention for underserved and key populations.	*2015 end-term review:* Not mentioned.
Private sector drug sales analysis 2011	*2021-2025 NSP*: Not mentioned. *2015-2020 NSP:* Not mentioned. *2011-2015 NSP:* Not mentioned.	*2020-2022 application:* Not mentioned. *2018-2020 application:* Not mentioned.	*2020 end-term review:* Not mentioned. *2015 end-term review:* Not mentioned.

Overall findings

Priority TB data activities and research:

The VNTP has been planning for a 5th drug resistance survey since the 2011-2015 NSP. Plans for a 5th DRS have been included in the 2011-2015 NSP and 2015-2020 NSP, and it was listed as an essential intervention under the research section in the 2021-2025 NSP. It was noted in the 2015 end-term review that the drug resistance survey was to be included in the first-tier prioritization for the above allocation request for Global Fund funding.

There are plans to conduct a 2nd patient cost survey in the 2021-2025 NSP to look at the change in proportion of patients incurring catastrophic costs due to TB since the 1st patient cost survey in 2016.

Supplemental TB data activities that were important for NSP development and program planning:

The VNTP used the patient pathway analysis, people-centred framework and the TIME Impact Model to select and prioritize interventions for the 2021-2025 NSP. Several publications were generated from the patient pathway analysis, patient cost survey, the first and second prevalence survey and the inventory study, which were used as data sources in preparation of the 2021-2025 NSP.

Findings from the first prevalence survey, fourth drug resistance survey, TIME Impact Model and previous epidemiological reviews served as important evidence for previous NSPs.

Supplemental data activities that were used or referenced in the Global Fund applications as rationale for funding:

Results from the second prevalence survey, the patient pathway analysis, inventory study and the TIME Impact Model were used as rationale to prioritize funding for specific interventions in the Global Fund application for 2020-2022. The people-centred framework, the 2019 epi review, inventory study, patient cost survey and TIME Impact Model helped guide funding requests for new and prioritized interventions for the Global Fund application for 2020-2022.

Though a fifth drug resistance survey has been a priority in previous NSPs and is a priority for the 2021-2025 NSP, there was no evidence of a funding request for the survey in the Global Fund application for 2020-2022.

Supplemental data activities that were important, used for or influenced the recommendations of the 2019 end-term review:

Findings from almost all the TB data activities were used to highlight key achievements, gaps, barriers and challenges of the TB program in the 2020 end-term review. The 2015 end-term review had recommendations to secure funding for and implement TB data activities, such as an inventory study and a second prevalence survey. The 2020 end-term review mentioned that the Global Fund had committed to increase funding for TB in Viet Nam based on the second prevalence survey findings that revealed the need for intensified interventions for TB.

Instances where there was no evidence of findings from the supplemental TB data activity being used:

There was no mention of the TB diagnostic network assessment and diagnostic network optimization in the 2021-2025 NSP or Global Fund application for 2020-2022, the main reason being that these activities were not completed prior to NSP development. There was no evidence of findings from the private sector drug sales analysis being used in any of the NSPs, Global Fund applications or program reviews, even though there was a focus on private sector involvement in the 2011-2015 NSP and 2015-2020 NSP. For some TB data activities such as the patient pathway analysis, patient cost survey and inventory study, there was no mention of a

plan to conduct the activity in the NSP for that strategic period in which it was conducted, however the findings were referenced in later plans.

Use case discussion

Respondent characteristics

Six VNTP staff and TB partners consented to and participated in the use case discussion. Half of the participants (50%) were male and half were female. Half of the participants were VNTP/MOH staff and half were from a TB partner organization.

Key findings from each section of the data framework

	Most critical and/or useful sources of data	Other data or tools that would be useful

Estimation of TB burden	• For DS-TB:
	  ○ Both prevalence surveys were used to revise the WHO DS-TB burden estimates for Viet Nam; the prevalence surveys provided both national and zone estimates (north, south, middle).
	  ○ Used VITIMES for routine reporting of TB case notifications, which can be used to estimate DS-TB burden based on notification and treatment coverage; the VNTP submits routine reporting data to WHO for the annual Global TB report.
	  ○ Used the inventory study to verify DS-TB burden estimates based on underreporting and notification data.
	• For DR-TB:
	  ○ The drug resistance survey was conducted four times, the last one in 2011; a 5th survey was planned for 2016/17, but the VNTP decided to use routine/GeneXpert data instead.
		• A quick patient pathway analysis was completed, but it was not used optimally, so there is a need for a more formal and comprehensive analysis which could help with burden estimation.
		• Could use mapping and notification data to see TB notification in different areas at the provincial level (i.e. MATCH analysis at the provincial level could fill this gap).
		• Need operational guidance for transitioning to and using routine DR-TB monitoring data for DR-TB estimates.

	○ The goal is to use routine data/GeneXpert network moving forward, but it may be challenging as countries are struggling to transition to using routine DR-TB surveillance. ○ Mainly use WHO's Global TB report DR-TB estimates, which is adjusted annually. • For target setting: ○ Used a combination of regional estimates from publications.	
People with TB who do not access the health system	• The prevalence surveys provided information on why people do not go to the health facility; used data from the 1st TBPS along with routine data for the Onion Model to estimate this gap. • Used routine data through VITIMES. • Conducted expert interviews in each province to understand why people with TB do not access the health system, how people access the health system and how the TB program is working. • Used data from active case finding/intensified case finding to understand the gap, which led the VNTP to focus on household contacts and other high-risk populations.	• Care cascade analysis or patient pathway analysis to understand the gap. • Maybe can use the Screen-TB tool, could just use active case finding. • Data from the ACT 5 study, which evaluated the effectiveness of community-wide screening.
People with TB who presented to health facilities but were not diagnosed and/or not notified	• The inventory study was critical in understanding the proportion of TB cases diagnosed in the private and public sectors but not notified to the VNTP. • Used data from public-private mix and public-public mix to understand the gap, which led to more people with TB who go to the private sector being referred, detected and notified. • Epi reviews assessed those who sought health care but were not notified.	• Would like to be able to use other disease data systems and link it with VITIMES to better understand the TB burden and TB care cascade (e.g. linking HIV and TB), for example: ○ The Electronic Communicable Disease Surveillance (ECDS) system includes people with TB who were diagnosed but maybe not notified. ○ The Access to Care Information System (ACIS)

	• Used the TB diagnostic network assessment to assess when and where TB patients go for care but are not diagnosed, especially in the public sector; some TB patients were not diagnosed due to low sensitivity of microscopy which is used to first diagnose TB in all the districts.	includes systematic TB screening in adults and children, which would be useful for quantifying drop-offs in the TB care cascade.
People with TB who were diagnosed but not successfully treated	• Mainly rely on routine reporting using WHO standard indicators, because other tools are episodic analyses, not overtime. • Used combined data sources from the laboratory and TB registers for DS-TB, but do not yet have routine indicators for MDR-TB. • Review of epi review including standards and benchmarks data led to discussions on relapse and poor treatment outcomes; analysis is also done at the provincial level, because outcomes may depend on local conditions and will allow planning to address specific issues in each province.	• Could use modelling to check accuracy of surveillance data in questionable areas. • Research is needed to better understand and address this gap. • Would like to use data from the adverse drug reaction monitoring system to understand poor outcomes especially amongst DR-TB patients and those who are lost to follow-up due to adverse events or adverse drug reactions. • Have a complete/full MATCH analysis; some geospatial mapping has been completed to look at rates of notification and associate rates with yield of active case finding; the analysis would complement active case finding.

TB program planning	• National TB Strategic Plan (NSP) development:
	  ○ Used all the available data sources and applied the people-centred framework: routine reporting data and WHO estimates are most critical, prevalence surveys, inventory study, modelling, epi reviews, patient pathway analysis and patient cost survey.
	• Global Fund proposal:
	  ○ The proposal is based on the NSP and highlights priorities from the NSP.
		• Would like to repeat the people-centred framework and use all the data from surveys and routine data for analysis and planning.
		• Would like to repeat the patient pathway analysis and modelling with updated data.
		• The VNTP started to use the OneHealth Tool for TB budgeting but use by the VNTP is limited.
		• The quality of TB services assessment has recently been completed but findings have not been used yet.

	○ Countries are given guidance and recommendations to put together a successful application (e.g. use the people centred framework to guide NSP development). ○ Used information from mid-term and end-term program reviews. • Routine program planning: ○ Data from routine reporting and WHO estimates from the annual WHO Global TB Report are most critical. ○ Routine planning is also based on the NSP.	• Would like to use data from active case finding and intensified case finding.

Key takeaways

- The VNTP used findings from the supplemental TB data activities extensively to estimate the TB burden, understand gaps in the TB care cascade and for program planning, but also relied a lot on routine data from VITIMES.
- The estimates provided in the annual WHO Global TB Report have been a critical data source to understand and address gaps throughout the TB care cascade and for program planning.
- The data from the fourth drug resistance survey (2011) is no longer in use and the WHO's annual Global TB Report DR-TB estimates have mainly been used since 2017. The drug resistance survey has been conducted four times and a fifth survey was planned to be conducted in 2016/2017, but the VNTP decided to use routine data and data from the GeneXpert network instead. The goal is to use DR-TB routine surveillance and GeneXpert data for DR-TB burden estimates and target setting moving forward, but it has been a challenging transition. The VNTP and partners are hoping for operational guidance for countries to transition to use of routine DR-TB surveillance data for DR-TB estimates.
- Findings from the private sector drug sales analysis have not been used for TB program planning and decision-making, as the information it provides is limited compared to other TB data tools like the prevalence survey and inventory study. It is difficult to know if the data collected is accurate because it is unknown whether the people who purchased the drugs took the drugs.
- Respondents expressed wanting to repeat the people-centred framework, patient pathway analysis and modelling with updated data.
- It would be helpful for burden estimation and program planning to have a more comprehensive patient pathway analysis and MATCH analysis.
- It would help the VNTP better understand the TB burden and gaps in the TB care cascade if they had access to data from other data systems in the country, such as the ECDS and ACIS; it would be ideal if those data systems could be linked with VITIMES.

Key informant interviews

Respondent characteristics

Of the eleven key informants, eight were VNTP staff and three were in-country TB partners (Figure 3, left). On average, the respondents have been doing TB-related work for 11 years (standard deviation = 7.8). Respondents were mostly male (72.7%) (Figure 3, middle) and mostly worked at the national level (72.7%) (Figure 3, right). The majority of respondents were familiar with (either were involved in implementing and/or planning, and/or heard the results of findings) the prevalence survey, drug resistance survey, patient cost study, patient pathway analysis, epidemiological modelling, people-centred framework, epidemiological review including standards and benchmarks, inventory study and TB diagnostic network assessment (Figure 6). Respondents in general were less familiar with the diagnostic network optimization and private sector drug sales analysis (Figure 6).

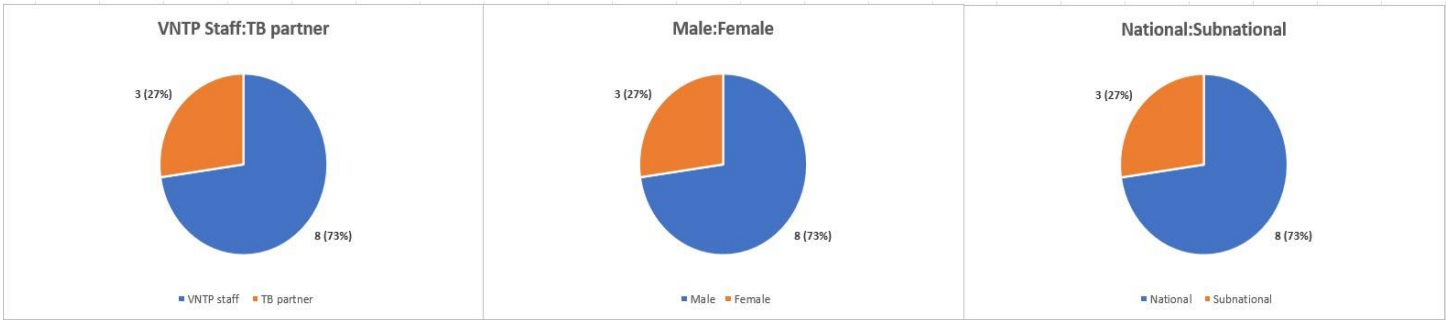


Figure 3. Characteristics of key informants (left: VNTP staff to partner ratio; middle: male to female ratio; right: national to subnational ratio)

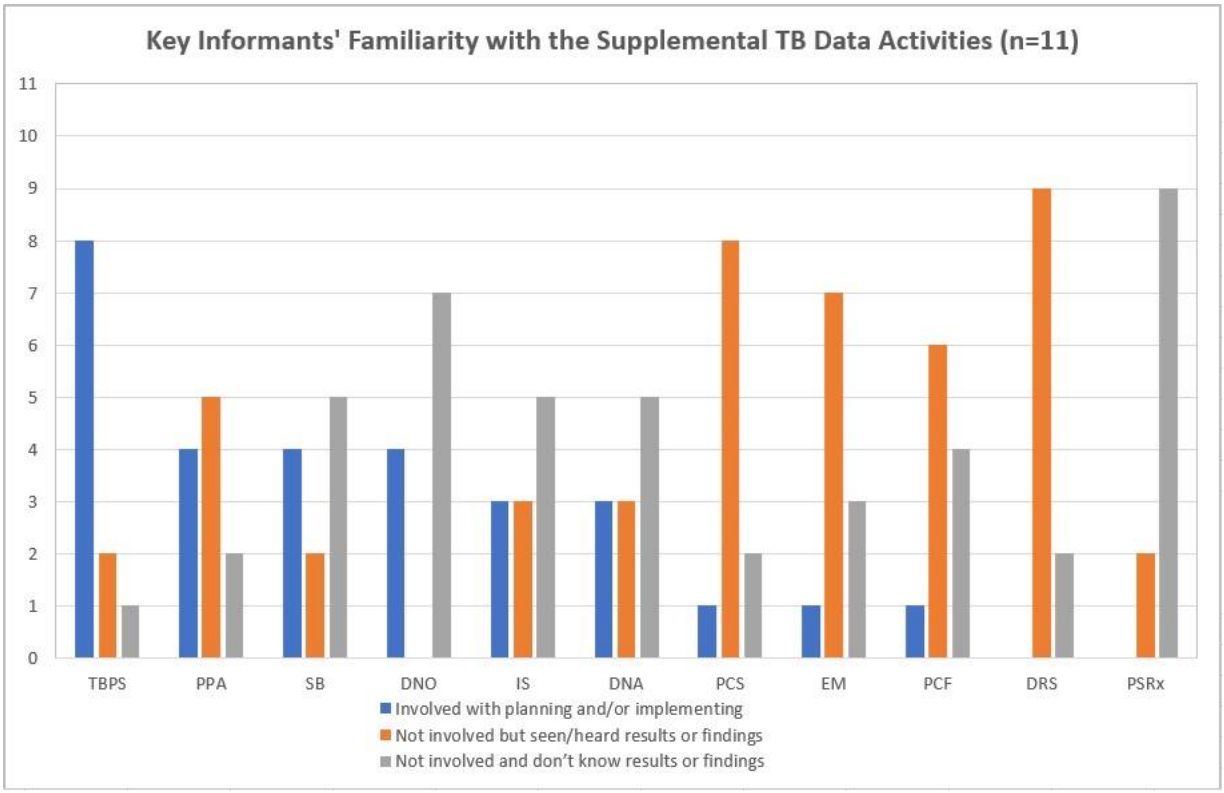


Figure 4. Key informants' familiarity with the supplemental TB data activities implemented in Viet Nam

TBPS = TB prevalence survey; PPA = patient pathway analysis; SB = epidemiological review, including standards and benchmarks; DNO = diagnostic network optimization; IS = inventory study; DNA = TB diagnostic network assessment; PCS = Patient cost survey; EM = epidemiological modelling; PCF = people centred framework; DRS = drug resistance survey; PSRx = private sector drug sales analysis

Key emerging themes

The following key themes emerged from the key informant interviews.

Theme: Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan.
• The VNTP has an electronic case-based routine reporting system (VITIMES) that collects key information. While the priority is to upgrade VITIMES and integrate it with other data systems, in the meantime, supplemental TB data activities provide important information such as true burden estimates and patient costs that are not captured by VITIMES and provide strong evidence for decision making and TB program planning. Supplemental data activities that were particularly useful include: the prevalence survey, patient cost survey, diagnostic network optimization, TB diagnostic network assessment, modelling and drug resistance survey. • **Prevalence survey** was most frequently mentioned as an important activity to understand/gain insight in the TB situation in the country and in the specific regions (e.g. north, south, middle) for planning; however, subnational level estimates are desired for provincial TB program planning.

- Two prevalence surveys have been implemented in the country about 10 years apart and it has been helpful to compare results over time.
- Several respondents perceived that conducting a prevalence survey won't be necessary moving forward, as data from the current or an upgraded routine surveillance system can be used to estimate the TB burden in the country.

- **Patient cost survey** was the most frequently mentioned as important for informing how to support TB patients, provided evidence to advocate to multiple sources such as other ministries and from donors, and informed how to improve policy and national health insurance.
- **Diagnostic network optimization** and **TB diagnostic network assessment** was often mentioned as useful for planning and reallocation of diagnostic resources, such as GeneXpert machines.
  - A few respondents discussed that further action has not been taken since the implementation and initial recommendations of those activities.
- **Modelling** was often mentioned as important for providing data for planning at both the national level and subnational levels and useful for budgeting for the Global Fund application.
- **Drug resistance survey** was often mentioned as useful for mobilizing more resources to combat high burden of drug resistant TB in the country.
- There was a high level of agreement amongst respondents that the VNTP used the findings from almost all the supplemental TB data activities in the latest NSP.
- Other important tools that were mentioned: epi review, inventory study, patient pathway analysis and people-centered framework were often listed as important with other data activities but specific examples were not given.

Illustrative quotes:

"They [the VNTP] use most [of the] results of all the tools in the strategic plan. So prevalence survey, drug resistance survey, diagnostic network, patient pathway analysis, people centered framework, epidemiological modelling, private sector was also mentioned. They use all the information." – Key Informant, National level, Viet Nam

"The modelling from the National Strategic Plan helped us to develop a strategic plan for our region. We can look at the numbers of people diagnosed with the disease, some indication, so we can develop a plan for treatment for the patient." – Key Informant, Subnational level, Viet Nam

"We have estimated the median cost for drug susceptible TB patients and drug resistant TB patients and portions of households that face catastrophic cost. And it was quite a big number so we know that TB is killing people financially. After that, we mobilized social help from other ministries and also, we create a fund called the charity fund. Across the country, they send us money and we use that money to give supply and support for poor TB patients. So far, we have helped about 3000 TB patients with the total amount of one hundred thousand dollars [USD]. We would buy them health insurance and give them money so that they can provide a living for their family." – Key Informant, National level, Viet Nam

Theme: Challenges with funding

- Limited funding availability for supplemental TB data activities was frequently mentioned as a key challenge; some supplemental data activities are very expensive (e.g. prevalence survey).
- Limited funding availability for implementing recommendations resulting from the supplemental activities was also frequently mentioned.
- The VNTP mostly depends on getting funding from Global Fund or other external donors to implement supplemental data activities; the government does not provide enough funding for TB activities in general.
- Many respondents believe external funding is needed for strengthening routine systems, especially to have a comprehensive integrated system; many respondents also believe external donors should keep funding supplemental TB data activities.
- Some respondents believe that the findings from supplemental data activities could be better used to convince the government to give more funding for TB.
- Some respondents perceived that the more supplemental data activities are being implemented, the more financial support they would receive for routine TB program activities.

Illustrative quotes:

"It could be much better if they [the VNTP] use the results for convincing the leader of health for more investment in TB, because now the investment in TB is still limited, they need much more budget to carry out all the needed TB interventions. And the use of the results of all these tools is useful for development partners to find a way to support TB. I think using the results of these tools differently is more on the government side, try to use these results to do advocacy with the leadership to have more investment in TB." – Key Informant, National level, Viet Nam

"The opportunity here is that we can plan and implement these supplemental activities and the more supplemental activities that we do, the more support that we receive for our routine activities." – Key Informant, National level, Viet Nam

Theme: Timing and coordination of supplemental activities is important

- Data activities need to be implemented in a timely manner to get timely results for use in program planning and decision making.
- The country always welcomes technical and financial support from external partners and donors, but it is important that proposed activities from external partners and donors must align with the VNTP's needs and priorities at that time and timing of implementation must be coordinated.

Illustrative quote:

"I think before the donor or international stakeholder would like to do something or to implement any supplemental activity in a certain country, it could be good to discuss with the NTP in advance to see whether it's the needs of the NTP and if it's the right time." – Key Informant, National level, Viet Nam

Theme: It is important to build capacity in country, but technical assistance is still needed

- There is technical capacity within country to implement the supplemental data activities, but there is an inadequate number of national and subnational TB program staff to implement the activities due to competing priorities and increased workload.
  - VNTP and subnational level TB staff are busy with routine TB program activities; health facility staff are also preoccupied with other activities such as vaccination and COVID.
  - Many respondents discussed the inadequate number of VNTP staff for certain supplemental activities, especially those needing field work (e.g. **prevalence survey**); not all VNTP staff have the relevant skills, so there is a limited number of VNTP staff who have the skills to support the supplemental activities.
  - There is often increased workload for laboratory staff during the implementation of supplemental data activities that require laboratory services.
  - A few respondents noted that supplemental activities are part of the VNTP staff responsibility/work, so it is not additional work; the data activity is assigned to the relevant unit within the VNTP and staff arrange their workload to accommodate the activity.
- Many respondents discussed the need for technical support from international partners throughout the supplemental data activity (from proposal development to data analysis); modelling is especially dependent on external technical experts.
- Supplemental data activities provided the opportunity for VNTP and subnational level TB staff to learn how to plan and implement these supplemental activities and improve their job performance and enhance their technical skills.
- Subnational level TB staff would like for the national level to provide more opportunities for subnational level staff to participate in supplemental data activities and more technical support to develop a TB strategic plan for their region/province.

Illustrative quote:

"The challenge is when we plan and implement these [supplemental] activities, there's a lot to learn. Before we can participate in, for example, the prevalence survey, we had to do our own research to make sure that we are ready to do it. For the second prevalence survey, I at that time only had one year of experience with TB, so I had to try to do my own research and a lot of work back then, but it was very helpful not [only] at that time, but also for my future working in the field." – Key Informant, Subnational level, Viet Nam (40012)

"A challenge is organizing the field team and prepare so many people and buy many items. For the second survey [**TB prevalence survey**], we organized ten teams. For each field team we've got eight persons from the TB hospital and we work in the field in one week per cluster. So it means that the field members need to stop their work at their hospital and join the team. And for the team, we need a doctor, a lab tech, radiologist and others. So sometimes people need to swap, because in the provincial hospital, they don't have many radiologists and doctors, they just have one or two. So if one joins a team, it means that the hospital only has one doctor." – Key Informant, National level, Viet Nam (40006)

Theme: Dissemination of results and recommendations

Dissemination practices:

- At national level
  - The VNTP typically organizes a workshop, conference or meeting to present the findings and recommendations and holds a discussion with all relevant partners and VNTP staff. National laboratory staff and provincial level staff are also included if relevant; workshop materials are shared with participants (examples given: prevalence survey, epi review).
  - Results are sometimes shared in a written report for the activity; however, some respondents mentioned that results are not always officially published or available online, so those outside the VNTP must request the results; information typically stays at the national level.
  - The VNTP sends the results to partners who were involved in the supplemental data activity.
  - Most respondents believe the relevant VNTP staff (leaders and heads of relevant units) and partners involved are well-informed of the findings and recommendations since they attend the workshops and worked on and/or received the reports.
- At subnational level
  - Provincial level staff are invited to dissemination meetings or workshops at the national level if relevant (example given: prevalence survey).
  - Findings and recommendations are shared by VNTP staff at meetings with subnational level TB staff to discuss future implementation for the province.
  - The VNTP sends the activity report and recommendations to provincial level officials.
  - There are mixed sentiments as to whether subnational level TB staff are adequately informed of the findings and recommendations:
    - Some respondents believe province level staff are informed since they are invited to dissemination workshops (example: prevalence survey dissemination) and provinces have meetings with national level staff to discuss the specific recommendations for their province.
    - One respondent noted that lower levels may not get the comprehensive results, just the key recommendations or relevant results for the local level staff, which fits the target audience.
    - Some respondents believe that dissemination at subnational levels is limited because the reports and/or dissemination at the national level are done in English only, which poses a barrier to those who don't speak English.
    - A few respondents noted that not all provinces receive the findings and recommendations, only the sites where the activity was conducted (example: prevalence survey).
    - One respondent noted that subnational level staff may not be interested in the findings even though they are invited to the national dissemination workshops, so they don't really absorb the information.
- Shared widely
  - Publications (example: 1st and 2nd prevalence survey, patient cost survey).
  - Published key findings in local newspapers.
- Supplemental TB data activities that are most widely disseminated/shared:
  - Prevalence survey
  - Patient cost survey

Illustrative quotes:
"Usually when the activity is done, the [VNTP] team has some kind of workshop to present the data and have discussion. After, they usually have some report or paper to show the result. I think that is important, because the VNTP needs evidence to make the decision. For the workshop, usually the VNTP will invite the sites which did the activity. For example, we conducted the prevalence survey in 55 different provinces, so they will invite some of the big provinces to come to the workshop." – Key Informant, National level, Viet Nam

"After an activity is implemented, typically we will have a meeting at the national level. We send delegates or our superiors to the meetings and in turn our superiors will relay that information of the result to us." – Key Informant, Subnational level, Viet Nam

"I hope that the national team would share the results of those surveys or activities with the regions…It would be best if they inform using a website or a direct office. Website information would be uploaded and anyone who needs that information, they can just go ahead and download that information…That would be helpful for people to access information if they need to plan for their area activities or for any doctor who want to do any research. Right now, it's really difficult to access information regarding the TB program from the national level system." – Key Informant, Subnational level, Viet Nam

"Dissemination among the VNTP system is sometimes limited. Normally the information stays at the central level. The dissemination down to the lower level is limited, because sometimes the report of the supplemental activity may be in English only. If it is in English only, it could be a barrier to disseminate to lower level because the people cannot understand English. It's a recommendation for dissemination of a supplemental activity, the report and the results should be available in both English and Vietnamese, so it's easier for the VNTP to disseminate and send that information." – Key Informant, National level, Viet Nam

Suggestions for improvement from respondents

- To improve survey implementation methodology:
  - Address selection bias by rethinking the timing of data collection (e.g. the TBPS did not capture a lot of younger people as they were at work or at school during data collection times).
  - Address selection bias by expanding sampling to a wider variety of areas (e.g. the PCS was only done in five provinces, which were not representative of the country); the big cities were not included.
- To improve dissemination/uptake of recommendations:
  - It is important for the VNTP to follow-up on/give the official order to implement recommendations resulting from the supplemental data activities; however, funding is often limited at both national and subnational levels to implement these recommendations.
  - The supplemental activity report and results should be available in both English and Vietnamese to increase dissemination accessibility.
  - Improve dissemination of results to subnational levels so that local TB programs can use the findings from planning TB activities in their area.
  - Share results and recommendations via a website or have a direct contact at the VNTP to ask for the results.

- Build TB program staff capacity to better understand the data activity (examples given: modelling, epi review, PCS).
- Better utilize findings from data activities for TB advocacy and domestic investment in TB.
- Ensure the activity is implemented in a timely manner to get timely results for use in program planning and decision making.
- There is a desire for subnational level estimates for decision making in each province.

Overall Findings

When the findings from the case study's three activities were jointly analyzed, several overall themes emerged and are described below. These triangulated findings are the same as those presented in the executive summary.

- **Supplemental TB data activities are useful and provide critical information for planning, decision making and development of the National Strategic Plan (NSP):** The different supplemental activities that Viet Nam conducted were extensively used to help estimate the TB burden, better understand gaps in the TB care cascade and develop interventions and strategies for the TB NSP, but the country also relied extensively on routine data from the VNTP's electronic routine surveillance system, VITIMES. Supplemental activities that have been particularly useful include the two prevalence surveys, the patient cost survey, patient pathway analysis, people-centred framework, modelling, the four drug resistance surveys and inventory study. Other important activities included the diagnostic network optimization, TB diagnostic network assessment and epidemiological reviews. Once a more comprehensive patient pathway analysis and Mapping and Analysis for Tailored disease Control and Health system strengthening (MATCH) have been completed, findings can further contribute to estimating the current TB burden and help TB program planning. For the near future, the VNTP and partners would like to repeat the people-centred framework, patient pathway analysis, inventory study and modelling with updated data for the development of the next NSP due in 2025. Conversely, there has been discussions in the country on the need to conduct a third TB prevalence survey., The country would rather be able to estimate the TB burden based on analysis of case-based routine data, especially once VITIMES has been strengthened and integrated throughout the country. The country has already conducted two prevalence surveys ten years apart and is able to compare findings over time. The drug resistance survey has been conducted four times and a fifth survey was planned to be conducted in 2016/2017, but the VNTP decided to use routine data and data from the GeneXpert network instead. The goal is to use DR-TB routine surveillance and GeneXpert data moving forward, but it has been a challenging transition. The VNTP and partners would like to have operational guidance for countries to transition to using routine DR-TB surveillance data for DR-TB estimates.

- **Timing, coordination and availability of funding for supplemental TB data activities is critical:** The VNTP and TB partners always welcome the opportunity to work with and receive technical and financial support from external partners and donors. However, it is

important that proposed activities align with the VNTP's needs and priorities and are timely. The timing of the implementation of activities should also be coordinated with the VNTP. Sometimes, funding availability hinders the implementation of an activity and/or implementation of the recommendations resulting from the activity; findings and recommendations are then not readily available for use in TB program planning and decision making when needed. The majority of the funding for TB-related activities in Viet Nam comes from The Global Fund and other external donors, since government funding for TB-related activities is limited. Some respondents believe that better use could be made of the findings from supplemental TB data activities to advocate for domestic TB funding, but external funding would still be needed for strengthening the routine systems and implementing supplemental TB data activities.

- **Important to build local capacity, but technical assistance is still needed:** There is technical capacity within the VNTP and subnational level staff for implementation of supplemental data activities. However, there is an inadequate number of staff to implement activities that require field work and competing priorities exist with running routine TB program activities. Additionally, not all TB program staff have the relevant skills for different supplemental activities, so there is a limited number of staff with the right skills to support the activity. Supplemental data activities provided opportunities for VNTP and subnational level TB staff to learn how to plan and implement supplemental activities to improve their job performance and enhance their technical skills; however, subnational level staff voiced the desire for the VNTP to provide more opportunities to participate in supplemental activities and more technical support from the national team to develop a strategic plan for their region/province. Even though there is capacity within the country, it was felt that technical support from external partners is still needed throughout the life of a supplemental activity (from proposal development to data analysis to report writing), especially for activities such as modelling. Local TB partners already have a good working relationship with the VNTP, but more collaboration is needed to reduce overlap in operational research or other data activities and to save costs and time.

- **Dissemination of results and recommendations:** Dissemination of findings and recommendations are typically organized and held at the national level, but relevant VNTP staff, local TB partners, external partners and donors, laboratory staff and subnational level staff are invited to attend. Additionally, VNTP staff have routine meetings with subnational level staff where they present and discuss findings and recommendations from supplemental TB data activities in addition to routine work. VNTP staff and external partners and donors are often adequately informed since they were involved in planning, implementing and disseminating the supplemental TB data activities. There is mixed sentiment on whether subnational level staff are adequately informed due to varying access to dissemination events and language barrier Subnational level staff would like to see improvement on dissemination so that local TB programs can use the findings and recommendations for planning TB activities in their local area. There is general agreement that information mainly stays at the national level; though findings from some supplemental TB data activities are published formally in academic journals, for example, others are written

in reports or presentation slides that are not always officially published or available online, so partners and staff outside the VNTP must request the results, which can be difficult to access as there is no direct point of contact.

After dissemination, it is also important to follow up on implementation of the recommendations. There is often inadequate funding to implement the recommendations resulting from supplemental TB data activities at both national and subnational levels.

- **Remaining data gaps for programmatic planning:** While VITIMES is an electronic case-based data system that provides a lot of data for key indicators, it is understood that it cannot capture all the needed data for burden estimation, understanding and addressing gaps it the TB care cascade, and for TB program planning. It would be helpful if the VNTP could access TB-related data from other data systems in the country, such as the Electronic Communicable Disease Surveillance System (ECDS) and Access to Care Information System (ACIS), and ideally these systems would be linked to VITIMES. Additionally, VITIMES is the data system for just DS-TB, it has not yet been fully integrated with e-TB Manager, which is the data system for DR-TB. Other data that could be useful include assessing public private mix and private sector engagement since it has been more involved with treating TB patients, analyzing cost effectiveness of TB interventions and activities and assessing the quality of TB care and services.

Conclusion and next steps

This country case study was conducted to learn from Viet Nam's experience with planning and implementing supplemental TB data activities and to better understand how these activities have helped the VNTP and TB partners to gain insight of the TB burden in the country, better understand and address gaps in the TB care cascade and make both short- and long-term plans for the TB program.

The case study was an opportunity for Viet Nam's TB program and partners to give feedback to global partners and funders on the use and usefulness of supplemental TB data activities and influence global recommendations on the use of TB data activities. Furthermore, it is hoped that findings from the case study will help Viet Nam's MOH look at how these supplemental activities have been used in the past, to help them prioritize TB data activities in the future. Key takeaways from the Viet Nam case study will be factored into the overall recommendations coming out of the project, which will cover both general aspects of planning and implementing supplemental TB data tools as well as tool-specific recommendations.

Findings from Viet Nam have been compiled with findings from the four additional country case studies, global-level interviews and desk review and the NTP manager survey. The triangulated findings will be used to develop a framework to help countries prioritize TB data-related activities in partnership with WHO.