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

Final Report, January 2021 - August 2023

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

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Abbreviations

BMGF	Bill & Melinda Gates Foundation
CCA	TB Care Cascade Analysis
CDC	U.S. Centers for Disease Control and Prevention
DNA	TB Diagnostic Network Assessment
DNO	Diagnostic Network Optimization
DRS	TB 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
MOH	Ministry of Health
NRL	National Reference Laboratory
NSP	National Strategic Plan
NTP	National TB Control Program
OHT	One Health Tool for TB Budgeting
PCF	People-Centred Framework
PCS	TB Patient Cost Survey
PPA	Patient Pathway Analysis
PSRx	Private Sector Drug Sales Analysis
QTSA	Quality of TB Services Assessment
SDCS	TB Service Delivery Costing Study (Value TB)
TB	Tuberculosis
TBPS	National TB Prevalence Survey
USAID	U.S. Agency for International Development
WHO	World Health Organization

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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 tools outside of routine surveillance and program data from both the country and global perspectives. Throughout this report, these tools are referred to as "supplemental" TB data tools since they supplement routinely collected TB surveillance data.

The U.S. Centers for Disease Control and Prevention (U.S. CDC) and the CDC Foundation, an independent nonprofit that supports the U.S. CDC, implemented this project from January 2021 through August 2023 with funding from the Bill & Melinda Gates Foundation. The project was also supported by steering committee comprised of 10 TB data experts from technical and funding partners in the TB sphere and a Ministry of Health (MOH) representative from Uganda.

The project took place in three phases as shown in Figure 1:

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 tools

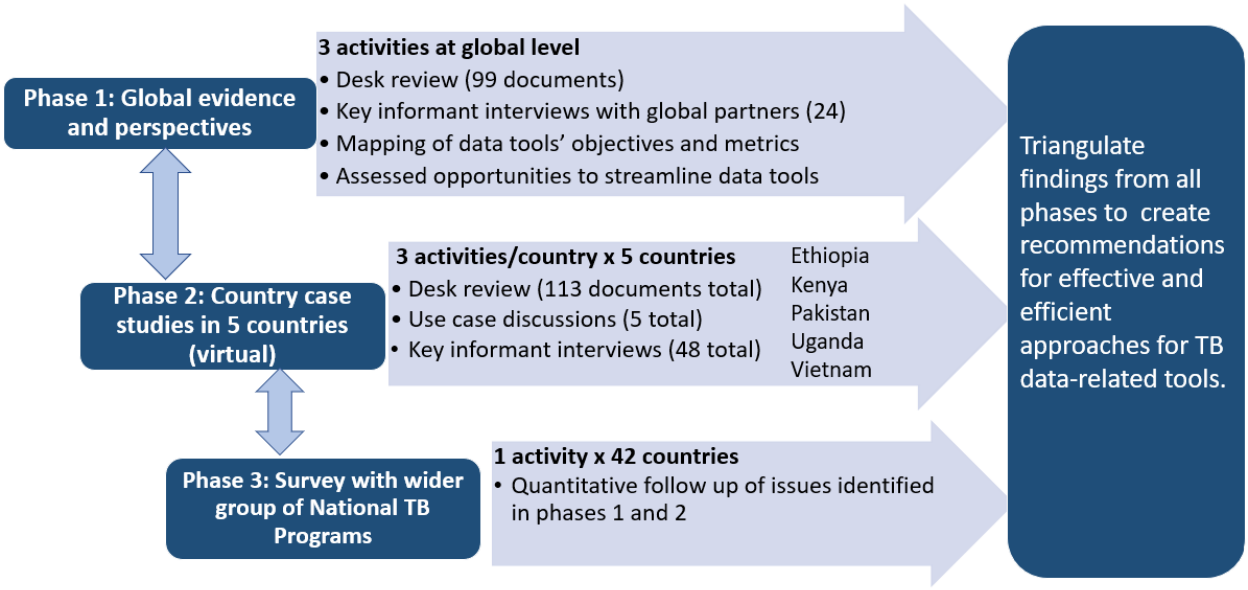


Figure 1. The three phases of the TB Data Optimization Project, January 2021 – August 2023

The project's first phase consisted of a desk review, indicator mapping and key informant interviews with global partners. A desk review of methodologies, evidence and outcomes for common TB data tools was conducted to understand the impact of supplemental tools on TB programs and policy. Specific indicators and outcomes from TB data tools (abstracted from guidance documents, e.g., user guide or handbook) were mapped and aligned to characterize

commonalities and the potential for streamlining tools and approaches. Key informant interviews were conducted with 24 TB experts from the major TB technical partners and funders. Key informants were selected based on discussion with the project steering committee; an effort was made to invite informants from as many organizations as possible that are involved in TB data work. Interview questions assessed their perception of major challenges and gaps in TB data systems and the usefulness of various activities in addressing these gaps. Opportunities and challenges for implementing TB data tools were also covered.

The second phase consisted of country case studies in five purposely selected countries (Ethiopia, Kenya, Pakistan, Uganda and Vietnam). Country selection was based on several factors including experience with various TB data collection activities, geographic diversity and willingness of the MOH to engage in this project. In each country, we commenced with a desk review of existing evidence (reports, publications) related to the country's use of TB data tools as well as strategic planning documents. We also conducted a use case discussion with 4-6 NTP staff and in-country partners and interviewed 9-11 MOH staff and partners at the national and subnational level who have supported TB data tools. The desk review, use case discussion and interviews assessed the use and usefulness of TB data for program planning and decision making as well as successes and challenges encountered when implementing TB data tools.

The project's third phase consisted of an online, quantitative survey of NTP managers or their designees. All countries that had completed at least two supplemental TB data activities, according to records kept by the World Health Organization (WHO), were eligible to participate. We emailed NTP managers from 55 countries that met this criterion and invited them to participate in the survey. Forty-two countries (76%) completed the survey. The questions were developed using information gathered during the country case studies to seek similar information from a wider range of countries.

Findings from the three project phases were triangulated using all data sources. Findings from country case studies were compared and summarized across countries and then triangulated with the findings from the NTP survey to compose a summary country perspective. Global perspectives consisted of triangulated findings from global key informant interviews and the global desk review. The global perspective was then compared to the countries' perspective. A tool-based analysis was also conducted using all the data sources, where findings were summarized for each TB data tool that was discussed during this project.

The following key messages were summarized from the combined analyses:

1. Strengthening routine data systems is fundamental for attaining robust, sustainable TB program data.
    - Strengthening routine data systems will allow for more and better analyses.
    - Need to ensure routine data systems are integrated and user-friendly.
    - With stronger routine data systems, some supplemental tools will become redundant; however, some tools will still be needed as they answer questions that cannot be assessed with routine data systems.
2. Although supplemental TB data tools require substantial resources (time, funding), they are critical to fill gaps in routine TB data.

- Findings from data tools are worth the investment because tools provide important information; however, results and recommendations from the tools are often not used optimally for TB program planning and decision making - and this limits the impact of the tool.
- Though data tools are generally worth the investment, it is not possible to implement all tools, and thus countries need to prioritize. Partners should align their interests with the country's prioritization, rather than advocating for tools that the partner prioritizes.

3. There is limited overlap between the supplemental TB data tools; one tool cannot replace another tool, but some tools can be complementary.
    - Consider implementing data tools with similar sampling strategies at the same time.
    - Consider implementing complementary data tools in a collaborative manner to minimize data requests and maximize information gained.
    - Consider logical sequencing of tool implementation (e.g., implement those that generate primary data first, so they can feed into secondary data analysis tools).
4. Countries prefer to have subnational level data for better target setting and planning.
    - Country case study respondents explained how regions in their countries have struggled to meet targets or have overshot targets when national estimates are used for target setting.
    - Countries repeatedly expressed desire for subnational level data because of varying populations and socio-cultural differences.
5. Recommendations from supplemental TB data tools are not always implemented due to lack of resources and/or feasibility.
    - Funding is often inadequate to implement the recommendations from data tools; in addition, some recommendations are not feasible for a country to implement.
    - Technical assistance is typically provided for planning, fieldwork/data collection and analysis of data, but often not for post-implementation activities like translation of findings into action.
6. There is need to build more capacity in countries to implement supplemental TB data tools, including planning, implementation, analysis, data interpretation, dissemination and translation of findings into action.
    - Global and country respondents reported limited technical capacity in countries to plan and implement data tools. However, capacity building was perceived by all respondent groups as an opportunity (e.g., learning research methods and how to conduct field work) and may empower countries to implement future supplemental tools more independently.
7. Funding for supplemental TB data tools is largely from donors; they may not always be funded at the right time due to funding availability and/or interest.
    - There is generally a lack of domestic funding for TB-related activities, data tools are almost always funded by donors.
    - Insufficient financial resources/funding was frequently cited as a significant challenge for countries with planning and implementing data tools; countries cannot always find adequate funding for data tools when they need to be implemented. However, when countries did manage to implement a tool, they reported that sufficient funding was provided in most cases.

8. There is a need for better coordination and timing of different supplemental TB data tools to optimize use of their findings for National Strategic Plan (NSP) development, Global Fund and other donor applications and program planning.
    - Timing and coordination are challenging but critical.
    - It is important that tool implementation aligns with the country's needs, priorities and TB strategic planning cycle; it is ideal to have findings available to inform NSP development.
    - Coordination among partners is especially important when data tools are being implemented in the country at the same time.

A set of practical best practices were developed based on the overall findings to guide future planning and implementation of supplemental TB data tools. Best practices are either based on project findings and discussions or taken directly from global and/or country key informants. The best practices are grouped into the following areas:

- **General best practices**
    1. Before considering which data tools to prioritize, it is important to review existing data, including routine programmatic data and previously implemented data tools and research. Existing data should be mapped, and key data and evidence gaps identified.
    2. Not all data tools need to be implemented in all countries; it is important to carefully prioritize activities based on existing data gaps and country priorities.
    3. It is important that the NTP is invested in any tool to be implemented, and fully understands the type of findings and recommendations that it generates.
    4. Some data tools can be more routinely adopted while others may remain periodic.
    5. As TB programs and routine data systems are strengthened, some data tools may no longer be needed. Countries that transition from an aggregate paper-based to an electronic case-based surveillance system may be able to collect and analyze data that answers critical questions, which may make certain tools redundant.
    6. Consider whether it's feasible to add aspects from one tool onto another tool to decrease the total number of tools to be implemented. However, the feasibility of implementing a combined tool must be thoroughly considered before doing so.
    7. If no data tool exists that directly addresses a priority question or data gap, consider whether integrating additional questions into an existing tool, or additional variables into routine program data, is possible. Alternatively, development of a research study to address the specific gap could be considered.
    8. Designs that can be implemented with minimal technical assistance and financial support should be taken into consideration when developing new data tools, so that countries are less dependent on partners to implement them.

- **Optimizing the usefulness of findings and recommendations resulting from supplemental TB data tools**

1. When contemplating whether to implement a data tool, assess whether prior recommendations from that tool and related tools have been implemented. If prior recommendations have not been implemented, repetition of the tool will likely generate the same recommendations rather than new ones.
2. In addition to resources needed to implement a data tool, it is important to consider the resources needed to implement recommendations derived from the tool.
3. Involve technical working groups in the development of recommendations and action plans.
4. It is important that recommendations resulting from the tools are SMART: specific, measurable, actionable/achievable (feasible), relevant and time bound.
5. Assign a responsible party/parties to implement recommendations.
6. It is important to disseminate findings and recommendations to all relevant internal and external partners, with requests for support to implement recommendations.
7. Recommendations from the data tools should inform National Strategic Plans as well as funding applications.
8. It is important to translate relevant findings into digestible key messages for civil society and the public. Consider requesting funding and technical assistance to interpret and disseminate results with engagement from civil society for advocacy, program implementation and National Strategic Plans.

- **Timing and coordination of supplemental TB data tools' implementation**
  1. It is important that partners coordinate with each other and the NTP to ensure they support activities that are a priority for the NTP, and that implementation of multiple data tools does not place undue burden on the NTP.
  2. Buy-in from the NTP for data tools is critical; without it, the resulting recommendations are less likely to be implemented.
  3. It is important to identify a logical sequence and timeline in which to implement data tools, so that findings are available for the next National Strategic Plan, and results from primary data collection tools can feed into data tools that use secondary data analyses.
  4. It is helpful to outline the sequence and timing of desired data tools in National Strategic Plans as well as funding applications to ensure a logical, integrated approach.
  5. When multiple partners implement data tools or request data in a country, it is important that they coordinate efforts to reduce the overall burden, avoid duplication of efforts and promote cost sharing.

- **Capacity building in countries for planning, implementation, analysis and interpretation of data/findings**
  1. It is important to include staff from national and subnational levels, as well as partners, in planning and implementation.
  2. It is important to ensure that planned technical support for activities continues through analysis, dissemination, report writing and implementation of recommendations.

3. When feasible, technical assistance to implement data tools should include building capacity of local staff to implement the tool, analyze the data and translate findings into action.
4. Consider south-to-south collaborations with technical support provided by trained/experienced persons from neighboring countries.

- **Funding of supplemental TB data tools**
  1. Incorporate data activities into National Strategic Plans and:
     a. Advocate for domestic funding.
     b. Include data activities in funding applications to minimize the need for ad hoc funding.
  2. It is important that partners align their funding with the country's needs and priorities, rather than being driven by donors' preferences.

- **Implementing supplemental TB data tools at subnational level**
  1. Several data tools could be suitable to implement at subnational levels (or to estimate subnational indicators) to better understand issues at subnational levels. These include: epidemiological reviews, care cascade analysis, modelling and mapping and analysis for tailored disease control and health system strengthening (MATCH).
  2. It is typically cost-prohibitive to generate subnational estimates in a methodologically sound way for some activities such as TB prevalence surveys and drug resistance surveys, although a very limited number of strata might be feasible, especially for drug resistance surveys.

In addition to the general best practices above, tool-specific best practices were formulated based on feedback of the tools from all data sources. Tool-specific best practices are covered in the main report.

Next Steps

Findings from the project will feed into the development of a new framework which is tentatively called the "Framework for prioritizing TB data-related tools." This will be developed in partnership with WHO and with substantial input from a working group with additional TB data experts from U.S. Agency for International Development (USAID), KNCV TB Plus, The Global Fund, the Bill & Melinda Gates Foundation and several country representatives. This framework will help countries to identify priority gaps in their existing TB data, understand which data tools could help them address those gaps and then prioritize and plan for TB data activities in an upcoming strategic planning cycle.

MAIN REPORT

Introduction

There are numerous global initiatives, partner-led activities and monitoring and evaluation (M&E) tools that countries use to assist in the collection and use of TB-related data outside of routine TB surveillance systems. While these TB data tools provide important information, implementation of such tools can burden Ministries of Health (MOH), National TB Programs (NTPs), technical partners and funders 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, aimed to assess the use and usefulness of "supplemental" TB data tools from both the country and global partner perspectives. For this project, "supplemental" TB data tools are those that go above and beyond routine data activities; they supplement routinely collected TB surveillance and programmatic data. Table 1 describes the final list of supplemental tools on which the project focused. The World Health Organization's (WHO) "Compendium of data and evidence-related tools for use in TB planning and programming"("the Compendium"), which includes both WHO- and partner-developed TB data tools, served as the starting point for selection of TB data tools included in the project. A couple of additional tools were added after discussions with technical partners active in the global TB sphere.

Table 1. List of focus supplemental TB data tools for the TB Data Optimization Project, January 2021 – August 2023

Supplemental TB Data Tool	Description (written by the project team)	Tool's guidance document
TB Prevalence Survey (TBPS)	Large national survey where community members are screened for TB to estimate the true burden of TB in a country.	Tuberculosis Prevalence Surveys: A Handbook
TB Drug Resistance Survey (DRS)	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.	Guidance for the surveillance of drug resistance in tuberculosis: Sixth edition
Epidemiological reviews, including standards and benchmarks[1]	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.	Standards and Benchmarks for Tuberculosis Surveillance and Vital Registration Systems: Checklist
Diagnostic Network Optimization (DNO)	An analytic approach to look at how diagnostic services are organized in a country to inform the optimal location of TB diagnostic tools (e.g., GeneXpert, TrueNat).	Diagnostic Network Optimization: A network analytics approach to design patient-centred and cost-efficient diagnostic systems

Patient Cost Survey (PCS)	A nationwide survey among TB patients conducted at selected health facilities to estimate and understand the costs incurred by TB patients.	Tuberculosis Patient Cost Surveys: A Handbook
Inventory Study (IS)	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.	Assessing tuberculosis under-reporting through inventory studies
Private Sector Drug Sales Analysis (PSRx)	An analytic approach to estimate the volume of TB patients treated by private sector providers using non-NTP drugs.	Surveys of private TB drug sales: a short, practical guide
TB Service Delivery Costing Study (SDCS)	A tool that estimates the cost of delivering TB interventions and services at the facility level.	Costing Guidelines for Tuberculosis Interventions
One Health Tool for TB Budgeting (OHT)	A costing tool used to estimate resources required to implement the TB national strategic plan.	WHO is developing a new version of OHT called the Integrated Health Tool
People-Centred Framework (PCF)[1]	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.	People-centred framework for tuberculosis programme planning and prioritization: User guide People-centred framework Handbook
TB Care Cascade Analysis (CCA)	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.	Constructing care cascades for active tuberculosis: A strategy for program monitoring and identifying gaps in quality of care
MATCH (Mapping and analysis for tailored disease control and health system strengthening)	An analytic approach which uses subnational level spatial and program data to identify gaps in TB service delivery within subnational areas.	The MATCH Manual
Patient Pathway Analysis (PPA)	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.	Patient Pathway Analysis: How-to Guide
TB Diagnostic Network Assessment (DNA)[2]	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.	Not yet available online

Quality of TB Services Assessment (QTSA)[3]	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.	Quality of Tuberculosis Services Assessment: Global Implementation Guide
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.	Guidance for country-level TB modelling Country-level TB model catalogue
Screen-TB (STB)	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.	Systematic screening for active tuberculosis: an operational guide
[1]The PCF is not listed as a separate tool in the compendium, but it was included as a framework that is meant to be used with the compendium. [2]The TB DNA is not included in the compendium. [3]The QTSA is not included in the compendium.		

This project was conducted from January 2021 through August 2023 by the U.S. Centers for Disease Control and Prevention (U.S. CDC) and the CDC Foundation (an independent nonprofit that supports the U.S. CDC) and funded by the Bill & Melinda Gates Foundation. A steering committee consisting of ten members was created to advise and provide expertise and feedback through discussions to further develop the project. The steering committee met seven times over the course of two and a half years. The steering committee included representatives from: WHO, USAID, STOP TB Partnership, KNCV TB Plus, TB HIV Care, Bill & Melinda Gates Foundation, The Global Fund and MOH of Uganda.

Project objectives

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

Methods

The project used mixed qualitative and quantitative methods and was conducted in three phases as shown in Figure 1 below.

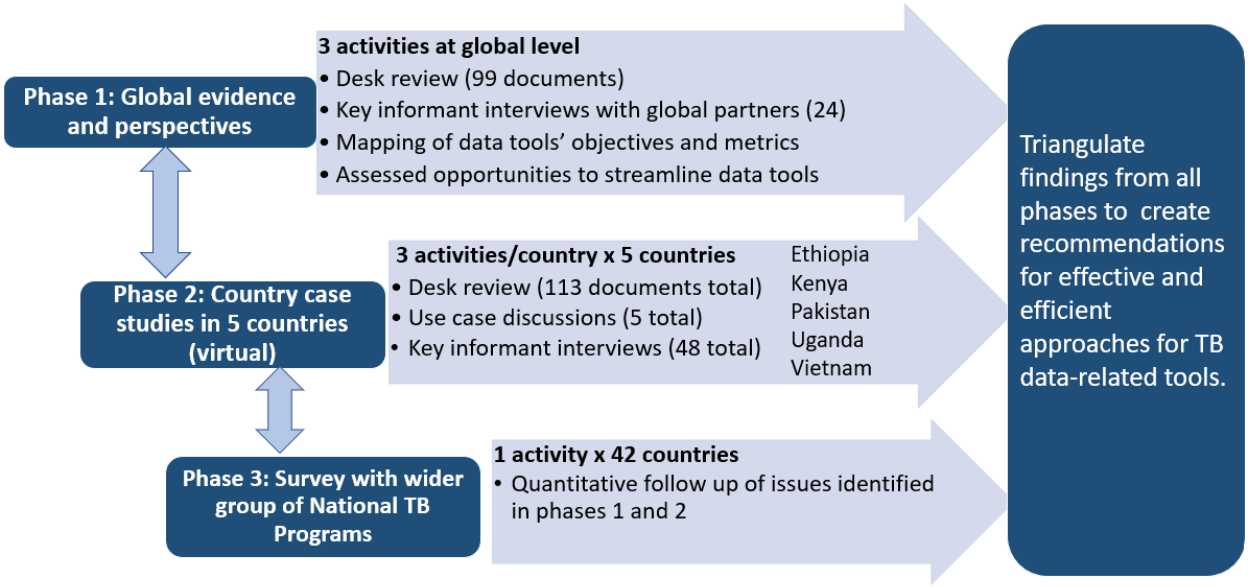


Figure 1. The three phases of the TB Data Optimization Project, January 2021 – August 2023

Phase 1: Global perspectives

Desk review

Thirty-two guidance documents for the TB data tools and 67 published and unpublished documents describing experiences with the implementation and use of these data tools were reviewed. A standardized template was developed to extract information. From the guidance documents, elements abstracted include the purpose, objectives, indicators/metrics measured and estimated time and cost to implement. From the evidence documents, elements abstracted include the year and country/countries of implementation, key findings, successes and challenges with implementation and any evidence related to use of the findings and/or recommendations. This information was used to summarize the use and impact of the data, findings and recommendations of the TB data tools and was used primarily to provide context and to triangulate with other findings. Documents were identified and obtained online from journals and websites using a range of general and tool-specific search terms; additional documents were suggested and shared by steering committee members.

The abstracted objectives and indicators from the TB data tools were compared to assess similarities, overlap and any opportunities for streamlining and alignment across tools.

Key informant interviews

Virtual key informant interviews were conducted via Zoom with 24 TB data experts from technical and donor agencies, including WHO, WHO regional offices, staff working on the TB

DIAH project at University of North Carolina at Chapel Hill in partnership with John Snow, Inc., KNCV TB Plus, Stop TB Partnership, The Union Zimbabwe Trust, FIND, Linksbridge, London School of Hygiene and Tropical Medicine/TB Modelling and Analysis Consortium (TB MAC), Imperial College London, The Global Fund to Fight AIDS, Tuberculosis and Malaria, Bill & Melinda Gates Foundation and U.S. Agency for International Development (USAID).

Key informants were identified through recommendations from the project's steering committee. An interview guide was developed and piloted with five TB data experts from five different organizations to direct the conversation; this was sent to the key informants prior to their interview (Annex 1). Interviews were approximately 60 to 90 minutes, audio recorded with permission from the participant and transcribed verbatim using NVivo Transcription. The first round of coding the transcripts were completed by two project staff using NVivo 13 (2020, R1). A mixed inductive-deductive coding approach was used; the parent codes were created a priori based on the interview guide to organize the data into categories and the child codes were created based on interview responses. The two project staff then reviewed all the codes and regrouped as necessary. Lastly, all codes were reviewed and agreed upon by four project team members. Content analysis was conducted and key emerging themes (defined as those where at least 25 percent of respondents discussed a topic) were summarized.

Mapping and streamlining of indicators

Key objectives and indicators and metrics collected by each supplemental TB data tool were abstracted and mapped. These were grouped along the TB care cascade. Similarities and any overlap of indicators and metrics across data tools were explored for opportunities to streamline or align across tools.

Ideas from all data sources (desk review, suggestions from global and country key informant interviews and mapping) were considered to explore whether use of supplemental TB data tools could be streamlined. Potential overlap and options for streamlining across tools were explored from several perspectives including comparison of the tools' objectives, methodology and target population.

Phase 2: Country case studies

Five low- and middle- income countries were purposely selected for the case studies and engaged virtually. Selection was based on having substantial experience with supplemental data tools, geographic diversity and willingness of the NTP to participate. Participating countries were: Ethiopia, Kenya, Pakistan, Uganda and Vietnam.

Desk reviews

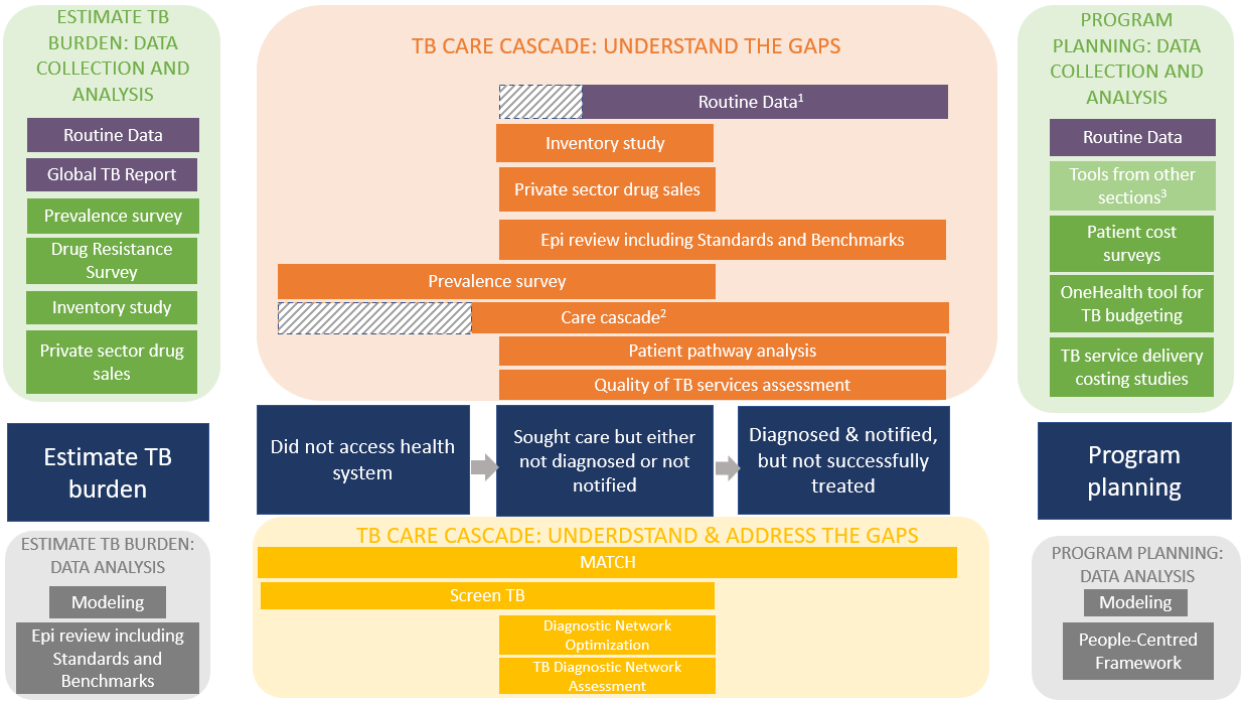
The purpose of completing a desk review for each case study country was to review the country's TB data tool activity reports and strategic planning documents for evidence of findings used for strategic planning and lessons learned from implementing data tools. A total of 116 existing documents that had been written by the NTP or partners from the five countries over the past ~10 years were reviewed. Documents reviewed included, but were not limited to, TB data tool activity reports, presentations, publications, TB program review reports, National TB Strategic Plans and Global Fund applications. Documents were obtained from NTP websites,

published journals and NTP staff. Documents were grouped into one of two categories: (a) reports, presentations and publications related to the use of routine and supplemental TB data tools and (b) strategic planning documents. A template was developed to extract relevant information. Lessons learned and recommendations from the TB data tools were abstracted from reports, presentations and publications. Evidence regarding use of the TB data tools' findings and recommendations was abstracted from strategic planning documents, as well as evidence of planning for upcoming TB data tools.

Information abstracted from the documents was used to summarize the use and impact of data, findings and recommendations from the TB data tools. The desk review summaries from the five countries were compared for similarities and differences in which tools countries used or cited in their NSPs or Global Fund applications and which tools countries implemented but were not planned for in their NSPs.

Use case discussions

One use case discussion was conducted in each of the five countries to better understand how NTPs have used TB data tools and routine data to a) estimate the burden of TB in their country, b) understand and address specific gaps in the TB care cascade and c) make short- and long-term plans for the TB program. A use case discussion guide (Annex 2) was developed based on the objectives previously listed to guide the conversation. Each set of questions was related to a section of the project's TB data use map (see Figure 2 below); the map shows the TB-related data tools that countries may have implemented to better understand each section (blue boxes). The guide was adapted for each country to reflect the tools that they had implemented and given to the participants ahead of the discussion. The NTP focal person or NTP manager of each country was asked to select five to seven participants from the NTP and TB partners who were closely involved with implementing and/or using findings from TB data tools and/or involved in the development of the most recent TB National Strategic Plan and Global Fund application. The discussions were approximately 90 to 100 minutes and conducted via Zoom. Interpreters were provided as needed. The discussions were audio recorded with permission from all participants and transcribed verbatim using NVivo13 (2020). Transcripts were edited for accuracy by a staff member who re-listened to the interview. Two project staff summarized responses for each section of the use case discussion guide and compared findings across the five countries.



1Shaded 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.

2Shaded 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.

3Tools from other sections = TB data tools listed under the "Estimate TB burden" and "TB care cascade" sections

Figure 2. TB Data use map: mapping of the use of TB data tools in different aspects of TB program evaluation and planning, TB Data Optimization Project, January 2021 - August 2023

Key informant interviews

Individual key informant interviews were conducted with a total of 48 participants across the five countries to better understand the motivating factor for countries to implement supplemental TB data tools, challenges and opportunities with planning and implementing supplemental tools, the use and usefulness of supplemental tools and how findings and recommendations resulting from supplemental tools are disseminated. The NTP focal person or NTP manager of each country was asked to identify potential key informants. Key informants included TB program staff who worked at the national and subnational levels and TB partners who have supported implementation of TB data tools and/or have made use of the data, findings and next steps resulting from the tools. An interview guide was developed and piloted with two TB Officers at two different CDC country offices to guide the conversation and was sent to the participant prior to the interview (Annex 3). The interview guide was adapted for each country to reflect the tools that they had implemented and given to each key informant ahead of the interview. An interpreter was provided as needed. Interviews were approximately 60 to 90 minutes and conducted via Zoom. The interviews were audio recorded with permission from the participant and transcribed verbatim using Nvivo Transcription. Transcripts were edited for accuracy by a staff member who re-listened to the interview. The transcripts were

coded by two project staff using Nvivo 13 (2020, R1), then all codes were reviewed and agreed upon by four project team members. Content analysis was conducted and key emerging themes (defined as where at least 25 percent of respondents discussed a topic) were summarized for each country and compared across countries.

Phase 3: NTP survey

The purpose of the NTP quantitative survey was to gain a wider perspective on countries' experiences with supplemental TB data tools. The 30-minute online REDCap survey was sent to NTP Managers/Coordinators of 55 eligible countries. Countries that had implemented at least two supplemental TB data tools per records kept by WHO were eligible. The survey questions and responses were informed by the project's core evaluation questions and the qualitative data collected in phases 1 and 2 (Annex 4). One of the initial questions provided a checklist of all tools of interest and asked countries to indicate which tools they had implemented. Most of the remaining questions focused on their experience with those supplemental TB data tools. For example, survey questions asked about decision making around implementing data tools, challenges and opportunities with planning and implementing data tools, the impact of findings and recommendations from data tools, whether data tools were worth implementing, which tools the country would implement again and whether adequate technical and funding support had been received by the country for the data tools. Most countries were asked in a general format (e.g., about the data tools in general rather than specific tools), though a few tool-specific questions were included.

After reviewing the results, there was concern that some respondents may have incorrectly stated that they had implemented a tool, due to uncertainty around the names of tools they implemented several years prior. Hence, where possible, we checked with the developers/implementers of tools to confirm whether a country had previously implemented the tool. We were able to do this for the following tools: TB prevalence survey, TB drug resistance survey, TB inventory study, private sector drug sales analysis, TB patient cost survey, TB service delivery costing study, people-centred framework, MATCH, patient pathway analysis, diagnostic network optimization, TB diagnostic network assessment, TB epidemiological review and quality of TB services assessment. However, prior implementation of some tools could not be confirmed including the OneHealth tool for TB budgeting, TB care cascade analysis, epidemiological modelling and screen-TB. Analysis of tool-specific questions was limited to the countries for which implementation could be confirmed, except for the four tools which could not be verified. Survey responses were summarized descriptively with raw numbers and proportions and are presented only in aggregate form. "Other" responses were post coded and open responses were summarized. Responses to certain questions on funding/financial support and technical support were also stratified by low, lower-middle and upper-middle income countries to explore similarities and differences.

Triangulation of findings

The overall findings from the three project phases were triangulated using all data sources. Findings from country case studies were compared and summarized across countries and then reviewed and compared with the findings from the NTP survey to compose a summary country perspective. Global perspectives consisted of findings from global key informant interviews and the global desk review. The global perspective was then compared to the countries' perspective.

Themes emerged from questions asked during key informant interviews, use case discussions and in the survey or emerged from participants' responses in the interviews and discussions.

TB data tool-based analysis was also conducted using all the data sources, where the findings were summarized for each TB data tool that this project assessed.

Results

Respondent characteristics

We interviewed 24 global key informants and 48 country case study key informants. A total of 27 people participated in country use case discussions and the NTP survey was completed by 42 countries (response rate=76%). A full list of countries completing the survey is in Annex 5.

Respondent characteristics of the different components are presented in Table 2.

Table 2. Respondent characteristics by data source, TB Data Optimization Project, January 2021 – August 2023

Characteristics	Global interview respondents (n=24)	Country case study interview respondents (n=48)	Country case study use case respondents (n=27)	NTP survey respondents (n=42)
Years working in TB *Mean (SD)*	16.0 (5.7)	12.2 (6.6)	n/a	13.9 (7.8)
Sex				
Male	11 (45.8%)	32 (66.7%)	18 (66.7%)	n/a
Female	13 (54.2%)	16 (33.3%)	9 (33.3%)	n/a
Affiliation (countries)				
MOH/TB program staff	n/a	31 (64.6%)	18 (66.7%)	42 (100%)
TB partner	n/a	17 (35.4%)	9 (33.3%)	n/a

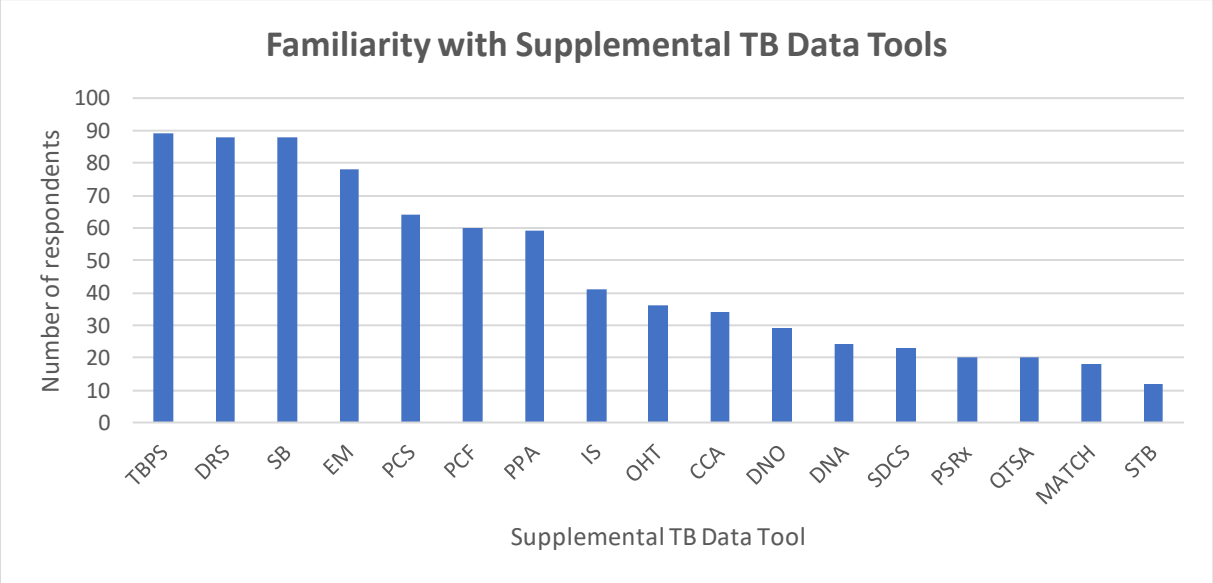
Overall, the average number of years respondents have been working in TB was high (over 12 years). The male to female ratio of global respondents was almost equal, while country case study respondents were mostly male. Country case study respondents were mostly TB program staff at the national and subnational level. All NTP survey respondents worked at their country's national TB program.

Among the 42 countries completing the NTP survey, 21 were in WHO's African Region, 2 were in Region of the Americas, 2 were in Eastern Mediterranean Region, 4 were in European Region, 4

were in South-East Asian Region and 9 were in Western Pacific Region. Ten of the countries were low income, 22 were lower-middle income and 10 were upper-middle income countries.

Familiarity with the supplemental TB data tools

Familiarity was defined based on whether the respondent was involved with planning and/or implementing the supplemental tool and/or had seen or heard the results of the supplemental tool. In general, the supplemental TB data tools which global and country key informants and survey respondents (N=114) were most familiar with include the TB prevalence survey, TB drug resistance survey, epidemiological review including standards and benchmarks, epidemiological modelling, TB patient cost survey, people-centered framework and patient pathway analysis as shown in Figure 3. The supplemental tools that respondents were least familiar with include private sector drug sales analysis, quality of TB services assessment, mapping and analysis of tailored disease control and health system strengthening and screen-TB.



TBPS=TB prevalence survey, DRS=drug resistance survey, SB=epidemiological reviews including standards and benchmarks, EM=epidemiological modelling, PCS=TB patient cost survey, PCF=people-centered framework, PPA=patient pathway analysis, IS=inventory study, OHT=OneHealth tool for TB budgeting, CCA=TB care cascade analysis, DNO=diagnostic network optimization, DNA=TB diagnostic network assessment, SDCS=service delivery costing study (Value TB), PSRx=private sector drug sales analysis, QTSA=quality of TB services assessment, MATCH=mapping and analysis of tailored disease control and health system strengthening, STB=screen-TB.

Figure 3. Global and country key informants and survey respondents' familiarity with supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Findings by theme

The overall findings are presented by themes that were explored during triangulation of findings from all the data sources. A total of eleven themes are presented. For each of the following themes, generally, the survey results will be presented first, followed by the most frequent responses from global and case study respondents. Responses are listed in order starting from most frequent; use case responses were also factored in where relevant. In addition, some quotes from interviews have been included to highlight specific findings.

Theme 1: Challenges with and gaps in routine TB data systems

Table 3 summarizes findings from the NTP survey and Table 4 summarizes findings from the country case studies and global perspectives. Overall, country and global respondents believe that the top challenges include limitations in data utilization (e.g., limited analytic capacity in staff, data quality) and limitations in the data systems themselves (e.g., fragmented data systems, paper-based recording and reporting, timeliness of data, limited variables collected).

More than 50 percent of NTP survey countries reported challenges with availability of real-time data, data quality, limited data analysis capacity at lower levels and limited use of data at lower levels (Table 3). "Other" responses included linkage of TB data with other data systems and implementing an electronic data system nationwide.

Table 3. NTP survey countries' top challenges in data generation, analysis and use of routine TB data, TB Data Optimization Project, January 2021 – August 2023

Top challenges with routine TB data systems (multiple responses selected)	%(n) N=42
Availability of real-time data	66.7 (28)
Data quality	64.3 (27)
Limited data analysis capacity at subnational levels	52.4 (22)
Limited use of the data at lower levels	52.4 (22)
Paper-based system	45.2 (19)
Some key data is not collected by routine system	33.3 (14)
Aggregate data, not case-based	33.3 (14)
Limited data analysis capacity at national level	23.8 (10)

Data flow is only bottom-up, analyzed results not shared with lower levels	21.4 (9)
Limited use of the data at national level	9.5 (4)
Other	7.1 (3)

While almost 67 percent of NTP survey respondents reported availability of real-time data was a challenge, it was not frequently mentioned by case study respondents. Fifty-two percent of survey respondents reported challenges with limited data analysis capacity and data use at lower levels, which was echoed by global respondents but less frequently mentioned by case study respondents. Case study country and global respondents often highlighted challenges with fragmented data systems in countries (Table 4). For example, TB data systems are often not linked to other disease data systems (e.g., HIV), laboratory data systems and even DR-TB data systems, as a key informant illustrated below:

> *"We have one [electronic] system to report on DS-TB data and another system to report DR-TB cases…after 2020, [leadership] made the decision to integrate the systems and now we are in the process of upgrading the system to cover all the requirements related to routine data under the NTP. So the challenge up til now is when we need the data for MDR-TB, we need to collect the data from the Excel file of the [DR-TB system], and if we want to collect the data related to the laboratory, we also need to collect data from the Excel file. We cannot find the comprehensive data from one system."* – Country Key Informant

Fragmented data systems were not a response option provided in the NTP survey, but one NTP survey country indicated challenges with linkage of data with other data systems as an "other" response. Case study country and global respondents also often discussed challenges with paper-based systems; some countries are still using paper-based systems or are transitioning to electronic case-based systems.

Case study countries were asked directly what data or information are missing from their routine TB data systems; country respondents highlighted variables that are not recorded or reported, such as patient's socioeconomic status, comorbidities, patient costs and quality of care.

Table 4. Most frequent responses from global and case study respondents on challenges with and gaps in routine TB data systems, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global perspectives
Most frequent to less frequent responses: 1. Limited variables collected (e.g., socioeconomic status, comorbidities, patient costs, quality of care).	*Most frequent to less frequent responses:* 1. Fragmented data systems.

2. Fragmented data systems (e.g., TB data not integrated with other diseases, not linked with lab data).	2. Some countries are still using paper-based systems.
3. Aggregate, rather than case-based reporting.	3. Limited analytic skills of TB program staff at national and lower levels; also impacts data use.
4. Mode of collection: Some countries still using paper-based system or transitioning to electronic system.	4. Data timeliness (e.g., reporting timeline inadequate for decision making, no real-time data).
5. Data quality (e.g., duplicate data, lab and enrollment data don't match).	5. Data flow is only one way (e.g., data only flows bottom-up).
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 2: Usefulness of supplemental TB data tools

Overall feedback on the supplemental TB data tools was mostly positive. Although tools require additional resources such as time, effort and funding, they are worth the investment because findings provide countries with important information; however, results and recommendations are not always optimally used for TB program planning and decision making. Tables 5 and 6 summarize findings on usefulness of supplemental tools from the NTP survey and Table 7 summarizes the related findings from the country case studies and global perspectives.

Table 5 shows that many of the supplemental TB data tools were considered worth the investment by greater than or equal to 80 percent of countries that have implemented those tools. However, it is important to note that five of the tools were implemented by five or fewer countries. The five lesser-known tools are quality of TB services assessment, service delivery costing study, private sector drug sales analysis, screen-TB and MATCH. When responses were stratified by income level of the countries (based on World Bank Income Grouping), the overall number of tools implemented by upper-middle income countries were lower than that in low income and lower-middle income countries, therefore making it difficult to make tool-specific comparisons across country income levels (refer to Annex 6 for stratified responses). Overall, low-income countries reported that most tools were worth the investment.

Table 5. NTP survey countries' report whether the supplemental TB data tool was worth the investment, TB Data Optimization Project, January 2021 – August 2023

% of countries that reported the tool* was worth the investment	Supplemental TB Data Tool(s)
≥80%	DRS, CCA, PPA, PCS, DNA, QTSA[s], DNO, TBPS, EM, SDCS[s]
60-79%	PCF, epi review, PSRx[s], STB[s]
40-59%	OHT, IS
<40%	MATCH[s]

**The total (N) for each tool was different, it is based on how many countries implemented that tool.*
[s] Tools with small total (N≤5)

DRS=drug resistance survey, CCA=TB care cascade analysis, PPA=patient pathway analysis, PCS=patient cost survey, DNA=TB diagnostic network assessment, QTSA=quality of TB services assessment, DNO=diagnostic network optimization, TBPS=TB prevalence survey, PCF=people-centered framework, SDCS=TB service delivery costing study, PSRx=private sector drug sales analysis, STB=screen-TB , OHT=OneHealth Tool for TB budgeting, IS=inventory study, MATCH=mapping and analysis for tailored disease control and health system strengthening, EM = epi modelling

As seen in Table 6, all or almost all the supplemental TB data tools were reported as either very or somewhat important or helpful in all six areas by at least 80 percent of countries that have implemented those tools. The tools in bold indicate that at least 80% of countries that have implemented those tools reported that findings from those tools were very important or helpful, which are similar to the tools cited by respondents in the qualitative findings in Table 7.

Table 6. NTP survey countries' report areas where findings from supplemental TB data tools were important or helpful, TB Data Optimization Project, January 2021 – August 2023

Areas	Tools* where ≥80% of countries said findings were very or somewhat important/helpful
Helpful for understanding gaps in the TB care cascade	**TBPS, DRS, PCS, PCF, CCA, DNO, DNA, epi review, QTSA**[s], IS, PSRx[s], SDCS[s], OHT, PPA, EM, STB (All tools except MATCH[s])
Helpful for routine programmatic planning and forecasting	**TBPS, DRS, CCA, DNO, DNA, epi review**, IS, PSRx[s], SDCS[s], OHT, PCS, PCF, MATCH[s], PPA, QTSA[s], EM, STB[s] (All tools)

Helpful for monitoring progress towards TB targets	**CCA, DNO**, TBPS, DRS, IS, PXRx[s], SDCS[s], PCS, OHT, PCF, MATCH[s], PPA, DNA, epi review, QTSA[s], EM, STB[s] (All tools)
Helpful for developing the TB National Strategic Plan	**TBPS, DRS, PCF, CCA, PPA, DNO, DNA, epi review**, PSRx[s], PCS, SDCS[s], OHT, MATCH[s], QTSA[s], EM, STB[s] (All tools except IS)
Helpful for developing funding applications	**TBPS, DRS, PCS, CCA, DNO**, PSRx[s], SDCS[s], OHT, PCF, MATCH[s], DNA, epi review, QTSA[s], EM, STB[s] (All tools except IS)
Helpful for impacting country's guidelines and/or policies	**TBPS, DRS, CCA, DNO, DNA, QTSA**[s], PSRx[s], PCS, SDCS[s], PCF, MATCH[s], PPA, epi review, EM, STB[s] (All tools except IS and OHT)

***Bold** = tools where ≥ 80% of countries said findings were VERY important/helpful*
[s] Tools with small total (N≤5)

DRS=drug resistance survey, CCA=TB care cascade analysis, PPA=patient pathway analysis, PCS=patient cost survey, DNA=TB diagnostic network assessment, QTSA=quality of TB services assessment, DNO=diagnostic network optimization, TBPS=TB prevalence survey, PCF=people-centered framework, SDCS=TB service delivery costing study, PSRx=private sector drug sales analysis, STB=screen-TB , OHT=OneHealth Tool for TB budgeting, IS=inventory study, MATCH=mapping and analysis for tailored disease control and health system strengthening, EM = epi modelling

Many supplemental TB data tools were perceived to be useful or worth the investment by countries and global TB experts, however conditions were mentioned such as whether a country needs to implement a particular tool and availability of data for tools that require existing data (Table 7). The tools that were cited most often as being particularly useful or worth the investment were usually those that were well-known amongst participants, for example, the TB prevalence survey, TB patient cost survey and patient pathway analysis. On the other hand, it was difficult to summarize which tools were less useful, since some tools were less known and used amongst country and global respondents, thus they could not comment on those tools.

Country respondents often mentioned that all or almost all the tools they implemented were included in or used to develop their TB NSP, as illustrated below:

> *"The NTP uses most results of all the tools in the strategic plan. Prevalence survey, drug resistance survey, diagnostic network optimization, patient pathway analysis, people-centred framework, epidemiological modelling, private sector drug sales analysis…they use all the information."* – Country Key Informant

Table 7. Most frequent responses from global and case study respondents on the usefulness and impact of supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. Tools were used to help estimate the TB burden in the country, better understand gaps in the TB care cascade, develop the NSP and write funding applications, but countries also relied extensively on their routine TB data. 2. Tools that were cited most often as being particularly useful: **TBPS, DRS, PCS and PPA**; however, these were also the most well-known amongst respondents. Other tools that were cited as particularly useful include: **DNO, DNA, IS, epi reviews and modelling**. 3. Evidence from desk reviews was somewhat less consistent; not all tools were used/cited in NSPs, Global fund applications and program reviews.	*Most frequent to less frequent responses:* 1. Every tool had respondents who believed it was worth the investment, other than Screen-TB. 2. The most well-known tools were believed by most to be worth the investment (with some caveats, e.g., data availability, country's needs): **TBPS, PCS, CCA, PPA, epi reviews**. Other tools mentioned by many/some respondents as worth the investment: **DRS, IS, PSRx, SDCS, PCF, DNO, modelling**. 3. There were mixed sentiments on whether recommendations resulting from tools are optimally implemented; issues include findings not being actionable or difficult to address, lack of funding to implement recommendations and lack of follow-up.
Blue text indicates similar responses between country case studies and global perspectives.	

Desk reviews also showed that findings from most but not all supplemental tools that countries had implemented were reflected in their strategic planning documents; some supplemental tools were cited more than others, such as the TB prevalence survey, drug resistance survey, inventory study, patient pathway analysis, people-centered framework, epidemiological modelling and patient cost survey. However, some tools such as the TB diagnostic network assessment and quality of TB services assessment were newer and could not be completed prior to NSP development, while findings from other tools may have been used to inform NSP development but not cited.

Theme 3: Opportunities from planning and implementing supplemental TB data tools

Overall, collaboration among partners, receipt of technical and financial support from partners and capacity building were the most frequently reported opportunities that arose from implementing TB data tools. Table 8 summarizes findings related to this theme from the NTP survey and Table 9 summarizes findings from the country case studies and global perspectives.

When asked about the most significant opportunities that arose from planning and implementing supplemental TB data tools in the NTP survey, the majority of survey countries

reported technical support from partners, capacity building for NTP staff and financial support from partners as significant opportunities (Table 8). When responses were stratified by country income group, there were no apparent differences across income groups on questions related to financial and technical support from partners and capacity building (refer to Annex 7 for stratified responses).

Table 8. NTP survey countries' most significant opportunities from planning and implementing supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Most significant opportunities (multiple responses selected)	%(n) N=42
Technical support from partners	88.1 (37)
Capacity building for NTP staff	85.7 (36)
Financial support from partners	73.8 (31)
Government commitment	47.6 (20)
Working together with partners and funders	38.1 (16)
Tools provide research opportunities	33.3 (14)
Tools provide timely information during the strategic planning cycle	33.3 (14)
Tools provide structure and/or equipment for routine TB activities	19.0 (8)
Tools fuel advocacy for TB support and TB education	16.7 (7)

In line with the NTP survey findings, both country and global respondents frequently discussed collaboration amongst partners/opportunity to work with partners and capacity building as the most significant opportunities that result from implementing supplemental TB data tools (Table 9). An example of the benefits of capacity building is highlighted below by a key informant:

> *"If the country could benefit from capacity building during implementation, we don't have to depend on external experts to come...Diagnostic network optimization, epidemiological modelling and match analysis, those ones would be very important to build capacity so we can routinely implement these activities."* – Country Key Informant

In addition, countries also appreciated receiving technical and financial support from partners, and the findings from these tools provide additional information to inform TB program planning.

Table 9. Most frequent responses from global and case study respondents on the opportunities that result implementing supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. Opportunity to work with and receive technical and financial support from partners. 2. Capacity building for NTP, subnational level staff and local partners (e.g., learn research methods, able to implement future data tools). 3. Data tools provide additional information for program planning (e.g., evidence to inform policy and interventions).	*Most frequent to less frequent responses:* 1. Collaboration and coordination amongst partners (e.g., alignment between partners implementing different tools, MOH working with other sectors). 2. Capacity building for country staff (e.g., gain experience working with partners).
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 4: Challenges with planning and implementing supplemental TB data tools

Overall, inadequate human resource capacity (technical capacity and number of staff needed) and inadequate financial resources were the most frequently reported challenges by NTP survey respondents, case study countries and global TB experts. Table 10 summarizes findings from the NTP survey and Table 11 summarizes findings from the country case studies and global perspectives.

When asked about the most significant challenges with implementing data tools, the majority of survey countries reported insufficient financial resources/funding, insufficient staff/time and limited technical capacity as the most significant challenges with implementing supplemental TB data tools (Table 10). When responses were stratified by country income group, there were no apparent differences across income groups on questions related to insufficient financial resources/funding or limited technical capacity (refer to Annex 8 for stratified responses).

Table 10. NTP survey countries' most significant challenges with planning and implementing supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Most significant challenges (multiple responses selected)	%(n) N=42
Insufficient financial resources/funding	83.3 (35)

Insufficient staff/time	76.2 (32)
Limited technical capacity	66.7 (28)
Procurement challenges delay implementation	37.5 (15)
Data availability for tools that need existing data	14.3 (6)
Lack of coordination between partners	11.9 (5)
Delayed receipt of results hinders their use	2.4 (1)

In line with the NTP survey findings, both country and global respondents frequently discussed limited human resources in terms of staffing and competing priorities, insufficient financial resources/donor funding and limited technical and/or analytic capacity in the country as significant challenges with planning and implementing supplemental TB data tools (Table 11), as illustrated by a key informant below:

> *"The national TB control program has a limited number of technical people in their team…these activities are very technical and require somebody to take ownership and then follow up. Although [there are] consultants to conduct these activities, somebody with sufficient knowledge and technical expertise should be there to follow up with the consultants to make sure that recommendations are being implemented and incorporated in national and provincial strategic planning. So if there is more technical human resource available, I believe that it will be more helpful and they will be able to distribute the workload. In the last epi review or program review, I have seen that there are only one or two people who are coordinating and with the provinces, with the consultants, making sure timelines are being met."* – Country Key Informant

Additionally, global respondents highlighted that operationalizing the findings from supplemental tools was challenging, especially because external partners typically do not have the time or funding to follow-up with countries after tool implementation to ensure that findings are disseminated to the right people who are able to make programmatic and policy changes in the country. Similarly, when country respondents were discussing insufficient funding to implement supplemental TB data tools, they also discussed lack of funding to implement the recommendations resulting from these tools.

Table 11. Most frequent responses from global and case study respondents on the top challenges with planning and implementing supplemental TB data tools, TB Data Optimization project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses:	*Most frequent to less frequent responses:*
1. Limited human resources (e.g., insufficient staff, competing priorities).	1. Limited technical/analytic capacity in countries.
2. Insufficient financial resources (e.g., rely heavily on donor funding).	2. Limited human resources in countries (e.g., competing priorities).
3. Limited technical capacity (e.g., don't have the expertise, need technical assistance).	3. Insufficient financial resources for supplemental tools (e.g., large surveys are costly).
	4. Operationalizing the findings (e.g., dissemination to the right people to make programmatic and policy changes, consultants don't have the time/funding to follow-up after tool implementation).
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 5: Technical assistance for supplemental TB data tools

Overall, technical assistance received by countries for supplemental TB data tools is welcomed and typically sufficient. However, NTP survey respondents, case study countries and global respondents indicated challenges with availability of technical assistance for activities after tool implementation, such as completion of reports and uptake of recommendations resulting from the tool. Table 12 summarizes findings from the NTP survey and Table 13 summarizes findings from the country case studies and global perspectives.

Table 12 shows that a few of the NTP survey countries that have implemented these tools received inadequate technical assistance when support was needed. Tools for which all countries reported adequate technical assistance are not included in Table 12. Areas that were cited as needing more technical assistance varied by tool, but more technical assistance for tool implementation and analysis/synthesis of results were commonly cited across tools.

Table 12. NTP survey countries reporting *inadequate* technical assistance received for specific supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Supplemental TB data tools	% (number) reporting inadequate assistance received	Areas that needed more technical assistance
OneHealth Tool for TB Budgeting (N=20*)	25.0 (5)	Planning (2)[+], implementation (1), analysis/synthesis of results (1), reporting and dissemination (1), other = capacity building for NTP to use (1)
Screen-TB (N=5)	20.0 (1)	Implementation (1), analysis/synthesis of results (1), reporting and dissemination (1)
Epidemiological Modelling (N=24)	16.7 (4)	Implementation (2), analysis/synthesis of results (3), reporting and dissemination (2), implementation of recommendations (1), translation into policy (1), other = capacity building for use of local data (1)
TB Patient Cost Survey (N=21)	9.5 (2)	Planning (1), implementation (1), analysis/synthesis of results (2), reporting and dissemination (1), implementation of recommendations (2), translation into policy (2)
TB Care Cascade Analysis (N=21)	9.5 (2)	Planning (1), implementation (2), analysis/synthesis of results (1)
TB Drug Resistance Survey (N=34)	8.8 (3)	Implementation (1), translation into policy (1)
TB Epidemiological Review (N=39)	2.6 (1)	Implementation (1), analysis/synthesis of results (1), reporting and dissemination (1)

*The total (N) for each tool is the number of countries that reported they had implemented the tool prior to completion of the survey

[+]Indicates the number of countries that reported the area that needed more technical assistance.

Country and global respondents frequently mentioned that technical assistance is often needed and welcomed by countries for supplemental TB data tools (Table 13), as illustrated by a key informant below:

> *"We had appropriate technical assistance because without that, we would not be able to manage and conduct [supplemental tools]. So these tools which are conducted there are specific and relevant TA available, made available by the donors."* – Country Key Informant

In addition to external technical assistance, some of the case study countries were also able to draw expertise from within their country, as a key informant highlighted below:

> *"The other opportunity is the national program leverages that network that the WHO has to identify resources in persons, expertise, but also funding. WHO could fund the external expertise to come and support some of those areas. The other opportunity is in-house, having the universities and research institutes within [the country] that when we don't have internal capacity within the ministry, we can draw on the capacities of the universities or those institutes as consultants to support these than drawing on the external, which is more expensive."* – Country Key Informant

The overall perception is that countries in most cases receive adequate technical assistance for planning and implementation of the tool, but not always for data analysis and post implementation activities such as translation of findings into action and report writing.

Table 13. Most frequent responses from global and case study respondents on technical assistance for supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. Received adequate technical assistance to plan and implement supplemental TB data tools. 2. Technical assistance is almost always needed and welcomed to implement supplemental TB data tools. 3. Sometimes, reports aren't completed because consultants leave after completion of the tool.	*Most frequent to less frequent responses:* 1. Technical assistance and external consultants are almost always externally funded and provided support to countries for implementation of supplemental TB data tools, but not always for analysis and translation of findings into action.
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 6: Financial support for supplemental TB data tools

Overall, respondents agree that countries depend heavily on donor funding for supplemental TB data tools, which can prevent or delay implementation; inadequate funding was frequently reported as a significant challenge for planning and implementing supplemental TB data tools (see Table 10). In the NTP survey, countries were asked about financial support received for tools that they had previously implemented (Table 14), hence these responses apply to tools that countries managed to implement, even if they reported need for additional resources. Country and global respondents were asked to talk about need for funding from a more general perspective, and often mentioned challenges with adequate funding to implement recommendations resulting from the supplemental tools. Table 14 summarizes findings from the NTP survey and Table 15 summarizes findings from the country case studies and global perspectives.

A few (<25%) NTP survey countries reported inadequate financial support for each of the eight previously implemented tools shown in Table 14. Areas that required more financial assistance were similar across tools, including planning, implementation, analysis/synthesis of results, reporting and dissemination and implementation of recommendations. For all other tools, all countries reported receipt of adequate financial support and they are not included in Table 14. When responses were stratified by country income group, there were no apparent differences across income groups for questions related to inadequate financial support received (refer to Annex 9 for stratified responses).

Table 14. NTP survey countries reporting inadequate financial support received for specific supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Supplemental TB data tools	% (number) reporting inadequate funding received	Areas that needed more financial support
TB Care Cascade Analysis (N=21*)	23.8 (5)	Planning (2)+, implementation (4), analysis/synthesis of results (5), reporting and dissemination (4), implementation of recommendations (2)
Epidemiological Modelling (N=24)	16.7 (4)	Planning (1), implementation (4), analysis/synthesis of results (4), reporting and dissemination (4), implementation of recommendations (3)
TB Drug Resistance Survey (N=34)	11.8 (4)	Planning (2), implementation (3), analysis/synthesis of results (4), reporting and dissemination (4), implementation of recommendations (2)

TB Epidemiological Review (N=39)	10.3 (4)	Planning (2), implementation (4), analysis/synthesis of results (4), reporting and dissemination (4), implementation of recommendations (3)
OneHealth Tool for TB Budgeting (N=20)	10.0 (2)	Planning (2), implementation (2), analysis/synthesis of results (2), reporting and dissemination (2), implementation of recommendations (2)
People-Centred Framework (N=10)	10.0 (1)	Analysis/synthesis of results (1), reporting and dissemination (1), implementation of recommendations (1)
TB Patient Cost Survey (N=21)	9.5 (2)	Planning (2), implementation (2), analysis/synthesis of results (2), reporting and dissemination (2), implementation of recommendations (2)
TB Prevalence Survey (N=24)	8.3 (2)	Planning (1), implementation (2), analysis/synthesis of results (2), reporting and dissemination (1), implementation of recommendations (2)

*The total (N) for each tool is the number of countries that reported they had implemented the tool prior to completion of the survey

⁺Indicates the number of countries that reported the area that needed more financial support.

With key informants, questions were phrased in an open ended and general format rather than focusing on specific tools that a country had already implemented (and thus had sufficient money to implement). Country and global respondents mentioned that implementation of supplemental TB data tools is often delayed due to inadequate funding and that countries cannot implement all the tools they would like to use because of inadequate funding (Table 15). Supplemental tools and even substantial parts of a country's key routine TB program activities are almost always funded by donors, as countries have insufficient domestic funding. Examples of challenges with funding are illustrated below by key informants:

> "*Unfortunately, funding never seems to be adequate. Sometimes an exercise requires a lot of inputs, it's supposed to take place maybe for an entire year, so we have to do a lot of stretching of the donor.*" – Country Key Informant

> *"The biggest problem that we've had is funding, which is largely external. We've not had a lot of in-country commitments from the government…we tend to rely on external funding and have to deal with the changing landscape of funding and sometimes we are not able to get funds in time."* - Country Key Informant

Other than inadequate funding for tool implementation, country and global respondents also emphasized lack of funding to implement the recommendations resulting from supplemental tools.

Table 15. Most frequent responses from global and case study respondents on financial support for supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses:	*Most frequent to less frequent responses:*
1. Implementation of supplemental TB data tools is often delayed due to inadequate funding.	1. Implementation of supplemental TB data tools is often delayed due to inadequate funding.
2. Donors may not have adequate or earmarked funds for supplemental tools, so countries must make a deliberate effort to get funding for that.	2. Countries can't do all the supplemental TB data tools they want to do due to funding availability.
3. Lack of domestic funding; rely heavily on donor funding for data tools.	3. Data tools are almost always donor funded; lack domestic funding for them.
4. Lack of funding to implement recommendations resulting from supplemental TB data tools.	4. Recommendations resulting from supplemental TB data tools are not optimally implemented due to funding constraints, among other constraints.
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 7: Timing and coordination of supplemental TB data tools

This theme mostly emerged during country and global key informant interviews; the topics of timing and coordination of supplemental TB data tools were not directly addressed in the NTP survey. However, the lack of coordination between partners was reported by 11.9 percent of NTP survey countries as a significant challenge with planning and implementing supplemental tools (see Table 10).

Table 16 summarizes findings from the country case studies and global perspectives. Overall, there is agreement among case study country and global respondents that timing and coordination of supplemental TB data tools are challenging but critical. Country and global respondents emphasized the importance of tool implementation aligning with the country's needs, priorities and TB strategic planning cycle, as illustrated by key informants below:

> *"The unfortunate thing with funding, especially from international donors, is sometimes the funding doesn't align with the country's priorities. So maybe in this strategic period, this is what the donor's priorities are, but they do not match the NTP's priorities that year. But then at the end of the strategic period, it's clear that all these supplemental tools should*

have taken place. So you end up with multiple tools happening at the same time. Alignment is extremely important." – Country Key Informant

"Over time, the burden of [supplemental tools] is becoming reduced because we have more experience and we can streamline things…and my thought would be to really think about what the country context is, because you don't want things like epi reviews or drug resistance surveys to become a check the box thing. You want to make sure that they're timed correctly and tailored correctly so that they really meet country needs." – Global Key Informant

Although timing of implementation to align with the country's strategic planning cycle can be challenging, especially for supplemental tools that can take a long time to plan and implement (e.g., TB prevalence survey, TB drug resistance survey), it is ideal to have the results available before NSP development so that countries have the evidence to inform TB program planning. A key informant highlights the importance of determining a timeline for implementation of tools below:

"Work closely with the NTP to ensure that for this strategic year, which supplemental tools do we need to focus on as a country. Then next year, which supplemental tools do we need to prioritize. So in a five-year strategic plan, rather than leaving the timeline open, we determine what happens when…it would go a long way in ensuring that each tool happens at the right time." – Country Key Informant

Global participants believe that coordination among partners is especially important when tools are being implemented in the country at the same time. For example, partners should coordinate data requests from the NTP if the supplemental tools require the use of existing data. Country respondents believed coordination of partners with the NTP is especially important to ensure buy-in from the NTP, otherwise, it is less likely that recommendations resulting from the supplement tool will be implemented. When looking at planning for supplemental tools, it was observed in the desk review that some supplemental tools that were implemented in countries had not been previously planned for in their TB NSP for that period.

Table 16. Most frequent responses from global and case study respondents on timing and coordination of supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. Timing of tool implementation is challenging and should align with a country's strategic planning period/Global Fund application cycle; results should be available before the next round of strategic plan development begins so they can inform program planning.	*Most frequent to less frequent responses:* 1. Timing of tool implementation is challenging and often not aligned with a country's strategic planning cycle (e.g., tools often take a long time to plan, implement and analyze results).

2. Tool implementation should align with the country's TB program priorities; coordinate with the National TB Program to ensure buy-in.	2. When multiple tools are implemented, ensure good coordination across parties implementing the tools e.g., can coordinate analytics/data request from the National TB Program.
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 8: Who typically proposes or suggests implementation of supplemental TB data tools vs. who makes the final decision to implement supplemental TB data tools

There are mixed opinions from country and global respondents on who typically proposes or suggests implementation of supplemental TB data tools. The majority of country respondents believed that the NTP typically proposes or suggests implementing a supplemental TB data tool, while global respondents indicated that tool implementation proposals typically come from external partners. However, there is strong agreement among country and global respondents that the NTP ultimately makes the final decision, but there are other factors such as funding or discussions with internal and/or external TB partners to guide that decision. Table 17 summarizes findings from the NTP survey and Table 18 summarizes findings from the country case studies and global perspectives.

Most countries reported that the NTP/MOH initially suggests and makes the final decision to implement a supplemental TB data tool (Table 17). A few countries reported that international technical partners and in-country technical working groups provide suggestions but do not have the final say. Three out of 42 countries (7.1%) reported that funding partners have the final decision to implement a supplemental tool.

Table 17. NTP survey countries on who typically proposes/suggests implementation of supplemental TB data tools versus who makes the final decision, TB Data Optimization Project, January 2021 – August 2023

Person/Entity	Who suggests %(n) N=42	Who decides %(n) N=42
National TB Program/MOH	76.2 (32)	90.5 (38)
International technical partners (e.g., WHO, U.S. CDC, KNCV)	14.3 (6)	0 (0)
In-country technical working groups	7.1 (3)	0 (0)
Funding partners (e.g., Global Fund, USAID, BMGF)	2.4 (1)	7.1 (3)
In-country partners (e.g., NGOs, academia)	0 (0)	0 (0)

Prefer not to answer	0 (0)	2.4 (1)

There were somewhat mixed opinions from country and global respondents. The majority of country respondents mentioned that the NTP typically proposes to implement a supplemental TB data tool since it will provide information that the TB program needs for program planning, but many country respondents also acknowledged that the initial idea is often proposed by external partners or are recommended to the NTP by the TB technical working group in the country (Table 18), illustrated by key informants below:

> *"[Supplemental tools] have a number of partners, it's not an activity that is decided by one partner. Typically, the national TB program must put a request and [second], there must be funding."* – Country Key Informant

> *"Right now, the national TB control program is responsible to decide which supplemental tool is needed. And ultimately the national TB control program decides about the [implementation of] supplemental tools."* – Country Key Informant

Global respondents agree that supplemental tools are typically proposed or recommended by external technical partners such as WHO or USAID, or they are a requirement by funders such as The Global Fund for the country to have evidence to inform funding applications (Table 18), as illustrated by a key informant below:

> *"I do feel like in a lot of countries it was hard for NTP to say no. At the end of the day they make the decision, but I think they often felt pressure to agree to do certain types of data collection activities. But I do think slowly over time, they're getting more comfortable with questioning when does this really need to be done? How is it going to benefit me? How much of my staff time are you going to expect from me?"* – Global Key Informant

Country and global respondents strongly agree that ultimately, the NTP/MOH has the final decision to implement a supplemental TB data tool but that it also depends on whether funding for the supplemental tool is available. Many country respondents added that the decision is often discussed first with in-country partners or the country's TB technical working group, or they were advised by external technical partners. A few respondents in some countries mentioned that the approval process to implement a supplemental tool can be challenging, as it depends on whether it is prioritized and understood by leadership. Global respondents expressed hope that NTPs have become more engaged over time as they have seen other countries implement and use findings from supplemental tools.

Table 18. Most frequent responses from global and case study respondents on who typically proposes/suggests implementation of supplemental TB data tools versus who makes the final decision, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: *Who typically proposes/suggests* 1. The National TB Program typically proposes to implement a supplemental tool based on need for information. 2. External technical partners (e.g., WHO, KNCV, USAID, U.S. CDC) have an idea and propose it to the National TB Program. 3. The TB technical working group in the country usually gives advice and recommendations to implement a supplemental tool. *Who makes the final decision* 1. National TB Program/Ministry of Health leadership makes the decision/gives approval to implement a tool, but it is usually discussed first with in-country partners or technical working group; the approval process in some countries is challenging. 2. Advised by external or internal TB partners (e.g., WHO, U.S. CDC, USAID, KNCV, technical working group). 3. Implementation depends on whether donors support the idea and provide funding.	*Most frequent to less frequent responses:* *Who typically proposes/suggests* 1. It is usually a recommendation from technical partners (e.g., WHO, USAID) or a requirement from funders (e.g., Global Fund, BMGF) which often leads countries to implement supplemental tools. *Who makes the final decision* 1. Initial push comes from external partners but the ultimate decision rests with the National TB Program. 2. The National TB Program should be making the decision, but this is not always the case; NTPs have become more engaged over time as they have seen tools being implemented in other countries, so there is more internal motivation now.
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 9: Motivating factors to implement supplemental TB data tools

Table 19 summarizes findings from the NTP survey and Table 20 summarizes findings from the country case studies and global perspectives. Overall, the country's need for data or information, external push from technical or funding partners and the availability of funding to implement the supplemental TB data tool were the most frequently reported motivating factors for implementing supplemental tools.

Fifty percent of survey countries reported that the strongest motivating factor for implementing supplemental TB data tools is the need for more data or evidence, while one-third of countries

reported that it is so the country can measure their TB program's progress towards global TB strategies (Table 19).

Table 19. NTP survey countries on the strongest motivating factors for implementing supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Strongest motivating factor for implementing supplemental TB data tools	%(n) N=41*
Need for more data or evidence	50.0 (21)
Measure progress towards global TB strategies	33.3 (14)
Availability of funding	11.9 (5)
Request by donor	2.4 (1)
Other	2.4 (1)
Recommended by external partners	0 (0)

*One "other" response was excluded, as the response entered was unclear

Both country and global respondents discussed the country's internal motivation/data needs for TB strategic planning and decision making, external push from technical and/or funding partners and availability of funding for tool implementation as strong motivating factors for implementing supplemental TB data tools (Table 20). A key informant highlighted the importance of having information for decision making below:

> *"The most motivating factor at the program level has been to strengthen our evidence base. We want to ensure that we have as much information as possible so that we can enhance our position for decision making. We understand and sometimes have suffered where inaccurate policies can prove to be costly, not just financially, but also in time."* – Country Key Informant

Country respondents also mentioned factors such as the will to implement supplemental tools depends on the NTP or leadership's focus or interests and the ability for the NTP to evaluate their program's progress towards global TB strategies such as the END TB Strategy.

Table 20. Most frequent responses from global and case study respondents on motivating factors for implementing supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. The country's desire for more information for planning, decision making, policy making, designing interventions, or understanding the TB situation.	*Most frequent to less frequent responses:* 1. External push from technical and/or funding partners.

2. External push/ recommendation from technical partners or requirement for funding application. 3. National TB Program or leadership's focus or interest. 4. Ability to evaluate progress towards global TB strategies (e.g., END TB). 5. Availability of funding to implement the tool; dependent on donor support for supplemental tools.	2. Funding to implement the tool. 3. Internal motivation at National TB Program (e.g., data needs for upcoming NSP development); if a country has strong NTP leadership and pushes for program needs.
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 10: Strengthening routine TB data systems vs. implementing supplemental TB data tools

Table 21 summarizes findings from the NTP survey and Table 22 summarizes findings from the country case studies and global perspectives. Overall, country and global respondents believed it is ideal to prioritize investing in strengthening routine data systems, but some supplemental TB data tools will still be needed.

Forty and one half percent of survey countries reported they would allocate between 51% and 75% of funding towards strengthening routine data systems, with the rest going towards supplemental TB data tools (Table 21). When responses were stratified by country income group, more than 50 percent of low income and lower-middle income countries would allocate more funding towards routine data systems strengthening, while most upper-middle income countries would allocate funding more evenly between strengthening routine data systems and investing in supplemental tools (refer to Annex 10 for stratified responses).

Table 21. NTP survey countries on the ideal allocation of funding for strengthening routine TB data systems vs for supplemental TB data tools, TB Data Optimization Project, January 2021 – August 2023

If you received a large grant for TB-related 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 tools?	%(n) N=42
76-100%	21.4 (9)
51-75%	40.5 (17)
26-50%	28.6 (12)
0-25%	9.5 (4)

Country and global respondents generally agree that it would be ideal to invest in strengthening routine TB data systems, because having more robust and sustainable data systems eliminate the need for some supplemental TB data tools. However, some country and global respondents emphasized that it is still important for donors and governments to invest in both routine systems and supplemental TB data tools now as they are needed to provide important information for TB program planning in countries (Table 22). The importance of strengthening routine data systems is illustrated by key informants below:

> *"I think supplemental tools are important, but there are lots of recommendations in these tools that if we don't strengthen the routine systems, we will not move…if we don't strengthen information or social behavior change activities in the communities, we will do another prevalence survey and find the same information."* – Country Key Informant

> *"The priority now is to have a good surveillance system which also facilitates analysis and interpretation of the data. It means a surveillance system with an automated fiscal dashboard that will allow people with minimal capacity of doing analysis to be able to use the results."* – Global Key Informant

Some country respondents also emphasized several factors that go hand in hand with strengthening routine data systems, including ensuring that systems are integrated and easy for TB program staff at all levels to use.

Table 22. Most frequent responses from global and case study respondents on strengthening routine TB data systems, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses:	*Most frequent to less frequent responses:*
1. Ideal to strengthen routine systems because they are more sustainable than supplemental data tools; more robust systems mean certain data tools will no longer be needed.	1. Ideal to strengthen routine data systems, as it eliminates the need for some data tools; strengthened systems allow for better or more analyses.
2. Need to ensure systems are integrated and user-friendly, not just strengthened.	2. Invest in routine data systems to have high quality data for the long run, but in the meantime, data tools are still needed for decision making.
3. Important to find a balance; some data tools will be needed even if routine systems are strengthened.	
4. Donors and the government should invest in both strengthening routine systems and in implementing critical data tools.	
Blue text indicates similar responses between country case studies and global perspectives.	

Theme 11: Information still missing from routine data and supplemental TB data tools and/or needed for TB program planning

Table 23 summarizes findings from the NTP survey and Table 24 summarizes findings from the country case studies and global perspectives. Overall, there was not much consensus over what information is still missing or needed for TB program planning, as it depends on each country's needs. Some country case study and NTP survey respondents reported the need for subnational level estimates. Many global respondents believed that there are already too many supplemental TB data tools and that there is no need for any new tools.

Table 23 shows the most frequent open responses from survey respondents on what information they think is still needed for TB program planning in their country. Other responses included stigma measurement, quality of care, impact and outcome information, implementation effectiveness, true number of missed/undiagnosed cases, close contact follow-up, geospatial mapping, social determinants, patient comorbidities, health seeking behavior and patients lost to follow-up. Not all survey countries provided a response. Some of the issues identified could be addressed by strengthening routine data systems in that country (e.g., case-based data, private sector data) and/or measured through implementation of existing supplemental tools that a country has not implemented yet (e.g., true TB burden). Others may

be best addressed through operations research or economic evaluations (e.g., cost-benefit/effectiveness analysis, hotspot mapping).

Table 23. NTP survey countries on important information that is still needed for TB program planning and decision making, TB Data Optimization Project, January 2021 – August 2023

Open responses*	n= 39 (multiple responses possible)
Prefer not to answer	6
Subnational level estimates	4
Private sector data	3
Presumptive TB	3
True TB burden	2
Nothing	2
Case-based data	2
Hotspot mapping	2
Cost-benefit/effectiveness analysis	2
*Other responses were mentioned only by one country.	

Similar to responses given by survey respondents, country case study respondents discussed the need for subnational level estimates and private sector data (Table 24). In the interviews, country case study respondents have repeatedly expressed the desire for subnational level data due to varying populations and socio-cultural aspects of different regions in the country, as highlighted by a key informant below:

> *"Certain regions are struggling to reach their targets, other regions are overshooting. The estimates are national estimates…have the appropriate study size that can give subnational estimates. It depends on funding but the need is already there."* – Country Key Informant

Global respondents felt that there are already too many tools and it is more important to use existing data for decision making and to provide guidance or training to countries to use that data rather than implementing more tools (Table 24), as illustrated by a key informant below:

> *"We already have too many tools…it's more about how to make those informed decisions and selecting the [tools] which will help that specific context, the country, rather than another set of data."* – Global Key Informant

Table 24. Most frequent responses from global and case study respondents on information still needed for TB program planning and decision making, TB Data Optimization Project, January 2021 – August 2023

Country Case Studies	Global Perspectives
Most frequent to less frequent responses: 1. Subnational level estimates. 2. TB-related mortality. 3. Patient socioeconomic status, comorbidities (e.g., case-based data) 4. Access to private sector data/private sector reporting.	*Most frequent to less frequent responses:* 1. No need for new tools; more important to optimally use existing data for decision making and provide guidance/training to countries to do so. 2. Quality improvement/quality of care*. 3. Stigma assessment*.

*Though this was mentioned by respondents, tools to measure this exist.

Findings by tool

Overall, feedback on most of the supplemental TB data tools was positive regarding the tools' impact and usefulness. Only a few of the supplemental tools had mixed findings and none of the supplemental tools had predominantly negative findings. Table 25 presents the summarized triangulated findings of each supplemental tool from the country case studies, NTP survey and global perspectives. A table with more detailed findings of each supplemental tool can be found in Annex 11.

Table 25. Summarized findings of each supplemental TB data tool triangulated from all data sources, TB Data Optimization Project, January 2021 – August 2023

Supplemental TB data tool	Familiarity with the tool	Summarized findings
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	There is strong agreement among respondents that the TBPS is critical and worth the investment even though it is costly and requires a lot of effort. Respondents from several case study countries mentioned the need for a repeat TBPS as earlier data are outdated.

	planning/implementing and/or have seen/heard of the results.	
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 with planning/implementing and/or have seen/heard of the results.	There is strong agreement among respondents that the DRS is worth the investment. This tool will move to routine in the long run (if 80% testing coverage of new TB cases can be achieved). Several case study countries mentioned the need for a repeat DRS as earlier data are outdated.
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.	Overall, respondents indicated that epi-reviews are worth the investment, as it helps to understand gaps in routine surveillance. It also provides epidemiological background for NSP writing. The opinion on the level of effort to implement epi reviews differs amongst respondents. An advantage is that it can be done at subnational level and is useful there and is relatively low cost.
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.	There is general agreement among respondents that the DNO is useful and worth the investment. It is especially useful for resource allocation, but capacity building in country is needed so that 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.	There is overall agreement amongst respondents that the PCS is worth the investment and is a great tool for advocacy and multi-sectoral engagement. However, there is mixed sentiment on whether findings from the PCS consistently result in needed policy or programmatic change.
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 and/or have seen/heard of the results.	While the IS can be helpful to understand gaps in the TB care cascade, there is mixed sentiment amongst respondents on whether the study is worth the investment. Respondents generally agree that an IS does not need to be implemented in all countries.
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.	The PSRx was less well-known amongst respondents and therefore had very few responses.
TB Service Delivery Costing Study (SDCS)	NTP survey: 5/42 countries have implemented a SDCS.	The SDCS is less well-known among respondents, but there is agreement that having cost data

	Country case studies: 2/5 countries have implemented a SDCS. Global respondents: 7/24 respondents were involved with planning/implementing and/or have seen/heard of the results.	could be useful for countries to cost their TB NSP.
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.	In general, respondents did not have much to comment about the OHT, but there is agreement that it goes together with NSP development. Of note: The WHO is currently developing a new tool called the integrated health tool (IHT) to replace the OHT.
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.	There is general agreement among respondents 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 with the PCF from both countries and global partners since the process is still evolving/improving. Countries and global respondents agree that it can be repeated during the NSP development period; countries want to repeat it if there is funding.
TB Care Cascade Analysis (CCA)	NTP survey: 21/42 countries have implemented a CCA.	There is general agreement among respondents that the CCA is worth the investment.

	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.	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.
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.	MATCH is less well-known among respondents and there were mixed responses on whether it is worth the investment. Both country and global respondents that it is/potentially is useful, but the MATCH approach is difficult to understand.
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.	85.7 percent of NTP survey countries who have implemented the PPA believed it was very important/useful for NSP development but not as many believed the same for understanding gaps in the TB care cascade or routine program planning. Though case study country and global respondents more frequently discussed its usefulness for understanding and addressing gaps in the care

		cascade and informing program needs and interventions.
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 DNA is less well-known than the DNO among respondents. Responses were similar to those for the DNO. DNAs were done more recently and often did not make it into countries' 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 the DNA as there are more generic "Diagnostic Network Assessments" that differ from the USAID-developed TB DNA tool. However, survey responses were limited to countries that had implemented the USAID TB DNA.
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.	The QTSA is newer and less well-known among respondents. Case study country respondents mentioned it is useful for NSP development, but less than half of NTP survey respondents believe it is very important/helpful for NSP development, though 60% believe it is somewhat important/helpful for NSP development. In the desk reviews, there was little to no evidence of the QTSA being used in the NSP (maybe because it was completed after NSP writing).
Epidemiological Modelling	NTP survey: 24/42 countries have implemented modelling.	There is general agreement among respondents that modelling is worth the

	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.	investment but needs technical assistance and capacity building in country so that countries can participate and understand what goes into the models. It is generally helpful for target setting and intervention prioritization, but needs quality data for input and enough understanding on what the model provides/outcomes mean.
Screen-TB (STB)	NTP survey: 5/42 countries have implemented STB. 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.	STB is less well-known among respondents and there isn't strong agreement that it is worth the investment. STB has not been used much by countries. Global respondents mentioned that it may be too easy to use and therefore may not give accurate results.

Findings by case study country

Individual country case study reports for Ethiopia, Kenya, Pakistan, Uganda and Vietnam can be found in Annexes 12 to 16.

Opportunities for streamlining

Findings from mapping objectives, indicators and metrics of the supplemental TB data tools showed limited overlap between the supplemental tools. One tool cannot simply replace another tool, but there are some opportunities for making implementation more efficient. Some ideas are to consider implementing tools with similar sampling strategies at the same time, consider implementing complementary tools in a collaborative manner to minimize data requests and maximize information gained and consider logical sequencing of tool implementation (e.g., implement those that generate primary data first, so they can feed into secondary data analysis tools). Examples of tools that can complement each other are shown in Table 26.

Table 26. Examples of opportunities to streamline tools or implement in complementary manner, TB Data Optimization Project, January 2021 – August 2023

Tool #1	Tool #2	Opportunities for streamlining/implementing in complementary manner	Feasibility/Considerations
Quality of TB Services Assessment (QTSA)	Patient Cost Survey (PCS)	Both surveys interview patients at a representative sample of health facilities. Staff are also interviewed for QTSA. Could implement surveys at the same time to use same logistic support (data collectors, travel costs, patients sampled etc.) If not feasible to implement both surveys in their entirety, could consider abridged versions of both, implemented as one survey.	Implementation will be more complex if administering 2 surveys. Need to ensure length of patient interviews do not become burdensome. Patients sampled for cost surveys include both those on intensive and continuation phase; this distinction not made for QTSA.
Drug Resistance Survey (DRS)	Patient Cost Survey (PCS)	The DRS is a national, health facility-based survey targeting TB patients. Could add questions on costs for health care seeking up to diagnosis.	Patients are sampled for DRS at time of diagnosis; hence would only be able to describe costs during the time period from care seeking to diagnosis.
TB Prevalence Survey (TBPS)	Patient Cost Survey (PCS)	The TBPS is a national, community-based survey targeting the general population. Could add questions on costs for health care seeking for those with TB suggestive symptoms.	This will provide a different perspective on costs of TB diagnosis than a PCS. Will provide insight into costs and barriers of seeking care for symptoms from people in the community – rather than those that have successfully completed the process and received a diagnosis. TBPS questionnaire is already very long.
TB Diagnostic Network	TB Diagnostic Network	Several global and country key informants suggested	The DNA and DNO often have somewhat different

Assessment (DNA)	Optimization (DNO) MATCH approach	combining DNA and DNO. These are complementary tools; output from a DNA can feed into a DNO. Since both tools and MATCH have a geospatial mapping component, potential overlap in inputs should be considered to maximize efficiencies of data collection/minimize data requests.	aims for their mapping exercises and the intended scopes of each should be assessed to ensure that they are complementary and not duplicative.
Patient Pathway Analysis (PPA)	MATCH approach	MATCH applies mapping and spatial analysis techniques to existing health data to then target interventions. Core to this approach is the integration of multiple sources of sub-nationally disaggregated data to identify people with TB who have been missing along the TB patient pathway. As the PPA also uses exiting data to assess potential gaps in the TB patient pathway, these tools could be integrated to provide a fuller picture of the gaps.	Implementers would need to have required expertise for both analyses.

Key Messages and Best Practices

After findings were triangulated from all data sources and presented by theme, the findings were further distilled into eight key take home messages. The findings and key messages were also shared with steering committee members for additional perspectives on whether key points were adequately summarized and were revised slightly based on their feedback.

Key take home messages

The following key findings emerged from the combined analyses of all data sources. These combined findings are the same as those presented in the executive summary:

1. Strengthening routine, preferably case-based, data systems is fundamental for attaining robust, sustainable TB program data.

- Strengthening routine data systems will allow for more and better analyses.
- Need to ensure routine data systems are integrated and user-friendly.
- With stronger routine data systems, some supplemental tools will become redundant; however, some tools will still be needed as they answer questions that cannot be assessed with routine data systems.

2. Supplemental TB data tools are critical to fill gaps in routine TB data and require substantial resources (time, funding) .
    - Findings from data tools are worth the investment because tools provide important information; however, results and recommendations from the tools are often not used optimally for TB program planning and decision making - and this limits the impact of the tool.
    - Though data tools are generally worth the investment, it is not possible to implement all tools, and thus countries could prioritize. Partners could align their interests with the country's prioritization, rather than advocating for tools that the partner prioritizes.
3. Supplemental TB data tools have limited overlap; one tool cannot replace another tool, though tools can be implemented in a complementary manner.
    - Consider implementing data tools with similar sampling strategies at the same time.
    - Consider implementing complementary data tools in a collaborative manner to minimize data requests and maximize information gained.
    - Consider logical sequencing of tool implementation (e.g., implement those that generate primary data first, so they can feed into secondary data analysis tools).
4. Countries need more subnational level data for better target setting and program planning.
    - Country case study respondents explained how regions in their countries have struggled to meet targets or have overshot targets when national estimates are used for target setting.
    - Countries repeatedly expressed desire for subnational level data because of varying populations and socio-cultural differences.
5. Lack of resources and feasibility constraints have limited implementation of recommendations resulting from supplemental TB data tools.
    - Funding is often inadequate to implement the recommendations from data tools; in addition, some recommendations are not feasible for a country to implement.
    - Technical assistance is typically provided for planning, fieldwork/data collection and analysis of data, but often not for post-implementation activities like translation of findings into action.
6. Additional capacity building is needed in countries to implement supplemental TB data tools, including planning, implementation, analysis, data interpretation, dissemination and translation of findings into action.
    - Global and country respondents reported limited technical capacity in countries to plan and implement data tools. However, capacity building was perceived by all respondent groups as an opportunity (e.g., learning research methods and how to conduct field work) and may empower countries to implement future supplemental tools more independently.

7. Funding for supplemental TB data tools is largely from donors; they may not always be funded at the right time due to funding availability and/or interest.
    - There is generally a lack of domestic funding for TB-related activities, data tools are almost always funded by donors.
    - In addition to insufficient human resources, insufficient financial resources/funding was frequently cited as a significant challenge for countries with planning and implementing data tools; countries cannot always find adequate funding for data tools when they need to be implemented. However, when countries did manage to implement a tool, they reported that sufficient funding was provided in most cases.
8. Improved coordination and better aligned timing of different supplemental TB data tools are necessary to optimize use of their findings for National Strategic Plan development, funding applications and program planning.
    - Timing and coordination is challenging but critical.
    - It is important that tool implementation aligns with the country's needs, priorities and TB strategic planning cycle; it is ideal to have findings available to inform NSP development.
    - Coordination among partners is especially important when data tools are being implemented in the country at the same time.

Best practices

Best practices were developed based on the overall findings to guide future planning and implementation of supplemental TB data tools. Best practices are either based on project findings and discussions or taken directly from global and/or country key informants. Draft best practices were shared with steering committee members and their feedback were incorporated. Best practices are grouped into the following areas:

- General best practices
- Optimizing the usefulness of findings and recommendations resulting from supplemental TB data tools
- Timing and coordination of supplemental TB data tools' implementation
- Capacity building in countries for planning, implementation, analysis and interpretation of data/findings
- Funding of supplemental TB data tools
- Implementing supplemental TB data tools at subnational level
- Tool-specific best practices

General best practices

1. Before considering which data tools to prioritize, it is important to review existing data, including routine programmatic data and previously implemented data tools and research. Existing data should be mapped and key data and evidence gaps identified.
2. Not all data tools need to be implemented in all countries; it is important to carefully prioritize activities based on existing data gaps and country priorities.

3. It is important that the NTP is invested in any tool to be implemented and fully understands the type of findings and recommendations that it generates.
4. Some data tools can be more routinely adopted while others may remain periodic.
5. As TB programs and routine data systems are strengthened, some data tools may no longer be needed. Countries that transition from an aggregate paper-based to an electronic case-based surveillance system may be able to collect and analyze data that answers critical questions, which may make certain tools redundant.
6. Consider whether it's feasible to add aspects from one tool onto another tool to decrease the total number of tools to be implemented. However, the feasibility of implementing a combined tool must be thoroughly considered before doing so.
7. If no data tool exists that directly addresses a priority question or data gap, consider whether integrating additional questions into an existing tool, or additional variables into routine program data, is possible. Alternatively, development of a research study to address the specific gap could be considered.
8. Designs that can be implemented with minimal technical assistance and financial support should be taken into consideration when developing new data tools, so that countries are less dependent on partners to implement them.

Optimizing the usefulness of findings and recommendations resulting from supplemental TB data tools

1. When contemplating whether to implement a data tool, assess whether prior recommendations from that tool and related tools have been implemented. If prior recommendations have not been implemented, repetition of the tool will likely generate the same recommendations rather than new ones.
2. In addition to resources needed to implement a data tool, it is important to consider the resources that will be needed to implement recommendations derived from the tool.
3. Involve technical working groups in the development of recommendations and action plans.
4. It is important that recommendations resulting from the tools are SMART: specific, measurable, actionable/achievable (feasible), relevant and time bound.
5. Assign a responsible party/parties to implement recommendations.
6. It is important to disseminate findings and recommendations to all relevant internal and external partners, with requests for support to implement recommendations.
7. Recommendations from the data tools should inform National Strategic Plans as well as funding applications.
8. It is important to translate relevant findings into digestible key messages for civil society and the public. Consider requesting funding and technical assistance to interpret and disseminate results with engagement from civil society for advocacy, program implementation and National Strategic Plans.

Timing and coordination of supplemental TB data tools' implementation

1. It is important that partners coordinate with each other and the NTP to ensure they support activities that are a priority for the NTP and that implementation of multiple data tools does not place undue burden on the NTP.

2. Buy-in from the NTP for data tools is critical; without it, the resulting recommendations are less likely to be implemented.
3. It is important to identify a logical sequence and timeline in which to implement data tools, so that findings are available for the next National Strategic Plan and results from primary data collection tools can feed into data tools that use secondary data analyses.
4. It is helpful to outline the sequence and timing of desired data tools in National Strategic Plans as well as funding applications to ensure a logical, integrated approach.
5. When multiple partners implement data tools or request data in a country, it is important that they coordinate efforts to reduce the overall burden, avoid duplication of efforts and promote cost sharing.

Capacity building in countries for planning, implementation, analysis and interpretation of data/findings

1. It is important to include staff from national and subnational levels, as well as partners, in planning and implementation.
2. It is important to ensure that planned technical support for activities continues through analysis, dissemination, report writing and implementation of recommendations.
3. When feasible, technical assistance to implement data tools should include building capacity of local staff to implement the tool, analyze the data and translate findings into action.
4. Consider south-to-south collaborations with technical support provided by trained/experienced persons from neighboring countries.

Funding of supplemental TB data tools

1. Incorporate data activities into National Strategic Plans and:
    a. Advocate for domestic funding.
    b. Include in funding applications to minimize the need for ad hoc funding.
2. It is important that partners align their funding with the country's needs and priorities, rather than being driven by donors' preferences.

Implementing supplemental TB data tools at subnational level

1. Several data tools could be suitable to implement at subnational levels (or to estimate subnational indicators) to better understand issues at subnational levels. These include: epidemiological reviews, care cascade analysis, modelling and MATCH.
2. It is typically cost-prohibitive to generate subnational estimates in a methodologically sound way for some activities such as TB prevalence surveys and drug resistance surveys, although a very limited number of strata might be feasible, especially for drug resistance surveys.

Tool-specific best practices

Best practices were developed for each supplemental TB data tool based on the triangulated tool-based findings to guide countries and tool developers/implementers on future planning and

implementation of supplemental TB data tools (Table 27). Best practices are either based on project findings and discussions or taken directly from global and/or country key informants.

TB prevalence survey

Best practices for countries:

1. A prevalence survey is a huge endeavor. When applying for funding, it is important to budget for additional staff to coordinate and implement the survey to reduce burden on NTP, lab and subnational level TB staff.
2. Questionnaires can be adapted to meet a country's need.
3. It is important to ensure that any additional data collected will be utilized.
4. Adequate training for people administering the survey in the field is critical.
5. While subnational estimates are often desired, they are typically not feasible due to the huge increase in sample size and resources that would be required.
6. TB Prevalence Surveys are critical to understanding TB burden in a country, but justification for a repeat survey is less clear, especially if routine surveillance is robust.
7. Consider optimal timing of the survey (e.g., to avoid rainy season or election period) as well as the benefit of having results in time for NSP development and funding applications

Best practices for tool developers/implementers/funders:

1. It is important that the provided technical support builds capacity in country to implement the survey as well as analyze, interpret and fully utilize the data.
2. It is important to work with country to understand the country situation/context/structure and optimize field logistics.
3. It is important to work with the country to optimize timing of the survey; two considerations for this are the best timing for field work/data collection and having results in time to inform NSP development.

Drug resistance survey

Best practices for countries:

1. Drug resistance survey (DRS) logistics are quite complex and implementation takes many months. Consider laboratory and human resource needs, as well as the impact of weather conditions and time of year on specimen collection and transport.
2. Consider inclusion of private facilities, depending on size of private sector in your country.

Best practices for tool developers/implementers/funders:

1. Several countries are overdue for another DRS but not able to get funding. Some of these countries have tried using routine GeneXpert data instead of a survey, but it is challenging. Countries need more active support to operationalize use of routine data to understand the burden of drug-resistant TB (DR-TB).

   a. Consider prioritizing funding for countries based on the country's ability to uptake new information (e.g., availability of infrastructure to conduct survey, such as existence of a sample referral network; ability to implement recommendations from the survey).
   b. Active support and guidance for countries to move from DRS to routine/sentinel surveillance systems is needed.
2. Consider survey methodology to capture subnational level estimates or provide guidance on feasibility thereof.

Epidemiological reviews, including standards and benchmarks

Best practices for countries:

1. Repeat epidemiologic (epi) reviews are most useful when recommendations from the prior review have been implemented.
2. Many aspects of an epi review can be implemented at subnational level; subnational staff could do this on an annual basis to analyze/review their surveillance data.

Best practices for tool developers/implementers/funders:

1. Repeating Standards and Benchmarks from the epi review is most useful when the country has made progress and has implemented recommendations from the previous assessment.
2. Consider providing specific recommendations (e.g., training, digitizing certain aspects, automating data quality checks, etc.); NTPs are typically already aware they have data gaps and quality issues.
3. Consider presenting more subnational level data, as this helps countries target activities, interventions and support to areas where most needed.
4. It is important to engage and train in-country staff, including those working at the subnational level, prior to conducting the review.
5. Consider inclusion of a quality-of-care component (unless planning on implementing a QTSA).

Diagnostic network optimization

Best practices for countries:

1. DNOs can be most informative when they look at diagnostic networks for several diseases, including TB and HIV, so that specimen transportation networks and shared diagnostic platforms can be assessed concurrently, with recommendations made to maximize efficiency for all diseases.
2. The first time a DNO is conducted, it may require a lot of time to compile the resources needed. But if these resources are updated annually, subsequent DNOs will be much quicker to conduct.
3. USAID's TB Diagnostic Network Assessment (TB DNA) tool has a lab spatial analysis that has some similarities to a DNO, but a somewhat different focus. If a country has

recently completed a TB DNA or plans to do so soon, it is important to ensure that the complimentary aspects of the two tools are considered.

Best practices for tool developers/implementers/funders:

1. A standardized definition and common standards for DNOs across partners are needed.
2. There is a need for improved explanations of the concept of a DNO for countries.
3. While a DNO and the lab spatial analysis of USAID's TB DNA are similar, they have somewhat different objectives; if one or the other has been completed recently, it is important to ensure that the complementary aspects of the two activities are considered.
4. Once a dataset is created for a DNO, it should be maintained and updated to facilitate faster and easier implementation of future DNOs (data will also feed into lab spatial analysis of TB DNA).

TB patient cost survey

Best practices for countries:

1. A patient cost survey provides important evidence for advocating to MOH and non-health ministries to enact policies that will reduce costs for TB patients. The results are also useful for NSPs and funding applications; results can be used as evidence to request funding for interventions that help reduce costs for TB patients (e.g., transport funds, nutrition supplements, cash transfers).
2. Repeat surveys should only be conducted if progress has been made to mitigate costs for patients; repeat surveys can measure the impact of policies or changes made because of prior surveys.

Best practices for tool developers/implementers/funders:

1. It is important that the support provided to countries helps build capacity to implement patient cost surveys.
2. Consider inclusion of costs for patients with comorbidities (e.g., HIV, diabetes).
3. Consider inclusion of opportunity costs.
4. After conducting a survey, consider evaluating the impact of policies or changes made because of the survey.

Inventory study

Best practices for countries:

1. Consider building capacity at subnational level so that subnational staff can implement in their area of the country.
2. When routine surveillance systems are adequate (e.g., case-based surveillance, lab diagnostic data linked to treatment data), inventory studies could be done more routinely to detect reporting gaps.
3. Results can be triangulated with prevalence survey findings to better understand reporting gaps.

4. Applying the results from an inventory study can be challenging; it is important to ensure that this is planned for and has funding support.

Best practices for tool developers/implementers/funders:

1. Consider incorporating GIS mapping into the methods.
2. It is important to support countries to fully utilize/apply the results; applicability of results can be challenging.

Private sector drug sales analysis

Best practices for countries:

1. Repeat private sector drug sales analysis are typically only worthwhile if changes have been made in engaging the private sector (e.g., mandatory case notification has been established or other public-private partnerships have been developed) since the prior private drug sales analysis.

Best practices for tool developers/implementers/funders:

No suggestions.

TB service delivery costing study

Best practices for countries:

1. A TB service delivery costing study will provide high quality cost data that is not found anywhere else and will serve as high quality data input into the updated OneHealth Tool for TB Budgeting (the Integrated Health Tool).
2. If it is not possible to implement your own study, you can use costing data from the pilot countries (available online) as a basis/estimate.
3. Technical support from a local research organization or university may be helpful for planning, implementation and application of results.

Best practices for tool developers/implementers/funders:

1. It is important to support country capacity building to implement the study. This is a good opportunity for capacity building of local researchers.
2. If needed, it is important that technical assistance includes interpretation and application of results.

One Health Tool for TB budgeting

Best practices for countries:

No suggestions.

Best practices for tool developers/implementers/funders:

1. Respondents asked that the tool be simplified and made more user-friendly, it is currently complex and challenging to use. [Note: *WHO is in the process of developing the new Integrated Health Tool*]
2. Training to build the capacity of country staff to use the tool is needed.

People-centered framework

Best practices for countries:

1. It is important that countries take ownership and lead the PCF process as it is intended to contribute substantially to their NSP and funding applications.
2. It is important to plan well in advance to ensure sufficient time to gather and consolidate all the data that will be used for the PCF.
3. While typically completed prior to development of an NSP, it could also be done during a mid-term review to revise the NSP with new data.
4. Can also be done at subnational level for local planning.

Best practices for tool developers/implementers/funders:

1. Coordination is needed amongst partners asking the NTP for data to implement the PCF or other data activities that use existing data.
2. It is important to involve TB program staff in the process to build capacity and encourage country ownership.
3. Other than providing technical support to implement the PCF, support for implementation/follow-up of the recommendations may be needed for it to have an impact.
4. Consider providing countries with additional resources if country wants to implement the PCF for subnational levels.

TB care cascade analysis

Best practices for countries:

1. The care cascade analysis approach could be used more routinely for reviewing routine surveillance data and implementing continuous quality improvement (CQI) activities.

Best practices for tool developers/implementers/funders:

No suggestions.

MATCH approach

Best practices for countries:

1. The methods underlying generation of results in a MATCH analysis and applicability of results can be a bit complex to understand; hence, it is important to ensure adequate technical assistance to understand, interpret and apply results.

Best practices for tool developers/implementers/funders:

1. Consider supporting/working with countries to use and incorporate an artificial intelligence approach to MATCH.
2. It is important to involve TB staff in the process as much as possible to build capacity to implement MATCH and use the data.
3. It is important to ensure countries understand what MATCH does, and provide support to understand, interpret and utilize/apply results.

Patient pathway analysis

Best practices for countries:

1. The PPA is a good starting point for exploring the roles of the private and informal sectors in TB diagnosis and treatment.
2. Since the PPA uses existing data, the quality of the results will depend on the quality of the existing data used.
3. If a country is planning other activities that make use of existing source data in addition to the PPA, this can be coordinated so that the relevant data can be gathered at the same time.
4. While a country's first implementation of the PPA may take some time and require technical assistance since it is a new process, the tools are available freely online and repeat implementations will be easier. Hence it can be updated at specific time points e.g., after a mid-term review, or when updated source data is available.

Best practices for tool developers/implementers/funders:

1. The PPA tool is available online, but it may be helpful to provide technical assistance to countries using it for the first time, with the goal of building capacity for countries to use it on their own.
2. Coordination amongst partners requesting data from the NTP to implement the PPA and other data activities that use existing data is important.
3. Since the PPA uses existing data, the quality of the results depends on the quality of the existing data used.

TB diagnostic network assessment

Best practices for countries:

1. It is important to engage relevant national and subnational level TB program staff during implementation. Consider establishing a liaison between implementing partner and subnational level staff to help implementation go more smoothly.
2. The TB DNA has an optional lab spatial analysis component that has some similarities to a DNO, but a somewhat different focus. If a country has recently completed a DNO or plans to do so soon, it is important to consider the complementary aspects of the two tools.

Best practices for tool developers/implementers/funders:

1. Consider whether the TB DNA can be better integrated/aligned with the DNO to reduce burden on NTP staff.
2. It is important to ensure buy-in from the country throughout the process; from planning through implementation and executing recommendations.

Quality of TB services assessment

Best practices for countries:

1. The length of the assessment checklist may be able to be reduced based on a country's priorities.
2. A repeat assessment will be most useful when recommendations from the prior assessment have been implemented.

Best practices for tool developers/implementers/funders:

1. In addition to providing technical support to implement the assessment, support to operationalize the findings for decision making may be needed to maximize usefulness of the assessment.
2. Consider reducing the length of the assessment checklist.
3. Consider decentralizing the assessment so it could be done more routinely at subnational levels.

Epidemiological modelling

Best practices for countries:

No suggestions.

Best practices for tool developers/implementers/funders:

1. It is important that partners build the capacity and understanding in country so that NTP staff and in-country TB partners can use modeling more routinely, understand the inputs, trust the results (reduce hesitancy) and better utilize the results.
2. Consider development and implementation of models that can be used at the subnational level.
3. Better communication between modellers and TB program staff to ensure mutual understanding of priorities and aims is needed.

Screen-TB

Best practices for countries:

1. Since the tool relies on existing source data and assumptions, the quality of the results will depend on the quality of the data input and accuracy of the assumptions made.

Best practices for tool developers/implementers/funders:

1. It is important to provide training to build capacity for country TB program staff to use the tool.

Conclusion and next steps

The TB Data Optimization project resulted in best practices for more effective and efficient planning and implementation of TB-related tools outside of routine surveillance data, and the conceptualization of a framework to help guide countries to assess their data needs, select appropriate tools and optimally plan for their implementation.

A second phase of the TB Data Optimization project has been funded by the Bill & Melinda Gates Foundation. It is a two-year project that began in September 2023, with two intended deliverables: a fully developed and piloted "Framework to prioritize TB data activities" and an updated version of the WHO's "Compendium of data and evidence-related tools for use in TB planning and programming". These combined outputs are meant to be used by national TB programs and their partners to support strategic planning related to TB data. Activities for Phase 2 of the data optimization project will be conducted in close collaboration with WHO's Global TB Program and activities that they are conducting in parallel to strengthen all aspects of TB National Strategic Planning.

Annexes

Annexes are located in a separate document.

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