TB Data-to-Action Continuum

in Nigeria

Report

June 2022

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TB DIAH
Tuberculosis Data, Impact Assessment and Communications Hub

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Report

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This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of the TB Data, Impact Assessment and Communications Hub (TB DIAH) Associate Award No. 7200AA18LA00007. TB DIAH is implemented by the University of North Carolina at Chapel Hill, in partnership with John Snow, Inc. Views expressed are not necessarily those of USAID or the United States government. TR-22-481 TB

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Acknowledgments

The TB Data, Impact Assessment and Communications Hub (TB DIAH) project, which is funded by the United States Agency for International Development (USAID), thanks those who contributed to the Tuberculosis Data-to-Action Continuum (D2AC) workshop in Nigeria.

First, we would like to acknowledge USAID for its support. Particular thanks go to our advisors, Joy Kamunyori, Catherine Griesedieck, Noor Streeter, Sevim Ahmedov, and Abdul Naser Ikram at USAID/Washington. We also thank Rupert Eneogu, Chika Obiora-Okafo, Debby Nongo, David Onime, and Temitayo Lagundoye Odusote at USAID/Nigeria.

Second, we thank Dr. Chukwuma Anyaike and Dr. Obioma Chijioke-Akaniro of the Nigeria National Tuberculosis and Leprosy Control Programme for their leadership, guidance, and support.

Third, we extend our appreciation to the Nigeria TB DIAH team, especially Temitope Morenikeji, Temitope Blessing Ullah, Segun Oluwaseun Bakare, and Abdullahi Adeleke of John Snow, Inc. (JSI).

Fourth, we thank the 40+ attendees who actively participated in the two-day workshop in Abuja. Thank you for your valuable insights.

Fifth, we recognize the core D2AC team for its contributions. Special thanks go to Meredith Silver, Yanira Garcia-Mendoza, David Boone, Stephanie Mullen, and Ezra Tessera of TB DIAH, JSI, and to Manish Kumar (formerly with TB DIAH) and Ann Fitzgerald of TB DIAH, University of North Carolina at Chapel Hill. We also thank the D2AC Advisory Group members for their contributions to the D2AC Toolkit's development since March 2021. Special thanks to Yanira for developing the Nigeria country profile and to Meredith for supporting the workshop data aggregation effort in real time.

Last, we thank the knowledge management team of TB DIAH, University of North Carolina at Chapel Hill, for editorial, design, and production services.

Suggested citation:

Chauffour, J., Hassan, A. O., Kuye, J., Ohikhuai, C., Udah, D. (2022). TB Data-to-Action Continuum in Nigeria: Report. Chapel Hill, NC, USA: TB DIAH, University of North Carolina

Cover photo: Jeanne Chauffour

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Abbreviations

ARC	Assessment of Reporting Capacity
D2AC	Data-to-Action Continuum
DHIS2	District Health Information System version 2
DHPRS	Department of Health Planning, Research and Statistics
DOT	directly observed treatment
DQA	data quality assessment
FMOH	Federal Ministry of Health
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	health management information system
ICT	information and communications technology
IHVN	Institute of Human Virology Nigeria
JSI	John Snow, Inc.
LGA	local government area
M&E	monitoring and evaluation
MDR	multidrug-resistant
MEL	monitoring, evaluation, and learning
MFL	master facility list
NETIMS	National Electronic TB Information Management System
NTBLCP	National Tuberculosis and Leprosy Control Programme
NTLTC	National TB and Leprosy Training Center
NTP	national tuberculosis program
PBMEF	Performance-based Monitoring and Evaluation Framework
RR	rifampicin-resistant
SOP	standard operating procedure
STBLCP	state TB and leprosy control program
TB	tuberculosis
TB DIAH	TB Data, Impact Assessment and Communications Hub
TBLS	tuberculosis and leprosy supervisor
TWG	technical working group
USAID	United States Agency for International Development
WHO	World Health Organization

Executive Summary

Background

A strong tuberculosis (TB) monitoring and evaluation (M&E) and surveillance system is a vital tool for countries to reach global goals to end TB. The United States Agency for International Development (USAID) leads the U.S. Government's global efforts to end TB. USAID's Global Accelerator to End TB is the Agency's programmatic approach to fight TB. Under the Accelerator, USAID funds the TB Data, Impact Assessment and Communications Hub (TB DIAH) project, which developed a TB Data-to-Action Continuum (D2AC) Toolkit to measure countries' progress and guide efforts to improve their TB M&E and surveillance systems. The D2AC allows national TB programs (NTPs) to precisely gauge the barriers to data use and assess the decision-making capabilities of different actors across their health systems. The purpose of a D2AC workshop is to guide the evaluation of data use capabilities to routinely monitor and improve data use attributes associated with TB program management and service delivery at subnational and national levels. The objective is to use the findings from the application of the D2AC Toolkit to evaluate TB M&E and surveillance systems by (1) assessing decision-making capabilities of different actors; (2) precisely gauging the barriers to data use; (3) helping NTPs select appropriate interventions in the context of their health systems; (4) developing an implementation plan to apply in the future; and (5) using implementation recommendations for strategic planning purposes and decision making.

Methods

Nigeria was selected as the second field test location for the D2AC workshop. The workshop was held in April 2022 in Abuja. Forty-one participants attended, representing all levels of the Nigeria health system and other TB stakeholder groups. The D2AC workshop was conducted in-person. The D2AC team applied a mixed methods approach conducted in three parts with the support of the D2AC Toolkit: (1) participants first completed the D2AC Toolkit's data collection instrument individually and then in groups; (2) individually and then in groups, participants provided evidence and justification in the data collection instrument for the response options selected; and (3) in groups, participants identified priority actions for post-workshop implementation. A semi-structured questionnaire and focus group discussion method were implemented during the assessment. The D2AC team facilitated the workshop with the use of slides and handouts, and there were several break-out group activities and report-backs. Quantitative data from the 42 (34 individual and eight group) data collection instruments were automatically generated using the D2AC Analysis Tool. The qualitative data—observations, comments, and questions submitted in the 42 instruments and brought up in group discussions and report-backs—were transcribed and analyzed.

Results

The overall D2AC assessment score from the aggregate group responses was 3.45 (out of 5), putting Nigeria at an "established" level according to the D2AC. The country performed best in domain 1 (Data Collection and Reporting, score of 3.88) and domain 3 (Leadership, Governance, and Accountability, score of 3.88) and worst in domain 5 (Information and Communications Technology, score of 2.59). Domain 2 (Data Analysis and Use) and domain 4 (Capacity Building) received scores of 3.13 and 3.33, respectively. The overall score from the aggregated individual

responses was similar (3.31 out of 5), albeit slightly inferior, to the group aggregate score (3.45). Comparison of the individual and group responses revealed disparities for domain 3: 12 percent difference in scoring between the individual and the group responses. Eight subdomains were identified as priorities: D1S1 (Data collection tools and workflow), D1S2 (Reporting), D1S3 (Data quality), D2S1 (Data integration and use), D3S2 (Data access and sharing), D3S5 (Monitoring, evaluation, and learning), D4S2 (Skill and knowledge development), and D5S1 (Hardware).

Discussion

The D2AC assessment in Nigeria shed light on the perceived weaknesses of the Nigeria TB system, primarily in the domain of information and communications technology (ICT), where hardware, network and connectivity, and ICT business infrastructure received the lowest scores across the groups, on average. Beyond the challenges around physical resources, equipment, and infrastructure, other challenges identified related to improvements that could be made concerning data management and use practices, functionalities, and capabilities, specifically: data integration, data exchange and interoperability, and data access and sharing. These areas received scores lower than 3 out of 5, meaning that they were identified as being at a "defined" stage of the continuum. While many systems are in place, many are suboptimal, outdated, underutilized, or not synchronizing properly with parallel systems. This reflects a programmatic gap with systems that exist but that are not operating optimally—whether it be the central data repository, the master facility list, the use of unique identifiers. The D2AC assessment in Nigeria also shed light on the areas of the D2AC scale that were performing the strongest. They included aspects of data availability practices, such as data reporting, data quality, and data dissemination and communication. Another strong area was monitoring, evaluation, and learning (MEL). These areas received scores superior to 4 out of 5, meaning that they were at an "institutionalized" stage of the continuum.

Recommendations

Priority recommendations were developed in small groups. They were then combined in plenary to develop a joint implementation plan, and were validated by the workshop participants to: improve the harmonization of data collection and reporting processes and move towards electronic tools at all levels; develop standard operating procedures and build capacity on data collection and reporting; increase supportive supervisions and peer-to-peer mentoring; build sustainable solutions to existing initiatives that are facing challenges (e.g., unique identifiers, the master facility list, the centralized data repository); hold regular M&E meetings; provide consistent pre-service training; implement data quality assessments; and procure hardware at all levels.

Conclusion

Despite progress toward ending TB worldwide, combating TB remains a high priority in Nigeria, especially in the COVID-19 era where TB case notification, screening, and contact tracing were being severely impacted and where Nigeria still faces among the world's highest burdens for TB, TB/HIV, and MDR/RR-TB. The D2AC assessment revealed good performance in certain dimensions of the D2AC, such as MEL, dissemination and communication, reporting, and data quality. However, it also highlighted gaps, such as the availability of hardware at all levels, the reliability of network and connectivity, ICT business infrastructure, and data integration, access,

sharing, and exchange. These findings provided evidence of the areas needing programmatic interventions, and can inform policymakers, donors, and program managers who want to design and implement responsive programs and interventions to strengthen and improve data use capabilities for evidence-based decision making to provide targeted and data informed high-quality services for all TB patients and their families.

Background

A strong tuberculosis (TB) monitoring and evaluation (M&E) and surveillance system is vital for countries to achieve global goals to end TB. By routinely collecting high quality, detailed data and by effectively integrating various components of routine information systems (e.g., service statistics, disease surveillance, and financial and human resource data), national TB programs (NTPs) are better able to meet the many data demands of stakeholders; better target TB program implementation; improve the quality and efficiency of TB services; and effectively plan and advocate for resources.

USAID Leadership in Ending TB

The United States Agency for International Development (USAID) leads the U.S. Government's global efforts to end TB. USAID's Global Accelerator to End TB is the Agency's programmatic approach to fight TB. The Accelerator increases commitment from, and builds the capacity of, governments, civil society, and the private sector to accelerate national progress to reach global TB targets. The Accelerator focuses on countries with high burdens of TB where the Agency can unite with local communities and partners to deliver performance-based results. To ensure the Accelerator's effectiveness and increased transparency, USAID uses standardized data collection and performance-based indicators that align with the targets.

TB DIAH and D2AC

Under the Accelerator, USAID funds the TB Data, Impact Assessment and Communications Hub (TB DIAH). TB DIAH aims to ensure optimal demand for and analysis of TB data, and the appropriate use of that information to measure performance and to inform NTPs and USAID interventions and policies.

TB DIAH developed the TB Data-to-Action Continuum (D2AC) Toolkit to measure countries' progress and guide efforts to improve their TB M&E and surveillance systems. The D2AC builds on the work of the Performance-based Monitoring and Evaluation Framework[1] (PBMEF), the Assessment of Reporting Capacity (ARC), and other existing documentation (i.e., joint program reviews, epidemiological assessments). It allows NTPs to precisely gauge the barriers to data use and assess the decision-making capabilities of different actors across their health systems. It also helps NTPs select appropriate interventions in the context of their health systems and develop implementation plans to apply them.

The D2AC framework aims to gauge country and NTP capacity to translate data into action to improve NTP performance. Through a systematic review of existing literature and a phased review by experts to validate the concept and pretest the approach, the D2AC team developed the D2AC Toolkit (Kumar, Silver, Chauffour, Boyle, & Boone, 2021). More information on TB DIAH's D2AC Toolkit can be found at https://www.tbdiah.org/assessments/d2ac

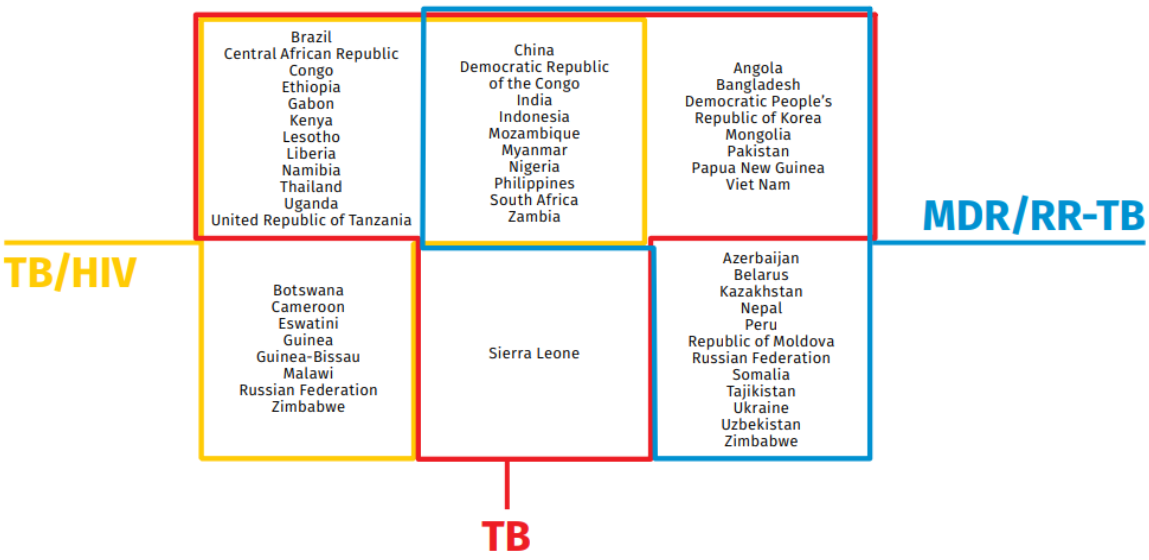
[1] Available at https://www.tbdiah.org/resource-library/pbmef/

TB and Nigeria

Nigeria has a dedicated NTP tackling 4.6 percent of the global TB burden (World Health Organization [WHO], 2021), or 219 cases per 100,000 people as of 2020, with an 88 percent treatment success rate in 2019 (WHO, 2022; World Bank, 2019). As of 2017, an estimated 71 percent of TB patients and their households still faced catastrophic costs in Nigeria (WHO, 2022) and it was estimated that USD 278 million was still needed to fill the gap in TB funding as of 2019 (Stop TB Partnership, 2020), and that 69 percent of the 2021 TB budget was unfunded (WHO, 2022). Considering the funding gap and the desire to reach global goals, Nigeria recognized the need to identify gaps in its current M&E and surveillance system to develop a strategic plan for improvement, and to use the strategic plan to advocate for greater funding.

In the context of the COVID-19 pandemic, Nigeria is among the ten countries with the largest gaps between notifications of new and relapse (incident) TB cases and the best estimates of TB incidence in 2020 (WHO, 2021). The WHO also deems Nigeria to have "worryingly low levels of treatment coverage" inferior to 50 percent (WHO, 2021). Nigeria is also among the 10 countries that account for about 70 percent of the global gap between the estimated global incidence of multidrug-resistant (MDR)/rifampicin-resistant (RR) TB each year and the number of people enrolled in treatment in 2020 (WHO 2021). Indeed, Nigeria appears in the three global lists of high-burden countries for TB, HIV-associated TB, and MDR/RR-TB to be used by the WHO in the period 2021–2025 (WHO, 2021) (Figure 1). This was likely a contributing cause to the 36 percent case fatality ratio for TB patients in 2020 (WHO, 2022).

Figure 1. The three global lists of high-burden countries for TB, HIV-associated TB and MDR/RR-TB to be used by WHO in the period 2021–2025, and their areas of overlap



Source: Global Tuberculosis Report 2021 (WHO, 2021)

In 2021, Nigeria saw a 50 percent increase in case finding as compared to 2020. While Nigeria's TB treatment coverage was 30 percent in 2020 (WHO, 2021), it has increased to approximately 46 percent in 2021 according to the cumulative TB case notification data shared by the National

Tuberculosis and Leprosy Control Programme (NTBLCP) to all partners. Furthermore, there was an increase of about 50 percent in TB case notification from 2020 to 2021 (138,591 cases in 2020 compared with 207,785 cases in 2021).

Objectives

Workshop Objectives

The purpose of the D2AC workshop was to guide the evaluation of data use capabilities to routinely monitor and improve data use attributes associated with TB program management and service delivery at subnational and national levels.

The D2AC Toolkit was used for both individual and group responses. The objective was to use the findings to evaluate TB M&E and surveillance systems by:

- Assessing decision-making capabilities of different actors
- Precisely gauging barriers to data use
- Helping the NTP select appropriate interventions in the context of its health system
- Developing an implementation plan to apply in the future
- Using implementation recommendations for strategic planning purposes and decision making

Beyond the standard objectives of the D2AC assessment, some objectives were also specific to Nigeria. The TB DIAH team in Nigeria expressed that the findings and recommendations from this workshop would be very useful as a pre-assessment for the local government area (LGA) and state-level TB program staff M&E capacity building workshops the team would be conducting in May and June 2022 focused on data use practice. Furthermore, the TB DIAH—Nigeria team expressed, on behest of the NTBLCP, that they were interested in having recommendations and the implementation plan be adapted and inclusive of the different levels of the TB program.

During a call on the eve of the workshop with USAID/Nigeria, the Mission expressed that a priority consideration following the D2AC assessment was the communication to the NTBLCP (of findings, recommendations, and what those meant for next steps to take jointly), partners, and stakeholders.

Field Test Objectives

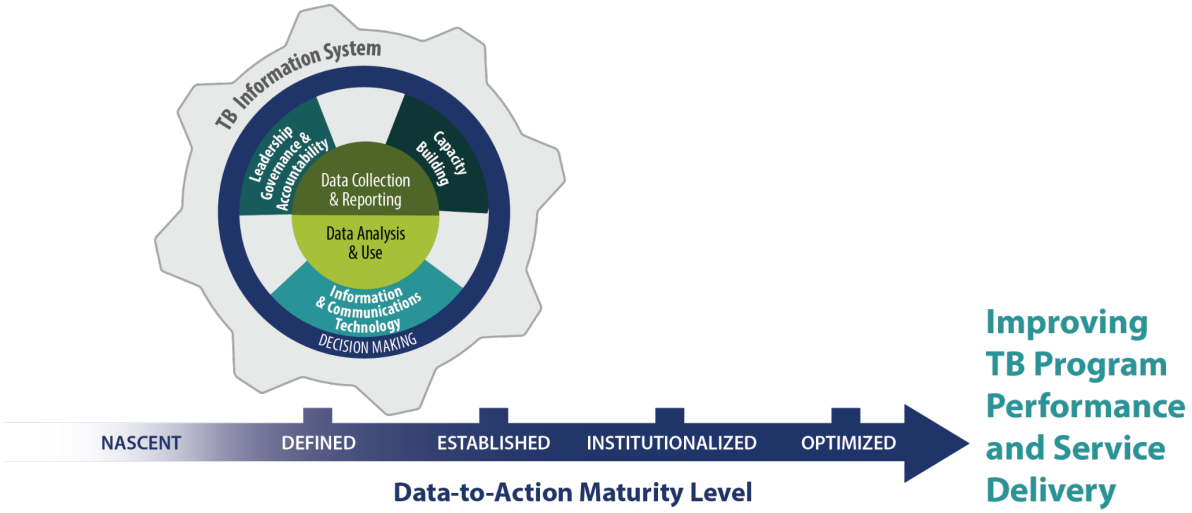
The objective of the field test component of the D2AC assessment using the new D2AC Toolkit was to gather insights on what about the Toolkit worked well when applied in a workshop setting with real data entry and at the country level, and what were the gaps, challenges, and limitations, with the aim of taking the feedback into consideration before publishing the D2AC Toolkit and the D2AC workshop method.

Concept

The conceptual framework (Figure 2) describes the organizational, human, technology, and process-related factors affecting data use capabilities. The framework highlights an interlinked and cyclical evolution of the health information system involving TB data collection and

reporting, analysis, use, and dissemination-related interventions that build on the leadership and governance and capacity building efforts of a given NTP. The framework shows that the interlinked interventions follow a continuous improvement approach to achieve the advanced maturity levels (often identified by a descriptor, such as nascent, defined, established, institutionalized, and optimized), which are associated with an improvement of NTP performance in terms of using data for proactive and responsive clinical, programmatic, managerial, and policy decision making.

Figure 2. D2AC conceptual framework



Tool Design

The D2AC Toolkit was developed under the TB DIAH project, funded by USAID's Global Accelerator to End TB. D2AC was initially developed as a framework to gauge country and NTP capacity to translate data into action to improve NTP performance. Informed by a review of peer-reviewed and gray literature, the D2AC Toolkit and process builds on previous experience with maturity models. The D2AC team documented and published a journal article on this systematic review (Kumar, et al., 2021). A phased review of the Toolkit was also conducted by the D2AC Advisory group starting in March 2021. More information on the Toolkit validation process can be found at https://www.tbdiah.org/assessments/d2ac

The D2AC Toolkit is composed of three components:

1. An Excel-based D2AC Data Collection Tool for collecting individual responses with: five defined continuum levels (Table 1); a country profile template to collect socioeconomic, demographic, and epidemiological indicators; a D2AC scale with capability statements organized into five domains and 17 subdomains (Table 2) for each of the five continuum levels; key user roles and decisions organized according to USAID's TB objectives of reach, cure, prevent, and sustain; a data collection instrument with closed-ended capability continuum response options; an analysis matrix; and an analysis dashboard.

2. An Excel-based D2AC Data Analysis Tool that automatically aggregates responses from all completed data collection instruments and generates data visualizations and recommended priority actions. This enables decision makers to make sense of and apply the findings, and to develop an implementation plan using the template provided in the D2AC Toolkit.

3. A User Guide to facilitate the use of both tools. It provides step-by-step instructions for planning and implementing the D2AC assessment and for developing an implementation plan

The Toolkit measures the status of current and desired TB M&E and surveillance systems data use capabilities across 17 subdomains, grouped in five domains. The domains and subdomains are then measured across five continuum levels: nascent, defined, established, institutionalized, and optimized (Table 1). This method offers a systematic way to show a measurable impact of improvements across processes (e.g., data collection processes); human resources (e.g., skill and knowledge development); and institutional attributes (e.g., policy, strategy, and governance).

Table 1. The five D2AC continuum levels

Continuum Level	Description
1 (Nascent)	• Formal processes, capabilities, experience, or understanding of data use issues/activities are limited or emerging. • Formal processes are not documented, and functional capabilities are at the development stage. • Success depends on individual effort (few committed users). • Predominantly paper-based data management system.
2 (Defined)	• Basic processes are in place, based on previous activities or existing and accessible policies. • The need for standardized processes and automated functional capabilities is known. • There are efforts to document current processes and policies, and capacity building needs.
3 (Established)	• There are approved documented processes and guidelines tailored to data use. • There is increased collaboration and knowledge sharing. • Need for external technical assistance is clearly identified. • Innovative methods and tools can be implemented and used to extend functional capabilities.
4 (Institutionalized)	• Activities are under control using established processes. • Requirements and goals have been developed and a feedback process is in place to ensure that they are met. • Detailed measures for processes and products are being collected.
5 (Optimized)	• Best practices are being applied, and people and the system are capable of learning and adapting. • The system uses experiences and feedback to correct problems and continuously improve processes and capabilities. • Future challenges are anticipated, and a plan is in place to address them through innovation and new technology. • Processes are in place to ensure review and incorporation of relevant innovation.

The D2AC scale is made up of five domains, with 17 corresponding subdomains (Table 2).

Table 2. The five D2AC domains and 17 D2AC subdomains

Domains	Subdomains
1. Data Collection and Reporting	1. Data collection tools and workflow 2. Reporting 3. Data quality
2. Data Analysis and Use	1. Data integration and exchange 2. Analytics and visualization 3. Dissemination and communication
3. Leadership, Governance, and Accountability	1. Data use guidance 2. Data access and sharing 3. Organizational structure and function 4. Leadership and coordination 5. Monitoring, evaluation, and learning (MEL) 6. Financial resources
4. Capacity Building	1. Data interpretation 2. Skill and knowledge development
5. Information and Communications Technology (ICT)	1. Hardware 2. Network and connectivity 3. ICT business infrastructure

Workshop Design

The D2AC Toolkit is designed to be implemented as a facilitator-guided workshop with stakeholders from different aspects of the NTP (e.g., screening, diagnosis, and treatment) and from different levels of the health system. Participants discuss and achieve consensus on where the elements of NTP capacity fall on the continuum. The Toolkit then yields suggested interventions—called priority actions—tailored to stakeholders' assessments of NTP capacities. These priority actions help the NTP improve capacity to translate data into action, targeted to the current continuum level at different levels of the health system.

D2AC in the Context of TB DIAH Resources

The D2AC Toolkit can be used on its own, or as a complement to other TB DIAH tools and products as part of an assessment of a country's TB M&E and surveillance systems. When used alongside other TB DIAH tools and assessments, such as the PBMEF, ARC, or Quality of TB Services Assessment,[2] the D2AC activity contributes to a holistic view of a country's TB M&E and surveillance systems and its capacity to collect, analyze, and use key indicator data for TB service delivery, performance improvement, and data-based decision making.

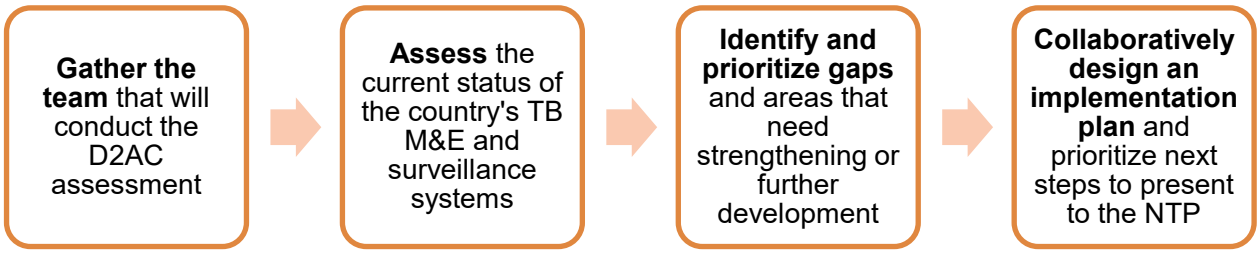
[2] Available at https://www.tbdiah.org/assessments/quality-of-tuberculosis-services-assessments/ —the QTSA was piloted in Nigeria in 2018, see report at https://www.tbdiah.org/assessments/quality-of-tuberculosis-services-assessments/

Methods

Summary of Workshop Process

Planning for the D2AC workshop began in the fall 2021 with the formation of the leadership team (described in the next section). USAID played a key role in working with the NTBLCP and the D2AC team to secure support, identify the assessment scope, discuss the planning process, and identify participants. Although COVID-19 caused a delay in the original assessment timeline, the team was able to eventually conduct the assessment in Nigeria a few months later. During the workshop, participants assessed the current status of the TB M&E and surveillance systems, identified gaps, and prioritized actions in areas that needed strengthening or further development. Once this was completed, the participants designed an implementation plan to present to the NTBLCP for further discussion (Figure 3).

Figure 3. The D2AC workshop approach and process



Identification of Nigeria as a Field Test Location

The D2AC team had several criteria in mind when considering what countries to partner with for the D2AC Toolkit field tests. First, the team wanted to field test the D2AC Toolkit in two Anglophone countries, before the original English version of the Toolkit was published, after which it would be translated into other languages. Second, the team wanted to conduct field tests in countries where a member of the D2AC Advisory Group was already working closely with a NTBLCP, and where there would be strong support from the USAID Mission to have more NTP buy-in and support for workshop facilitation and an increased chance of later use of the assessment recommendations and findings. Third, for health safety reasons, the team wanted to target a country with a low COVID-19 incidence at the time of the workshop.

The Nigeria TB DIAH team, in concertation with the NTBLCP and USAID/Nigeria, while expressing interest in a D2AC assessment early on, had subsequently decided to await an implementation in July 2022. The team decided to come back on this decision and participate in the D2AC field test for three reasons: (1) to align with NTBLCP priorities, (2) to capitalize on the D2AC assessment as part of a preparatory phase for the M&E capacity assessment work the team would be leading in May and June 2022, and (3) as a pre-assessment for the M&E training (that will target state TB program managers and state TB M&E managers). Therefore, the July 2022 timeline was moved up to April 2022 after calls with the team in March 2022.

Nigeria is one of USAID's 23 priority countries that TB DIAH usually works with closely as part of their portfolio of technical assistance activities, thereby providing the opportunity of testing the tool in a context where the findings would be of particular interest. Strong and established support from the NTBLCP was another valuable consideration. Moreover, the nature of Nigeria's integrated TB program was an opportunity to test how the tool responded in such a health system structure and context. The D2AC core team approached Nigeria as a possible first field test location in October 2021, contacting the TB DIAH—Nigeria team on October 13, followed by the TB DIAH—Nigeria Chief of Party introducing the D2AC team to the Nigeria NTBLCP and USAID Mission on November 25.

Formation of the Leadership Team

The leadership team consisted of two senior NTBLCP staff taking on the role of hosts; one D2AC advisory group member as co-facilitator; one D2AC team members as workshop co-facilitator; three TB DIAH—Nigeria staff supporting the activity locally, and three D2AC team members supporting the event from headquarters. USAID was represented at the workshop on both days. The leadership team had the appropriate knowledge of the D2AC Toolkit and assessment process, and the expertise to oversee the assessment process (Table 3). The leadership team met over Zoom calls on October 25, 2021, and on March 18 and April 4, 2022.

Table 3. Nigeria D2AC leadership team

Name	Position	Institution
Obioma Chijioke-Akaniro	TB M&E Focal Person	Nigeria NTBLCP
Olawumi Olarewaju	M&E Officer	Nigeria NTBLCP
Abiodun Olusegun Hassan	Chief of Party	TB DIAH–Nigeria
Joseph Kuye	M&E Surveillance Expert	TB DIAH–Nigeria
Charles Ohikhuai	Strategic Information Advisor	TB DIAH–Nigeria
Donald Udah	Digital Health Expert	TB DIAH–Nigeria
Jeanne Chauffour	D2AC Team Lead/M&E Advisor	TB DIAH
David Boone	Epidemiologist	TB DIAH
Meredith Silver	Data Systems and Use Technical Advisor	TB DIAH
Yanira Garcia-Mendoza	M&E Officer	TB DIAH

Invitation of Participants

The leadership team used purposive sampling to identify and select participants. Criteria for selection included participants from the national level (e.g., NTP, national reference laboratory, health management information system [HMIS] department); provincial level (e.g., provincial TB program unit); district level (e.g., district health/TB program unit); and health facility level

(TB clinic/health unit). Emphasis was placed on diversifying participants working on TB case outreach, treatment, prevention, and TB program sustainability (USAID TB pillars of reach, cure, prevent, sustain). Thirty-six people were carefully identified by name or institution and invited by the NTBLCP, of which 31 attended, and another ten were in attendance, either as substitutes for the original invitees or as additional invitees, for a total of 41 participants. This total did not include the TB DIAH staff.

Workshop Process

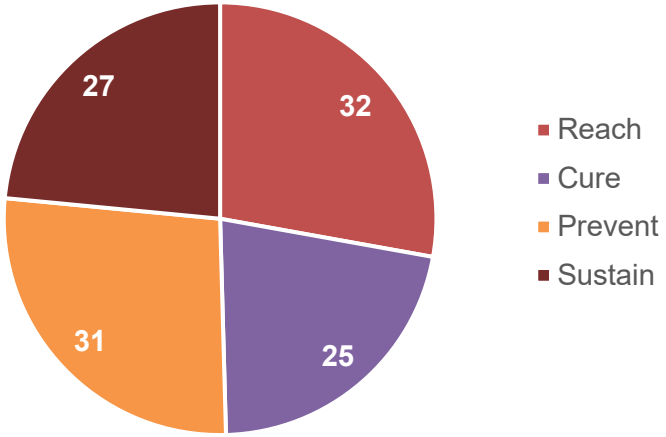
The D2AC assessment can be implemented using a variety of approaches, including individual assessment, group assessments, or a hybrid approach. In Nigeria, a hybrid approach was implemented. The assessment was conducted in-person. The workshop was conducted over a two-day period and included 41 key personnel identified and invited by the NTBLCP.

The assessment took place on April 20–21 at the Corinthia Villa Hotel in Abuja, Nigeria. The workshop was facilitated by Jeanne Chauffour, D2AC Team Lead and M&E Technical Advisor, of TB DIAH, John Snow Inc. (JSI); Abiodun Olusegun Hassan, Chief of Party and D2AC advisory group member, Joseph Kuye, M&E Surveillance Expert, and Charles Ohikhuai, Strategic Information Advisor, of TB DIAH—Nigeria, JSI. The workshop was supported by Donald Udah, Oluwaseun Segun Bakare, Temitope Morenikeji, Temitope Blessing Ullah, and Abdullahi Adeleke of TB DIAH—Nigeria, JSI. The workshop agenda can be found in Appendix A.

Workshop Participants

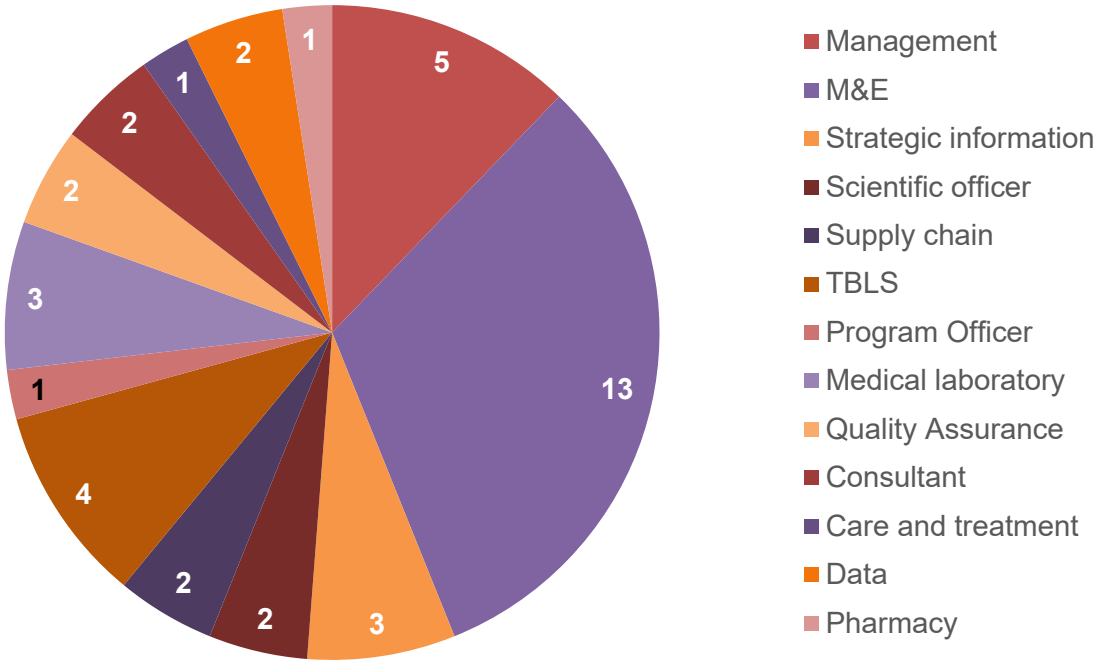
Of the 41 participants, 56 percent were men (23 participants), and 44 percent were women (18 participants). Nearly two-thirds of the participants came from the national level (61% – 25 participants), two participants represented the zonal level, about one-quarter represented the state level (17% – 7 participants), and the lower levels were represented by three participants from the LGA level, three participants from the health facility level, and one participant from the community level. The four USAID TB pillars of reach (32 participants identified with this pillar), cure (25 participants), prevent (31 participants), and sustain (27 participants), were evenly represented by participants' areas of work and focus (Figure 4 and Appendix B, Table B1). The split was also relatively even when examining secondary responsibilities, falling into the four USAID TB pillars of reach (10 participants), cure (9 participants), prevent (11 participants), and sustain (11 participants).

Figure 4. Participant composition, by TB work area



Although most participants were in M&E roles (13 participants), management (5 participants), working as TB supervisors or linkage coordinators (4 participants), in strategic information (3 participants) or in a medical laboratory (3 participants), other technical, scientific, clinical, data, quality assurance, and supply chain representatives also attended (Figure 5).

Figure 5. Participant composition, by TB program sector or specialty

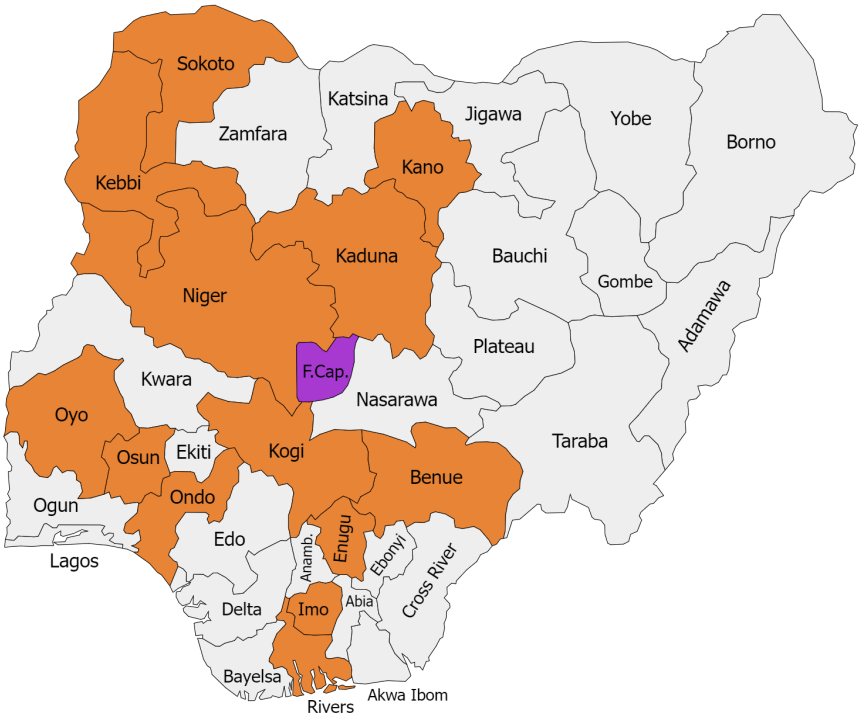


Twenty-five participants (61%) were representing the national level. Ten participants represented the NTBLCP from the following units: management (1 participant), M&E (5 participants), supply chain (1 participant), IT/M&E (1 participant), IT/communications (1 participant), and scientific (1 participant). Four other participants represented the following

three government programs: National HIV/AIDS and STIs Control Program (NASCP), Federal Ministry of Health (FMOH)'s Public Health Department medical laboratory services, and M&E/Department of Health Planning, Research and Statistics (DHPRS). Finally, there were also 12 central level partners. The two partner organizations most represented were the Institute of Human Virology Nigeria (IHVN) (3 participants) and USAID (3 participants). All the following partner organizations had one representative in attendance at the workshop: the WHO, the United States Department of Defense Walter Reed Program-Nigeria (US DOD- WRP-N), the Centers for Disease Control and Prevention (CDC), the *Koninklijke Nederlandse Chemische Vereniging* (KNCV) Tuberculosis Foundation Nigeria, the Association for Reproductive and Family Health (ARFH), and the APIN Public Health Initiatives. Another partner organization, the Damien Foundation Nigeria (DFB), was representing the state level.

Thirteen of Nigeria's 36 states were represented at the workshop by 16 participants coming from Benue, Enugu (2 participants), Imo (2 participants), Kaduna, Kano, Kebbi (2 participants), Kogi, Niger, Ondo, Osun, Oyo, Rivers, and Sokoto (Figure 6), in addition to the Federal Capital Territory where the workshop was held.

Figure 6. States represented at the D2AC workshop in Abuja



The zonal level was represented by a participant from Aminu Kano Teaching Hospital (in Kano State) and one participant from the South East Zone Tuberculosis, Leprosy and Buruli Ulcer Control Program (Enugu State).

Six participants represented state TB and leprosy control programs (STBLCPs): Kebbi STBLCP (KBSTBLCP; 2 participants), Ondo State TB, Leprosy and Buruli Ulcer Control Programme, Imo

STBLCP, Kogi STBLCP, and Niger STBLCP (1 participant each). One implementing partner, DFB, was also representing the state level (Oyo State).

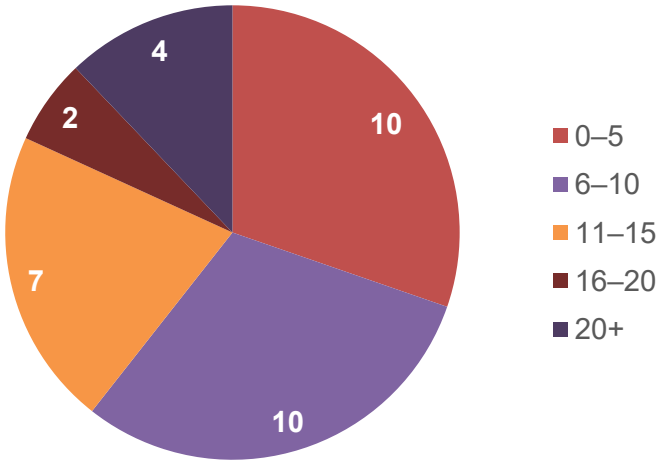
Three participants represented the LGA level: one from the Benue State local government TB and leprosy control programs (LGTBLCP), one from the Imo State LGTBLCP, and one from Enugu North LGA.

Finally, three participants represented facilities in Sokoto State, Rivers State (University of Port Harcourt Teaching Hospital - UPTH), and Kaduna State (National Tuberculosis Reference Centre in Saye, Zaria) respectively, and one participant represented the community level in Osun state (Osun State TB network of CBOs).

Two participants came from teaching hospitals: one from UPTH (Rivers State, representing the health facility level) and another from Aminu Kano Teaching Hospital (representing the zonal level). Appendix B provides the full list of participants (Table B1).

Nearly one-third of the attendees had less than five years work experience (29% – 10 participants) and 5–10 years of experience (29% – 10 participants). Twenty-one percent had 11–15 years of experience (7 participants), and 18 percent had more than 15 years of work experience (2 participants had 16–20 years of work experience and 4 participants had more than 20 years of work experience). One participant did not provide a response (Figure 7 and Appendix B, Table B2).

Figure 7. Years of experience in TB work among workshop participants



Workshop Proceedings

Workshop Opening

The opening address was given by Drs. Obioma Chijioke-Akaniro, Monitoring and Evaluation Manager at the NTBLCP and Chukwuma Anyaike, NTBLCP Coordinator; Chika Obiora-Okafo, Project Management Specialist (SI), USAID/Nigeria; and Dr. Hassan. Ms. Chauffour concluded the opening words of welcome. Dr. Anyaike was unable to attend the entirety of the workshop

after giving his opening address, hence why the subsequent sections only mention 40 participants.

The D2AC team lead presented the workshop overview, including its purpose and how the findings would be used, and the D2AC assessment approach and Toolkit.

The D2AC team lead applied a mixed methods approach conducted in three parts: (1) participants completed the D2AC Toolkit's data collection instrument first individually and then in groups; (2) individually and then in groups, participants provided evidence and justification in the data collection instrument for the response options selected; and (3) in groups, participants identified priority actions for post-workshop implementation. A semi-structured questionnaire and focus group discussion method were implemented during the assessment.

The D2AC team lead facilitated the workshop with the use of slides and handouts. There were also several break-out group activities and report-backs. The D2AC team lead introduced the objectives of the workshop, the background of the Toolkit's development and method, the workshop approach, and the Toolkit in detail, tab-by-tab.

The Nigeria country profile was developed by a D2AC core team member, Yanira Garcia-Mendoza, M&E Officer for TB DIAH, JSI (who was not facilitating the workshop), with support from the TB DIAH—Nigeria team, in parallel to the workshop taking place. The country profile is provided in Appendix C.

Individual Instrument Completion

The 40 participants were invited to fill out the D2AC data collection instrument individually with the help of the D2AC Glossary (Appendix D). This gave each participant the chance to explore the tool, become familiar with the instrument questions and their answer options (Appendix E), and to indicate their views on the Nigeria TB program and information system's current status for each of the 44 capability questions associated with the five domains and 17 subdomains (Table 4). The 34 filled-out instruments were aggregated in the D2AC Data Analysis Tool. The findings from the aggregated individual responses were shared in plenary using data visualizations generated by the D2AC Data Analysis Tool. The floor was then opened for comments and questions.

Table 4. Data collection instrument questions, by domain and subdomain

Domain	Subdomain	Questions by subdomain	Questions by domain
Data Collection and Reporting	Data collection tools and workflow	6	11
	Reporting	3	
	Data quality	2	
Data Analysis and Use	Data integration and exchange	4	10
	Analytics and visualization	4	
	Dissemination and communication	2	

Leadership, Governance, and Accountability	Data use guidance	1	11
	Data access and sharing	1	
	Organizational structure and function	1	
	Leadership and coordination	2	
	Monitoring, evaluation, and learning	4	
	Financial resources	2	
Capacity Building	Data interpretation	3	8
	Skill and knowledge development	5	
Information and Communications Technology (ICT)	Hardware	2	4
	Network and connectivity	1	
	ICT business infrastructure	1	
Total number of questions		44	

Group Instrument Completion

The 40 participants were divided into eight groups of five people which were designed to be as homogeneous as possible. Each group had at least one representative from the national level, at least two representatives from the regional or state level, at least one representative from an implementing partner/non-governmental/civil society sector organization, and with at least two women in each group (Table 5). Each group had at least one member working in an M&E role (e.g., M&E officer, M&E manager, or head of M&E unit).

Table 5. Group composition for the D2AC instrument completion exercise

Group number	Number of central government staff	Number of states represented	Number of partners	Man-to-woman ratio
1	1 (NTP)	2 (one STBLCP, one community level) States: Kebbi, Sokoto	2 (both central level)	3:2
2	2 (both NTP)	2 (both STBLCP – one state level, one LGA level) States: Enugu, Kebbi	1 (central level)	3:2
3	2 (both NTP)	2 (one STBLCP, one zonal level) States: Enugu, Niger	1 (central level)	3:2
4	1 (NTP)	3 (one STBLCP, one community level actor, and the community-level partner) States: Kogi, Osun, Oyo	2 (one central, one community level)	2:3

Group number	Number of central government staff	Number of states represented	Number of partners	Man-to-woman ratio
5	1 (NTP)	2 (one LGA level, one zonal level) States: Benue, Kano	2 (both central level)	3:2
6	1 (NTP)	2 (one LGA level, one zonal level) States: Imo, Kaduna	2 (both central level)	3:2
7	2 (one from NTP and one from other government body)	1 (STBLCP) State: Ondo	2 (both central level)	3:2
8	2 (both non-NTP from other government bodies)	2 (one STBLCP, one academic institution) States: Imo, Rivers	1 (central level)	3:2

Participants were invited to fill out the D2AC data collection instrument (Appendix E) as a group. Each group discussed and built consensus on all 44 capability questions before submitting their completed instrument. The eight group instrument responses were aggregated in the D2AC Data Analysis Tool. Each group presented the scores, findings, and discussion points raised during this group exercise in plenary, by selecting a question that had prompted debate or dialogue, and the discussion was open in plenary for all groups to contribute. The findings from the aggregated group responses were then shared in plenary using data visualizations generated by the D2AC Data Analysis Tool, and the floor was then opened for comments and questions.

Co-Created Priority Actions

Following the groups' completion of the data collection instrument and plenary presentation of results, which was a moment for consensus building around the aggregate group score, the D2AC team facilitated an activity where participants individually identified the eight subdomains (out of a total of 17 in the D2AC Toolkit) that were of highest priority for action, according to their experience and results (personal opinion).

Once the eight priority subdomains were identified by tallying the individual votes (eight votes per person, to assign to eight subdomains of their choice among the 17), the D2AC facilitators asked participants to divide themselves equally across seven groups (with each group assigned one of the seven priority subdomains, once it was decided to drop the eighth so that groups could be large enough) based on their interests and votes. Participants chose what subdomain to work on and created groups of three to five people. The seven groups each filled out an implementation plan worksheet. Once submitted, the seven worksheets were compiled into a combined implementation plan. The combined implementation plan was projected on the screen, with each group presenting their suggested priority actions and rationale. The combined implementation plan was approved and validated by all attendees in plenary.

Toolkit Field Test Feedback

The field test objectives were presented to participants, and all participants were given a feedback rubric to fill out over the two days of the workshop with any comments or observations useful to the team. Feedback was also provided during the workshop (verbally) and presented in some of the group PowerPoint slides. All feedback given (written or oral) was collected, transcribed, and organized.

Workshop Closing

Dr. Obioma gave closing remarks, expressing high satisfaction with the workshop purpose, objectives, and findings. She described a valuable learning opportunity that stressed reflection and enabled the gathering of and discussions with colleagues from different levels of the TB health system. Dr. Obioma also expressed gratitude at Nigeria being selected to pave the way in the field test of the D2AC Toolkit. Ms. Chauffour gave closing words on behalf of TB DIAH and the D2AC team.

At the end of the workshop, all participants received a certificate of completion. The D2AC team collected all feedback rubrics about the D2AC Toolkit and the workshop and aggregated the results.

Data Analysis

Quantitative Data

The quantitative data from the 42 (34 individual and 8 group) data collection instruments were automatically generated using the D2AC Analysis Tool; these data included the scores by domain, subdomain, user level, etc. The scores were automatically generated and displayed in summary data tables and bar charts. Responses were averaged across subdomain, domain, and overall to derive scores for each. Although subdomains are given an equal weight in the calculation of domain aggregates, domains are weighted by the number of subdomains they include to derive the overall score. The aggregate score generation was done by David Boone, Epidemiologist, of TB DIAH, JSI; Meredith Silver, Data Systems and Use Technical Advisor, of TB DIAH, University of North Carolina at Chapel Hill (both remotely); and Jeanne Chauffour of the D2AC core team, using the D2AC Data Analysis Tool.

Qualitative Data

The qualitative data from the assessment workshop consisted of the observations, comments, and questions presented and posed in plenary and in groups; the comments entered in the individual and group data collection instruments; the work entered on the implementation plan worksheets; and the group presentations and report-backs. The group presentation takeaways and the plenary observations, comments, and questions were carefully noted in real time during the workshop. All 42 (34 individual and 8 group) data collection instruments were reviewed manually one-by-one and all comments were noted. Last, all seven group implementation plan worksheets were transcribed and analyzed.

Limitations

There are limitations to the generalizability and applicability of the findings in other contexts, given that all participants were from and were responding to questions about the context of the Nigeria TB system. The purposive sampling strategy could have led to some biases, with the most engaged or involved actors in the Nigeria TB system being invited, agreeing to attend, and participating in the two-day workshop, as opposed to other actors perhaps less engaged or involved.

It is also possible that some courtesy bias may have been introduced, meaning that participants wished to convey an image of quality that was better than reality. This may have occurred for several reasons, including the fact that they were invited by the NTBLCP's leadership and were participating in the workshop in the presence of their hierarchical superiors, and even potentially assigned to the same groups. Participants may have felt inclined to say positive things about the TB program to please superiors or to avoid receiving negative feedback. To minimize this bias, the D2AC team first asked each participant to individually share their responses, without discussing or sharing those with anyone else in the room. Subsequently, the group work was organized so that no one person could sway a group's answers or potentially, even unintentionally, inhibit other group members from freely expressing their opinions.

Ultimately, the value of the output of the workshop depended heavily on the expertise and experience of the participants. A potential limitation arises if insufficient knowledge and experience of the local system are not brought to bear when completing the tool.

Post hoc comparison of group scores is one quality assurance approach to assess the consistency and coherence of the workshop output. Divergent group scores can indicate imbalances in knowledge or experience, or of overly influential group members.

A second quality assurance technique is comparing the individual scores to the group scores. Consistency across individual and group scores provides reassurance that output is unbiased, whereas inconsistencies reveal areas that should be examined more thoroughly.

Quality is challenging to guarantee, especially when it comes to the individual tool completion exercises. All participants completed the same data collection instrument, and while it took the fastest participant just 70 minutes, it took others 3.5 hours (without interruptions), excluding those who submitted their instruments in the evening after having gotten home or the following day.

Challenges

The principal logistical challenge was the very short turn-around window to prepare the workshop, including notifying participants. Furthermore, some participants did not bring a laptop to the workshop, and had to access the Toolkit and complete the data collection instrument on Excel on their mobile phones, which was not as user-friendly an interface.

Some of the technical challenges with the data collection instrument were the fact that the questions were not always well adapted to participants who were working at the facility or community levels and were not responsible for data management or M&E.

Ethics

The D2AC team explored the need for institutional review board approval, but it was deemed not necessary by the University of North Carolina and JSI institutional review board committees.

Risks

There were no major risks associated with participating in this workshop. The non-physical risks included personal information about participants being shared with the D2AC team. This was considered of minimal risk because little or no information of a confidential nature was collected and all personal information collected during the assessment was treated as confidential; all responses aggregated in the D2AC Data Analysis Tool were anonymized before being shared back with the participants. The primary research burden for participants was the time spent providing information to the D2AC facilitators team.

All necessary precautionary measures pertaining to COVID-19 were taken, including mandatory mask wearing during the workshop, and readily available hand sanitizer in the workshop hall and on tables. Meals were served in two separate rooms to avoid crowding. Microphones were regularly disinfected after use.

Advantages

No direct benefits accrued to participants from attending this workshop. Participants were each given a transportation per diem for the two workshop days, and the 16 participants coming from outside Abuja had their flights and accommodation paid for by TB DIAH. Each participant was awarded a certificate of attendance.

At the national level, there were several important societal benefits from this assessment, namely that the NTBLCP and its partners will receive feedback on the quality of data use and evidence-based decision making in the TB program, and that useful policy and program implications, and targeted funding allocation, may result from the findings.

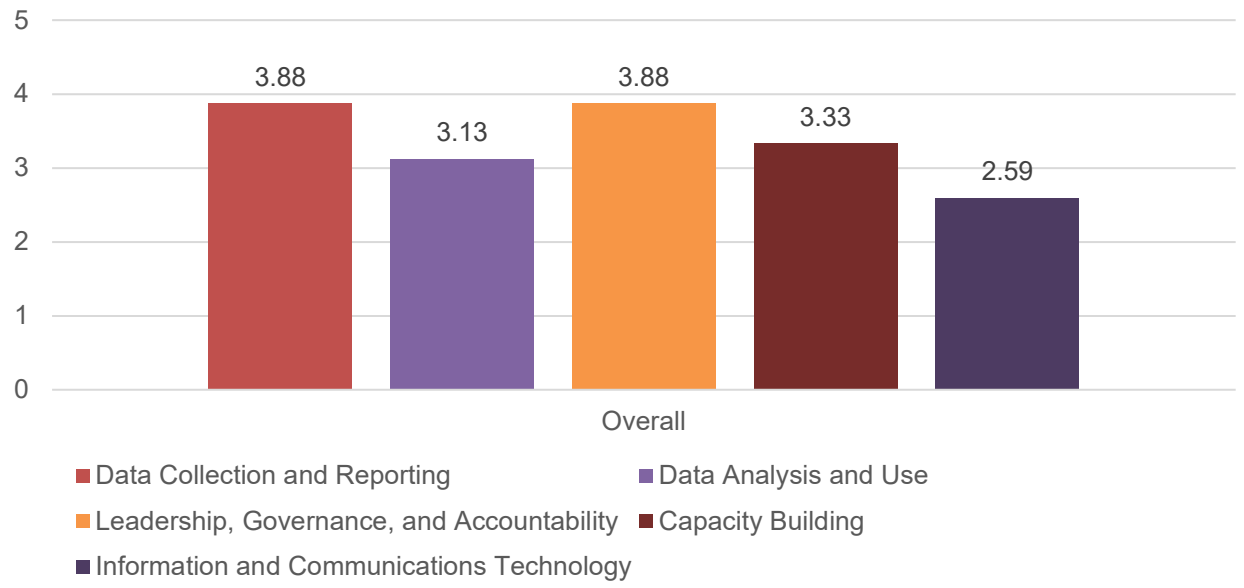
Results

Overall Results

The overall D2AC assessment score from aggregate group responses was 3.45 (out of 5), putting Nigeria at an "established" level according to the D2AC. The country performed best in domain 1 (Data Collection and Reporting, score of 3.88) and domain 3 (Leadership, Governance, and Accountability, score of 3.88), and worst in domain 5 (ICT, score of 2.59). Domain 2 (Data Analysis and Use) and domain 4 (Capacity Building) received scores of 3.13 and 3.33, respectively (Figure 8). Summary tables of results are provided in Appendix F. The answer equivalents to the aggregate group score for each of the 44 questions are highlighted in yellow in Appendix E.

The overall score from aggregated individual responses was similar, albeit slightly inferior, to the group aggregate score, with a score of 3.31 (out of 5).

Figure 8. Overall domain scores (aggregate of group responses)

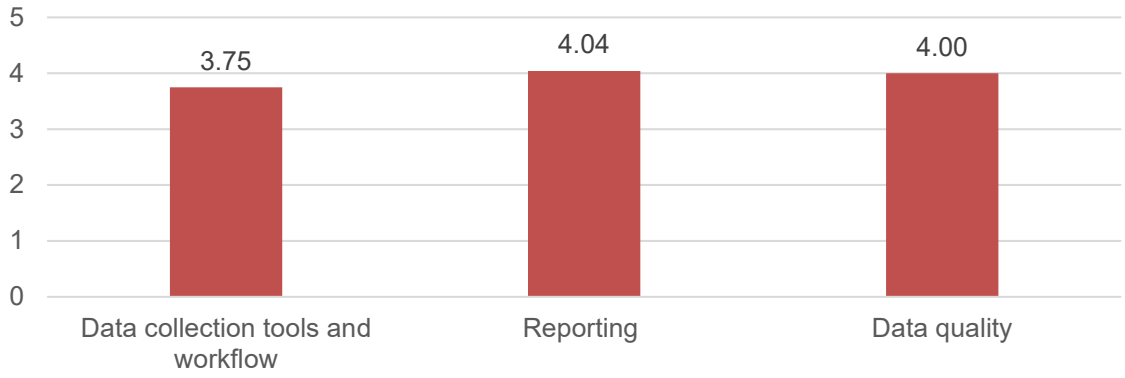


Results by Domain

Domain 1: Data Collection and Reporting

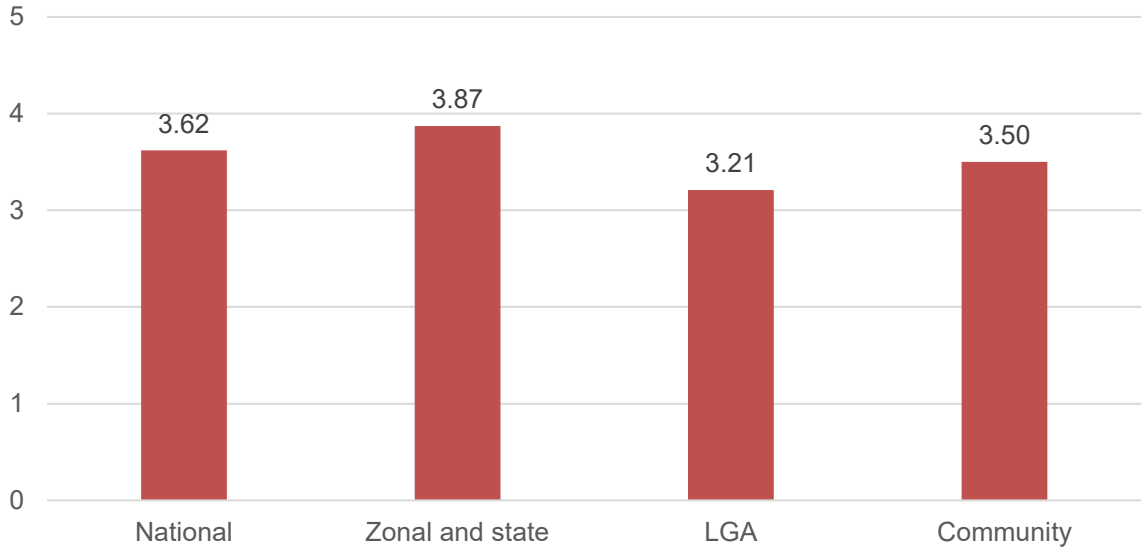
Domain 1, subdomain 1 (Data collection tools and workflow) received an aggregate score of 3.75; subdomain 2 (Reporting) received an aggregate score of 4.04; and subdomain 3 (Data quality) received an aggregate score of 4.00 (Figure 9). Domain 1, along with domain 3, was the highest performing domain.

Figure 9. Domain 1 subdomain scores (aggregate of group responses)



When looking at individual respondent data for domain 1, zonal- and state-level participants gave higher scores, on average (3.87), whereas the LGA level was the most conservative (3.21). The national-level score was 3.62 and the community-level score was 3.50 (Figure 10).

Figure 10. Domain 1 scores, by health system level (aggregate of individual responses)



The qualitative findings for domain 1 (11 questions) were that standardized paper-based data collection tools remain the primary tools for data collection especially for those at the local (community, facility, and LGA) and state level (**question 1**), although electronic tools and templates are available at certain health facilities, but that the use of this hybrid option is "suboptimal." Electronic data collection tools "are not use with the community-based organizations." The paper-based data summary is "sent to the LGA M&E who enters the data electronically to the national instance." The national HMIS instance, called the e-TB Manager,[3] is linked to the District Health Information System version 2 (DHIS2) tool. A participant added that the NTP's electronic data collection platform "is suboptimal in terms of functionality, hence

[3] Available at www.etbmanager.gov.ng

most all facilities still use paper-based data collection tools," but that the "NTP is developing a road map for standardized electronic data collection tools." Another participant shared that "a lot of challenges occur with the electronic gadgets either light, data, network issues etc." That being said, other electronic tools are also used, such as GxAlert,[4] the Open Data Kit (ODK) tool, and Pick n Pack."[5] At the state level, the STBLCPs are integrated to the NTBCLP and the national HMIS data collection system. A participant commented that "higher level electronic data entry would be better because of the volume of data." Microsoft Excel is used at the central and state levels.

The inventory of TB data collection systems (**question 2**) includes a Microsoft Excel-based system. State M&E officers get soft copies of updated data tools but this "is not usually cascaded to the LGA level." The TB data collection system inventory is "routinely updated to accommodate new information and very useful in real time decision making" but "trainings are required to adapt to the changes." Some information is updated "annually" while some is "updated based on directives of the NTBLCP." Continued updates to data collection tools are "required as new ideas may inform a shift in paradigm to program decisions making and learning." Another participant stressed the "need for a harmonized TB data collection tool." The NTBLCP also shares the "data and information with all stakeholders in organized forums."

The data collection processes (**question 3**) conducted at service delivery points, as well as the monitoring and assessment processes, align with TB service delivery guidance. However, some data collection processes "are not entirely aligned with service delivery guidance, for example data collection for the contact investigation and TB preventative treatment (TPT) cascade." Data quality assessments (DQAs) are conducted on a quarterly basis and help "to understand what our program is all about" and evaluate performance. A participant added that "adequate monitoring of the data generated from the regions and used in decision making real time."

The NTP uses a unique identification number (**question 4**) referred to as an "LGA TB number" which is assigned at the LGA level to identify and monitor diagnosed TB cases—numbers are attributed to all new TB cases enrolled in care, and cannot be shared. These numbers are associated with the facility, LGA, state, and quarter of registration (in the calendar year). The patient carries that number for the rest of the treatment. However, this does not guarantee that if the patient is lost to follow up and is enrolled in a different state without knowledge of their previous TB history, that they will not be assigned a different number—in that sense, it does not truly provide unique identity. Challenges still remain in using the LGA TB number as a unique identifier, and LGA TB numbers are not applied across all service delivery points. Indeed, "at various level of TB services and delivery, especially at the local and state levels, some sites use their own unique numbers to identify TB cases," and "tracking is not done using the LGA TB number." In plenary, the group expressed a wish to see a unique identifier for TB and MDR, for example like a fingerprint. There remains confusion between the unique ID and the national identifier. Some participants inquired about how this could be linked to the pharmacy. One of

[4] GxAlert is an automatic electronic notification service that provides immediate Xpert® MTB/RIF testing results.
[5] A dynamic logistics management information system tool that has helped further strengthen procurement and supply management in Nigeria.

the issues raised in the discussion are that patients do not present their cards, and while they have their unique ID, it is not electronic, so there are issues of identity theft and of patients being turned away due to stigma and fear of being tracked.

The NTBLCP has an updated electronic list of DOT facilities (**question 5**), to which new DOT sites are added when established. This list is web-based, accessible on DHIS2,[6] and "routinely reviewed and updated with the national master facility list (MFL) for concordance." The DHPRS of the FMOH has an electronic list that all programs use, but that one is not updated. In plenary, the group explained that the FMOH has a MFL of all 17,000 health facilities, but it will not show which are TB facilities, and it is not regularly updated. The NTBLCP routinely review their own list and disseminates it with the DHPRS, but it is not disaggregated. The FMOH's MFL is synchronized to it, with each unique code for each facility linking to the DHIS2. In the midst, the 7,000–8,000 TB facilities are linked to the MFL, but this is not the up-to-date list. The challenges seem to be a gap in synchronization, different facility codes attributed to the same health structures, the need to manually tag facilities. One participant recommended uploading the full list of DOT facilities on the website.

All TB data collection and reporting tools allow for data disaggregation (**questions 6 and 8**), specifically for age (younger or older than 15 years of age), sex (male and female), type of TB (drug-susceptible TB or drug-resistant TB and extra-pulmonary TB or pulmonary TB), and treatment regimen (including whether or not this is a new TB case). As a result, "collected data can be easily disaggregated" at all levels, and this is done before reporting occurs. However, another participant shared that "data are not properly recorded" in some facilities, with someone else adding "in as much as the M&E team review data, the quality of the data collected at the lower levels are often poor because of either incompleteness of data or inaccurate data collection." In terms of data use, data disaggregation is carried out and analyzed during quarterly and annual review meetings with the goal of "improving an effective M&E plan for collection." The regional level is also involved in assessing data quality, and afterwards, the NTBLCP reviews data from the regions to assess the disaggregated reported data summaries. Another participant added that they were aware data disaggregation was important to the NTP.

Electronic data reporting (**question 7**) is not fully implemented: it is mostly paper based from the community to the LGA level, and then an electronic template is used for reporting from the state to the central level. While standardized paper-based tools are used at the facility and LGA level in the vast majority of structures, but it is possible that they are complemented by electronic data reporting tools. As aforementioned, community-based organizations exclusively use paper-based tools. The standardized electronic data tools used at the regional and national levels are based on Microsoft Excel. A participant shared that at the LGA level, the National Electronic TB Information Management System (NETIMS) can be challenging to use. Another participant expressed that "although TB data are reported in the national HMIS, they are not integrated with the TB program data, and as a result, data on the national HMIS are often lower than that in the national TB data repository."

[6] Available at dhis2nigeria.org.ng/dhis/dhis-web-dashboard/#/

Alignment between data reporting processes and TB service delivery guidance (**question 9**) is ensured by the NTP, who reviews the data reporting process periodically (not routinely). There exists a national guideline that informs on the standardized reporting process in the country. Some revisions of the NTBLCP guidelines have been previously done and are currently ongoing.

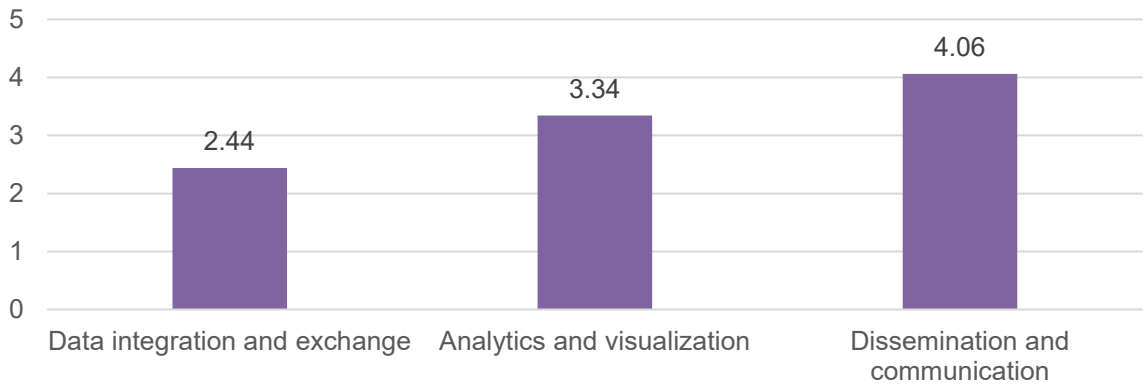
Data quality parameters (**question 10**) are defined in the updated national TB and leprosy guideline. Furthermore, DQAs are carried out quarterly to assess the quality of data reported from facilities. A participant shared that "during on-site supervisions, the NTP checks for these elements in data previously submitted," but was unable to say whether "the findings are applied to improve data collection processes." Data reviews are available annually.

Data quality reviews (**question 11**) occur monthly when conducted by the LGA TBLS for facility level data, and quarterly by the state team. DQAs are carried out quarterly to assess the quality of the data reported from the facilities.

Domain 2: Data Analysis and Use

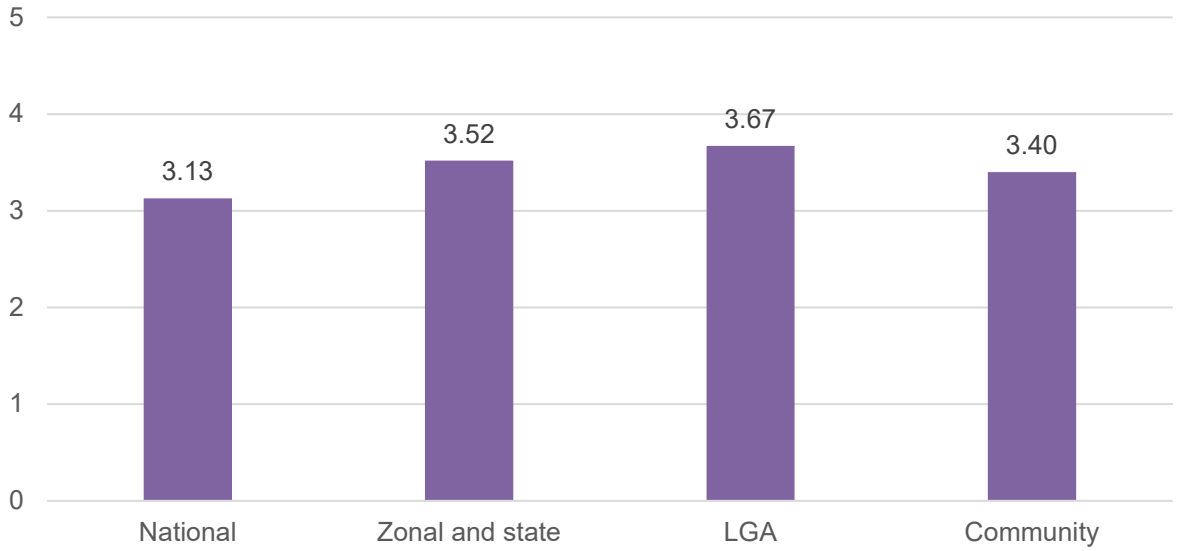
Domain 2, subdomain 1 (Data integration and exchange) received an aggregate score of 2.44; subdomain 2 (Analytics and visualization) received an aggregate score of 3.34; and subdomain 3 (Dissemination and communication) received an aggregate score of 4.06 (Figure 11).

Figure 11. Domain 2 subdomain scores (aggregate of group responses)



When looking at individual respondent data for domain 2, LGA-level participants gave higher scores, on average (3.67), whereas the national level was the most conservative (3.13). The zonal- and state-level score was 3.52 and the community-level score was 3.40 (Figure 12).

Figure 12. Domain 2 scores, by health system level (aggregate of individual responses)

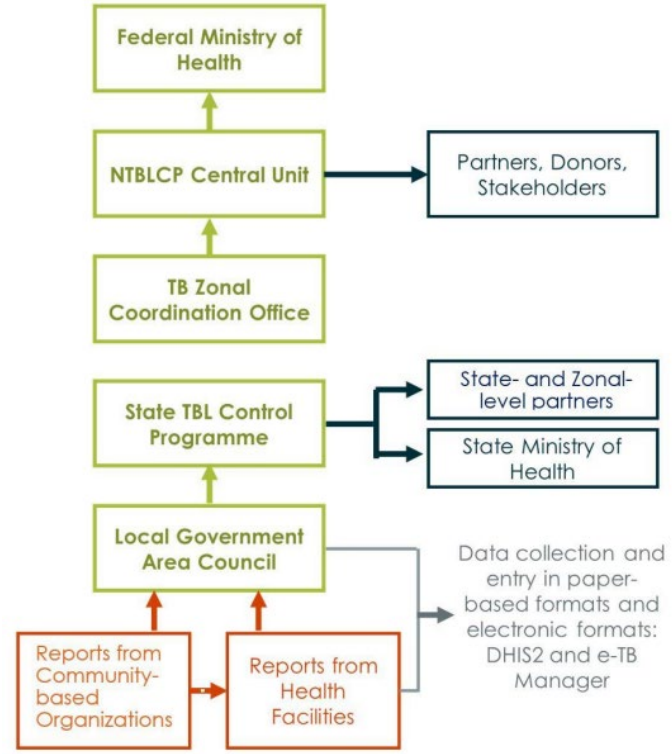


The qualitative findings for domain 2 (10 questions) were that the NETIMS has the capacity to serve as the NTBLCP's central data repository (**question 12**), although it remains suboptimal. All LGA TBLS have their central registers for data collection which are then reported to the state level; and regional TB data are collated and aggregated only at the national level. Although a central repository is available, "the reporting rate on the platform is not at 100 percent from all levels of data reporting and upload." A participant added that the central repository is "used to distribute any equipment available to the TB high burden areas." Although different electronic tools can store data, "the NTP has documented the need for one-stop data repository." In plenary, when discussing the data collection tools, the group stressed that while different electronic tools could remain in place, it was important for there to be one central data repository—the need for a "one stop shop." There appeared to be confusion as to where data were stored, and how data were linked to DHIS2. While systems are available, they are suboptimal, under-utilized, and incomplete. The NTBLCP gave the example of needing to ask USAID to access their own data, as it is stored in fragments. For example, lab data are fragmented—the lab repository does not include chest x-ray, microscopy, or culture data. One thought shared in plenary then was to imitate the model set forth by the HIV/AIDS program. The requirements for the repository are in place, in both the strategic and the M&E plan, but implementation is missing to this point. Another suggestion put forth was to add an electronic module in the EMR system—also not fully functional—to act as a repository.

Data exchange between systems at points of service and central repositories (**question 13**) is possible thanks to the linkage between GxAlert and the NETIMS, and the NETIMS and the DHIS2. This excludes laboratory data. Data can be exchanged from the LGA to the national levels. Participants were unsure about the automation of the data exchange, and were aware of other limitations. One participant shared that "regional TB data are collated and aggregated at the national level but not exchanged adequately."

Data were reported by participants to only flow (**question 14**) between GxAlert and the NETIMS and DHIS2 (Figure 13). The GxAlert system connects all GeneXpert labs with a central system for investigation results and automated data exchange. However, this is not linked to any other patient management system. Limits to data exchange occur also at subnational levels. Regional TB data are collated and aggregated at national level not exchanged adequately.

Figure 13. Flow of TB information from health facilities to the FMOH



Source: Nigeria ARC Report (TB DIAH, 2021)

Standards for TB data management and exchange are standardized (this also applies for GxAlert system only for lab investigation data) and there exists data exchange between the e-TB Manager and the DHIS2 (**question 15**). New partners for data exchange require certification.

Users' ability to conduct analyses and develop visualizations (**question 16**) is mostly limited to the regional and national levels and entirely "absent from some facilities." A participant shared that "the capacity for analysis is low at sub-regional and facility levels, and sometimes there at the facility level." Another participant added that they "don't draw charts but from our records we discuss reasons for poor performance and the way forward."

Data analytics and visualizations requirements (**question 17**) are documented in the electronic tool, but the latter is not fully optimized, "which affects visualizations on the dashboard." A participant shared that "all levels are encouraged to use the data for decision making; it is part of the aspect that is assessed during a DQA."

Data sources are used (**question 18**) as "role plays and models employed to achieve program impact decisions and policies." A participant shared that the use of source data should be strengthened through e-TB Manager.

Decision support tools (**question 19**) such as the report from data analysis are "used to guide program decision and formulate policy," but other than reporting tools and visualization charts, there are no tools serving the unique purpose of serving for decision support. Indeed, decision support tool needs are documented, but not implemented. Participants from the community level said they had no such tools at the grassroots level. Beyond tools per se, the NTP has established "continuous assessment findings and improvement mechanisms" and "program quality efficiency (PQE) are used in some instances for quality improvement." Many participants were unclear as to the definition of decision support tools.

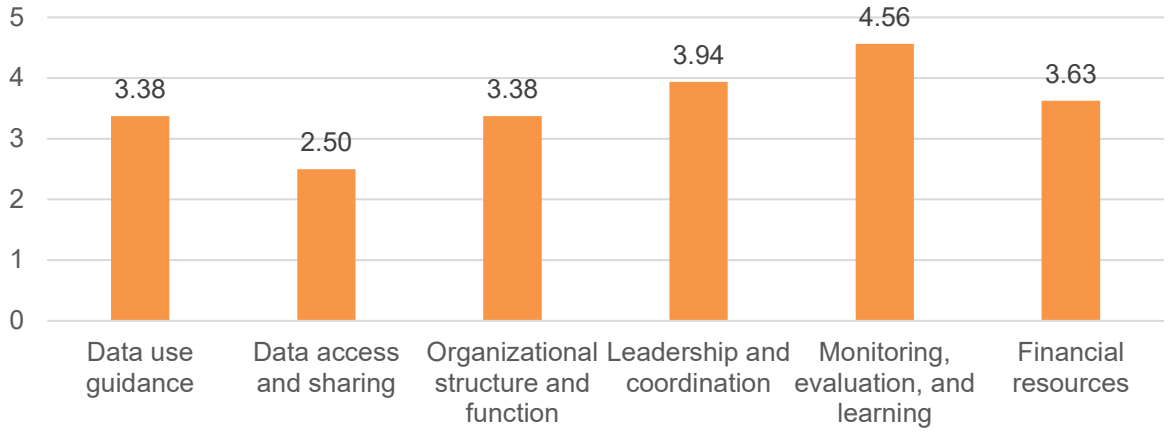
A documented national communications strategy is in place and also operational (**question 20**). A state review meeting is held at the state level, a zonal review meeting is held at the zonal level, and a data harmonization meeting is held at the national level in conjunction with partners; the results of the data analysis are communicated. During zonal review meetings, findings are cascaded back to different stakeholders, however it is "unclear if the effectiveness is monitored." As part of the advocacy efforts, the NTP adopts communication and social mobilization strategies. A participant added that "in-house monitoring to check the effectiveness of the communication strategy is done although no official assessments have been conducted."

Information products (**question 21**) are communicated from the national level to the state level. "Communiqués from each meeting are sent to stakeholders for follow-up action" and the NTP "regularly prints and distributes information product to all levels including partners and their sub-recipients (SRs)." Participants also shared that email and social media such as WhatsApp are also often used to communicate among colleagues, and even with patients.

Domain 3: Leadership, Governance, and Accountability

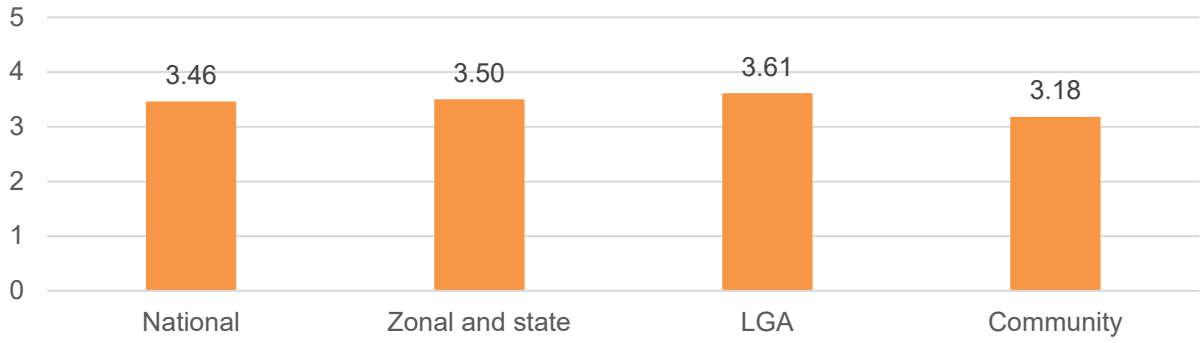
Domain 3, subdomain 1 (Data use guidance) received an aggregate score of 3.38; subdomain 2 (Data access and sharing) received an aggregate score of 2.50; subdomain 3 (Organizational structure and function) received an aggregate score of 3.38; subdomain 4 (Leadership and coordination) received an aggregate score of 3.94; subdomain 5 (Monitoring, evaluation, and learning – MEL) received an aggregate score of 4.56; and subdomain 6 (Financial resources) received an aggregate score of 3.63 (Figure 14). Domain 3 subdomain 5 was the highest performing subdomain. Domain 3, along with domain 1, was the highest performing domain.

Figure 14. Domain 3 subdomain scores (aggregate of group responses)



When looking at individual respondent data for domain 3, LGA-level participants gave higher scores, on average (3.61), whereas the community level was the most conservative (3.18). The national-level score was 3.46 and the zonal- and state-level score was 3.50 (Figure 15).

Figure 15. Domain 3 scores, by health system level (aggregate of individual responses)



The qualitative findings for domain 3 (11 questions) were that an SOP for data use guidance exists at the NTBLCP level and it is shared with the state level (**question 22**). There is strong adherence to this data use guidance.

In terms of data sharing, the NTP shares data to relevant stakeholder as necessary (**question 23**), including the IHVN data from public-private mix (PPM) facilities in the 21 states where the PPM is implemented. Data are shared/disseminated using various methods that include the various program review meetings at all levels, the partners/stakeholders meeting, dissemination of reports etc. Data sharing "is done to ensure compliance with data use guidance and policies."

Job descriptions exist at all levels and roles are well defined but it is unclear if they include specific data use responsibilities (**question 24**). Participants mentioned that data are shared with stakeholders based on demand, and not on job function. A participant shared that the regional level has clear roles defined, and that the supporting documentation is the NTBLCP National Treatment Guideline.

The interagency leadership and coordination team (**question 25**) leads the annual reviews of TB data use activities at the national level (regional representations).

Standard operating procedures related to annual TB data review or data quality review meetings do not exist (**question 26**), although the meetings exist. Leadership and coordination are assessed during DQAs, and integrated key coordination forums still lack funding (e.g., for COVID-19 integrated testing).

A MEL plan exists and is implemented at all levels in a cascade (**question 27**). The MEL plan is an important fixture of the annual review meetings. The IHVN's MEL plan is part of the program implementation.

No comments were provided by participants for **questions 28** and **29**.

MEL support to program improvement (**question 30**) is evidenced from program decisions made based on the data reported and evaluated. One participant shared that "the TB program at all levels has improved due to an effective MEL."

There is no dedicated budget for data use (**question 31**), but "budgets are allocated for M&E activities" (the M&E and strategic plans are fully costed). Data use activities are implemented during any of the M&E activities and other program activities. The IHVN has a budget for visualization tools and graphs. There appear to be low budget support for data use activities at most levels in the NTP, but "different projects and interventions have different budgets and these have specific data use budgets." In plenary, this question led to much deliberation about budgets that exist but funding not necessarily made available for interventions, not necessarily being adequate, and the budgets not always being shared.

The majority of funding for implementing NTP activities (**question 32**) comes from donors, including the Global Fund to Fight AIDS, Tuberculosis and Malaria's (Global Fund) new funding model (NFM) grants.

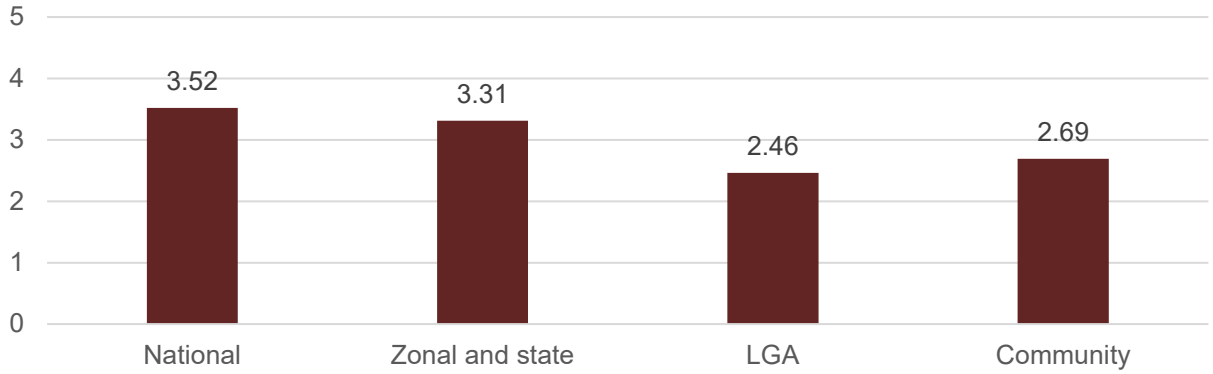
Domain 4: Capacity Building

Domain 4, subdomain 1 (Data interpretation) received an aggregate score of 3.63 and subdomain 2 (Skill and knowledge development) received an aggregate score of 3.16 (Figure 16).

Figure 16. Domain 4 subdomain scores (aggregate of group responses)

When looking at individual respondent data for domain 4, the national- and zonal/state-level participants gave higher scores, on average (3.52 and 3.31, respectively) while the LGA level was the most conservative (2.46). The community-level score was 2.69 (Figure 17).

Figure 17. Domain 4 scores, by health system level (aggregate of individual responses)



The qualitative findings for domain 4 (8 questions) were that some participants reported that data use forums (**question 33**) exist through the M&E technical working group (TWG) and are well-structured at all levels but are not funded while others said that these did not exist at the LGA and facility levels. However, another participant confirmed that the STBLCP "are part of data use forums at the regional and national levels through data review meetings." Participants did not know if it was monitored as a performance indicator.

Data reviews (**question 34**) are conducted by the MEL team at regional and national levels, and "quarterly at all levels of implementation." DQAs are conducted by a team of M&E officers from the NTBLCP and partners. A participant shared that "some program staff conduct data review at all levels" and that "in some instances, where it occurs, the monitoring and assessment data are used to improve implementation of actions identified in the data review."

The national and regional NTP staff receive on-site supportive supervision by the WHO on behalf of the NTBLCP (**question 35**). A participant shared that "few NTP staff can mentor or coach peers on data use." Pre-service training programs for skill and knowledge development developed by the NTP (**question 36**) "are receiving dwindling support" and "not all staff can attend pre-service due to a funding deficit" (the previous training of trainers was tied to funding, so now it is ad hoc). The NTBLCP has a training center (called the National TB and Leprosy Training Center [NTLTC]) for program staff in Kaduna state where "staff at all levels are supposed to go for pre-service training" However, this is often "limited due to the unavailability of funds and space." While pre-service training used to be more regular, the practice is currently "ad hoc." A participant shared that "a university is currently collaborating with the NTLTC, and a national pre-service curriculum development was done for leprosy ten years ago" but that "there has not been national pre-service curriculum development and engagement for the TB component." Because these are not routine and do not cover all cadre of staff, only on-the-job training is consistently done for NTP staff, who "acquire their skill while on the job." The NTLTC manages the pre-service training (**question 37**), and this institution is overseen by the FMOH.

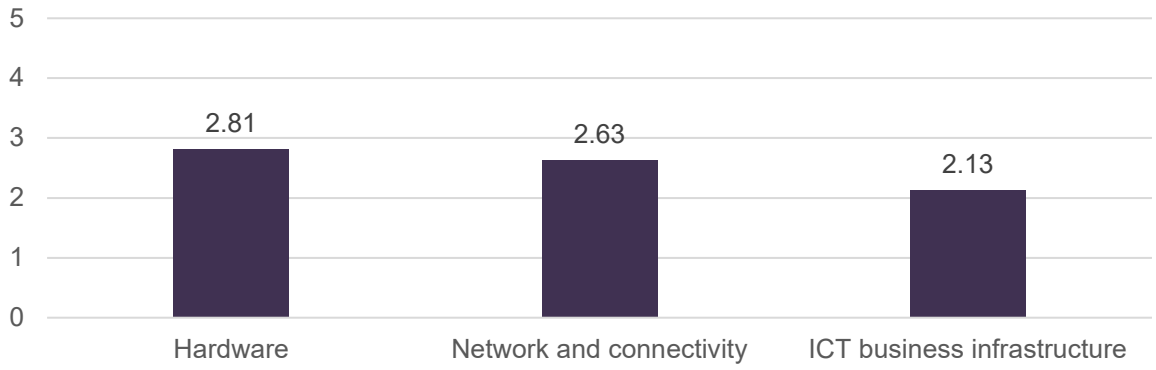
The NTP's in-service training program for skill and knowledge development (**question 38**) is ad hoc, and "implementation is low due to funding gaps." In-service training is especially effective when based on a needs assessment. Like for pre-service trainings, these are not routine activities and "do not cover all cadre of staff." In-service training as part of guidance outlined by the NTP (**question 39**) is offered on topics like M&E. A participant shared that "opportunities exist for continuous training and sometimes based on program reviews." One participant shared that a behavioral change communication program should be institute to engender the right attitudes towards persons affected with TB, as there remain an important need for continuous capacity building initiatives for all stakeholders across the TB prevention and control program.

There is "insufficient funding to provide in-service training programs for all staff" (**question 40**), although they are "sometimes conducted at the LGA and state levels." Trainings needs are identified during DQA exercises and other supervisions.

Domain 5: ICT

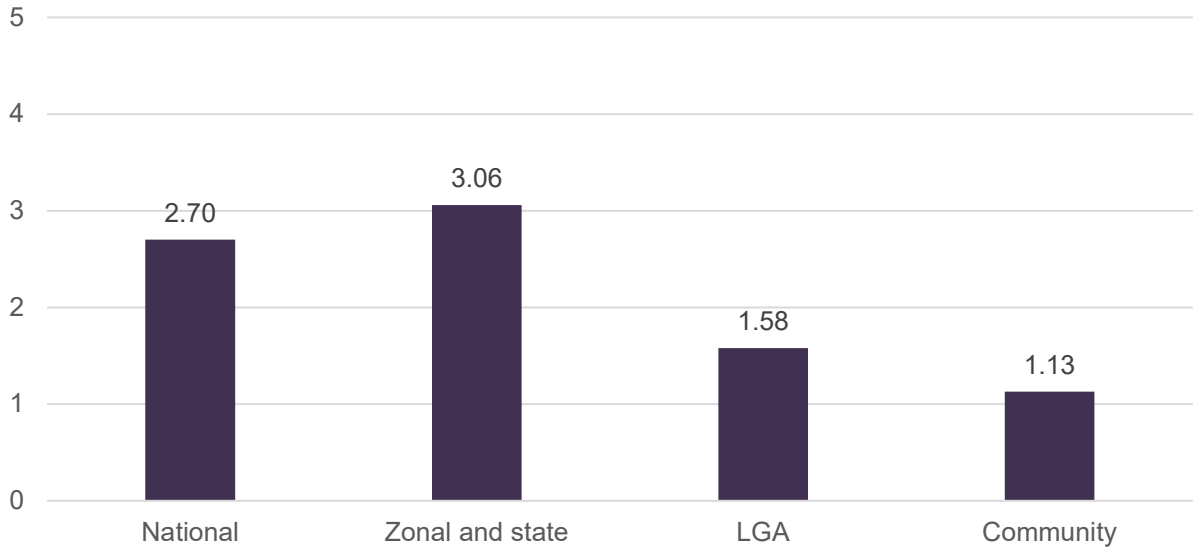
Domain 5, subdomain 1 (Hardware) received an aggregate score of 2.81; subdomain 2 (Network and connectivity) received an aggregate score of 2.63; and subdomain 3 (ICT business infrastructure) received an aggregate score of 2.13 (Figure 18). Domain 5 was the lowest performing domain, and domain 5 subdomain 3 was the lowest performing subdomain.

Figure 18. Domain 5 subdomain scores (aggregate of group responses)



When looking at individual respondent data for domain 5, zonal- and state-level participants gave higher scores, on average (3.06), whereas the community level was the most conservative (1.13). The national-level score was 2.70 and the LGA-level score was 1.58 (Figure 19).

Figure 19. Domain 5 scores, by health system level (aggregate of individual responses)



The qualitative findings for domain 5 (4 questions) were that hardware (**question 41**) is missing at subnational levels. Laptop computers are limited to "the NTP central unit, the STBLCP Manager, and some members of the STBLCP team" while most of the 774 LGA TB and Leprosy Supervisors (TBLS) do not have laptop computers. A participant shared that there are "inadequate working tools at most levels" and that "provisions are made with the funding available."

Regularity of hardware specification (**question 42**) updates are done based on the funding available which "determines what upgrade is made (following the needs assessment regularly updated)." It is unclear whether guidance exists.

Internet connectivity (**question 43**) at the subnational level is very limited, if existent at all. Subnational staff mostly rely on personal cell phone hotspots or personal modems for connectivity. At the national level, NTBLCP staff are "provided with Internet connectivity hardware like MiFi" and "the Institute for Human Virology Nigeria (IHVN) has an institution-wide Internet and staff are also provided with a communication allowance to buy data." While Internet connectivity exits at the central level, "functionality is suboptimal"—a situation that worsens at most other levels. Indeed, "Internet connectivity has been an issue that has needed to be addressed in the subnational regions as there is no reliable or adequate Internet service."

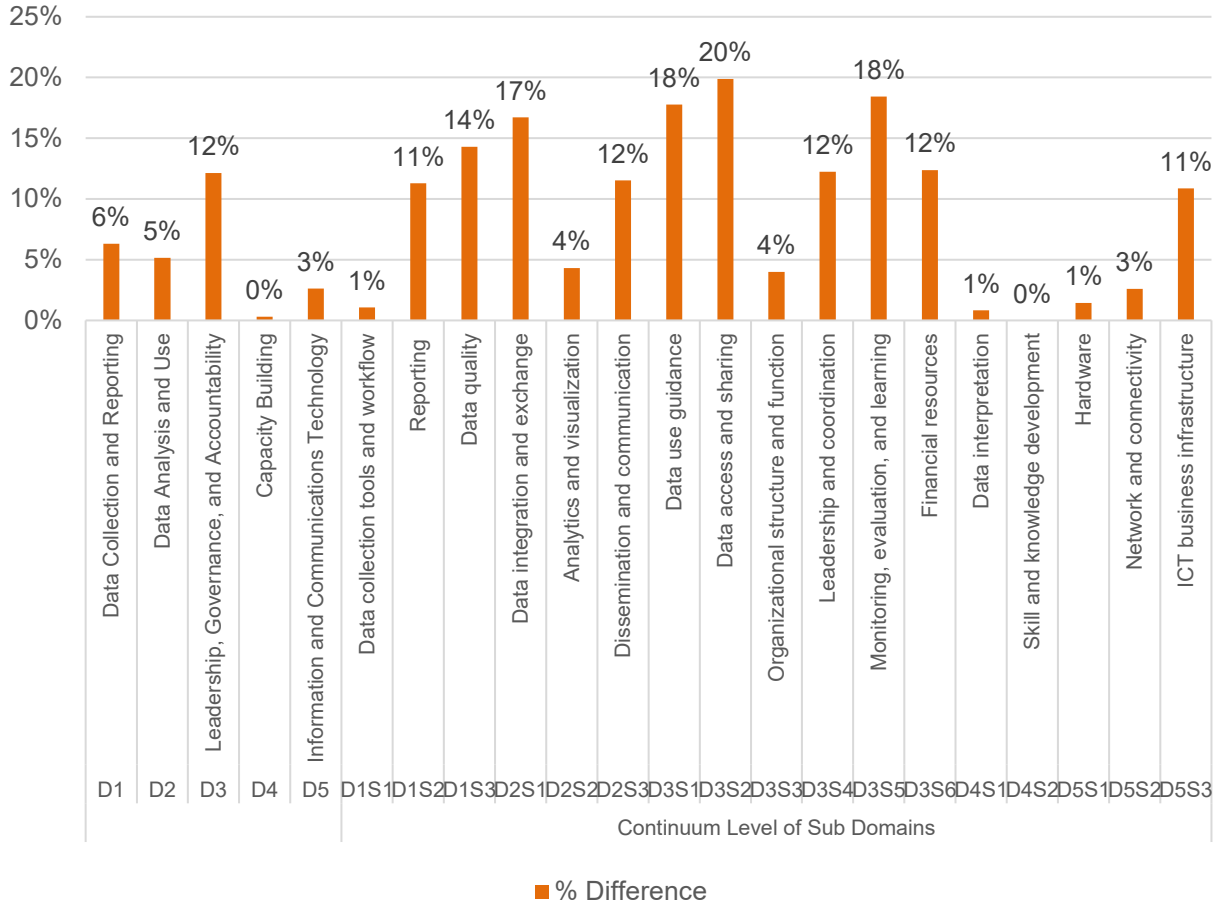
The ICT infrastructure (**question 44**) need is still very large at all levels. All regions are "supported and linked by an ICT infrastructure that gets regularly updated."

Comparing Individual and Group Results

A comparison of the individual and group responses revealed the highest disparities in scoring (a 12% difference) for domain 3 (Leadership, Governance, and Accountability). Domain 3 rated 0.42 points higher in the group responses than in the individual responses (Figure 20). Other domains, like domain 4 (Capacity Building), saw no difference (0.01 point difference in average

score between group and individual responses). At the subdomain level, the largest differences were for domain 3 subdomain 2 (20% difference), subdomain 1 (18%), and subdomain 5 (18%), and domain 2 subdomain 1 (17%). Domain 3 subdomain 2 (Data access and sharing) was scored 0.62 points lower in the group responses than in the individual responses, and domain 3 subdomains 1 (Data use guidance) and 5 (MEL) were scored 0.51 and 0.71 points lower, respectively, in the individual responses than in the group responses. Domain 2 subdomain 1 (Data integration and exchange) was rated 0.49 points lower in the group responses than the individual responses. Domain 1 subdomain 1 (Data collection tools and workflow), and domain 5 subdomain 1 (Hardware), in addition to both subdomains in domain 4 (Data interpretation; Skill and knowledge development), saw very little difference across responses when comparing individual and group aggregate scores (0-1% differences in scoring).

Figure 20. Difference between individual and group results, by domain and subdomain



Co-Created Priority Actions

The count of individual votes resulted in eight subdomains being identified as priority subdomains (receiving between 18 and 32 votes each). Five other subdomains received between 12 and 15 votes each, three subdomains received between 6 and 11 votes each, and finally, one subdomain received no votes at all (Table 6). The eight priority subdomains were all three

subdomains under domain 1—D1S1 (Data collection tools and workflow), D1S2 (Reporting), and D1S3 (Data quality)—D2S1 (Data integration and use), D3S2 (Data access and sharing), D3S5 (MEL), D4S2 (Skill and knowledge development), and D5S1 (Hardware).

Table 6. Number of votes by subdomain

Subdomain		Votes
D4S2	Skill and knowledge development	32
D5S1	Hardware	24
D2S1	Data integration and exchange	23
D3S2	Data access and sharing	23
D1S3	Data quality	20
D1S1	Data collection tools and workflow	18
D3S5	Monitoring, evaluation, and learning	18
D1S2	Reporting	18
D5S2	Network and connectivity	15
D5S3	ICT business infrastructure	14
D3S6	Financial resources	14
D4S1	Data interpretation	12
D3S4	Leadership and coordination	12
D2S2	Analytics and visualization	11
D3S3	Organizational structure and function	9
D2S3	Dissemination and communication	6
D3S1	Data use guidance	0

Of the eight highest scoring subdomains, the 31 participants attending the second day of the workshop chose to focus on seven subdomains, excluding D1S2 (Reporting) so that groups would be large enough to stimulate conversation. For the seven subdomains evaluated, the groups came up with 40 priority actions in a combined implementation plan (Appendix G).

For D1S1 (Data collection tools and workflow), three participants suggested that the priority actions should be to develop and use standardized electronic data collection tools at all levels, integrate all electronic data tools, develop standard operating procedures (SOPs) for data collection at all levels, build capacity on data collection and workflow, align unique identifiers for TB cases with national identifiers, and integrate NTP facility list into the national master facility list.

For D1S3 (Data quality), five participants suggested that the priority actions should be to harmonize and validate data at the LGA level, conduct effective supportive supervision at all service delivery points (state, facility, and community levels), build capacity in the area of documentation, data processing, validation, and reporting, sustain data validation, harmonization, data sharing and exchange meetings across all stakeholders at national, state, and LGA levels, deploy electronic data capturing tools (with in-built data quality checks) across all service delivery points, and review tools and their availability.

For D2S1 (Data integration and exchange), five participants suggested that the priority actions should be to develop a policy for a centralized platform for the NETIMS to subsume every other platform currently in place (including the development of related guidelines and SOPs), develop a central data repository with the capacity to interact with different electronic TB platforms, and procure a cloud service to house said central data repository.

For D3S2 (Data access and sharing), four participants suggested that the priority actions should be to build the capacity for existing data sharing SOP for seamless data sharing (by reviewing existing data sharing protocols, SOPs, and guidelines to assess its capacity to support seamless data sharing), increase access to the database (by creating specific profiles with defined levels of access to database for different stakeholders—e.g., funders, implementing partners, etc.), and train staff and stakeholders on the use of the access profiles created.

For D3S5 (MEL), five participants suggested that the priority actions should be to organize annual national-level and state-level M&E TWG meetings and use the monitoring data to review and update the existing MEL plan (the meeting should include discussions on performance findings, gaps/challenges, innovative solutions and future recommendations, and should use the measurement of health outcomes to prioritize program interventions), strengthen existing meetings of the national and state level TWGs (and potentially increase frequency), conduct in-process/mid-term evaluation for continuous monitoring and improvement of program interventions at the national and state levels, hold capacity building and training events at the national and state levels, conduct mentoring and supportive supervision at the national, state, and LGA levels, conduct a DQA, data sharing and exchange at the national and state levels, plan meetings at LGA level to discuss activities to be carried out daily, weekly or quarterly, hold best practice routine meetings to discuss performance findings, gaps, challenges, find innovative solutions, and provide recommendations, and implement a DQA at the LGA level.

For D4S2 (Skill and knowledge development), four participants suggested that the priority actions should be to implement pre-service training at all levels of health trainings, provide performance-based incentives from national to facility levels, conduct monitoring and assessment of in-services training to determine the knowledge transfer, expand partnership with relevant stakeholders to offer opportunities and incentives to promote continuous education of staff at all levels, review routine assessment plan for the training programs as part of the MEL activities to gauge skill and knowledge of trainees, and establish peer mentorship between the state and national level, or between states (regarding data use, data management, M&E).

For D5S1 (Hardware), five participants suggested that the priority actions should be to assess hardware needs (what we have vs what we need) at all levels from the national level to the

facility level, procure laptops, printers, projectors and external hard drive for the national level, procure laptops, printers, projectors Internet routers for states, procure laptops, external hard drive and mobile WiFi for LGA TBLS, procure tablets, power bank and data bundle for DOT facilities, conduct hardware specification and follow-up, and replace hardware periodically.

Field Test

The field test component findings will be the object of a series of meetings among the D2AC team members to update the Toolkit before its publication. The Nigeria field test was preceded by a first field test in Ghana in March 2022. The findings from these field tests will be published in the Journal of Global Health in 2022 and will be made available at https://www.tbdiah.org/assessments/d2ac. The Ghana field test report is also available at this link.

Discussion

The April 2022 D2AC assessment in Nigeria shed light on the perceived weaknesses of the Nigeria TB information system, namely in the domain of ICT, where hardware, network and connectivity, and ICT business infrastructure received the lowest scores across the groups, on average. Hardware shortages were one of the most important stated concerns when examining the reasons for the lack of data use or lack of strong data use practices. Many facilities lacked essential hardware for data reporting, analysis, visualization, and communication. Significant hardware needs existed at the facility, LGA, and state levels.

Network and connectivity are essential to send information. In the context of COVID-19, Internet accessibility is also instrumental for conducting virtual meetings and training in the era of democratization of remote work.

In addition to the challenges of physical resources, equipment, and infrastructure, other challenges revealed concerned improvements that could be made were around data management and use practices, functionalities, and capabilities, specifically: data integration; data exchange and interoperability; and data access and sharing. These areas received scores lower than 3 out of 5, meaning that they were identified as being at a “defined” stage on the continuum.

While many systems are in place, many are suboptimal, outdated, underutilized, or not synchronizing properly with parallel systems. This reflects a programmatic gap with systems that exist but that are not operating optimally—whether it be the central data repository, the MFL, the use of unique identifiers.

At the lower levels, it was expressed that there was a reluctance to introduce a new measure or check that would not be sustainable, because while expensive to set up something new, it is even more expense to have to go back and put it back in place if it did not catch on and work/become sustainable the first time around.

The D2AC assessment in Nigeria shed light on the areas that were performing the best. They included aspects of data availability practices, such as data reporting, data quality, and data dissemination and communication. Another strong area was MEL. These areas received scores superior to 4 out of 5, meaning that they were identified as being at an “institutionalized” stage on the continuum. A worthwhile observation about these three top-performing subdomains is that they were also among the eight selected as priority subdomains for action (data quality receiving 20 votes and data reporting and MEL both receiving 18 votes), illustrating that while there was consensus about their strength, there still remains a lot of progress to be made. It is also worth noting that all three subdomains of the highest performing domain (domain 1, scoring at 3.88) were selected as areas for priority action.

The D2AC records data in two ways: individual and group responses. The individual responses provided an opportunity for workshop participants to orient themselves to the content of the tool and engage in forethought on the maturity of the various capabilities, subdomains, and domains. The group-level exercise provided an opportunity for participants to derive a consensus view following discussion among themselves. The group-level results should be

considered the more reasoned responses, given that a post hoc analysis of group constitution yielded reassurance that the appropriate background and experience were present in the groups. The individual responses could be used to validate the group responses if they were not substantially different (that is, if they were similar, it could be reasonably assumed that the group responses reflected the actual maturity of the system). If individual and group responses differed significantly, a comparison of individual and group responses at the capability and subdomain level could provide insight on the disparity. For example, the comparison may reveal that individual respondents lacked significant background or experience, or it could bring to light an overly influential group member. Differences in individual versus group responses do not indicate bias in the responses per se, rather, the potential for such that should be evaluated further and rectified, if possible.

Upon reveal of the aggregate group score, some comments were raised concerning the perceived high score achieved by Nigeria. In order to test for potential bias, with the hypothesis that the participants most knowledgeable about the answers to the questions in the instrument would be scoring more accurately (in this case, the suspicion was that they were scoring more conservatively) than those less knowledgeable and perhaps more inclined to score generously, a sub-sample of five instruments from participants identified as being among the most reliable, knowledgeable, and objective assessors, were jointly analyzed. The expectation was that their combined aggregate score would be lower than 3.31, the aggregate combined score of all individual instruments (which was already inferior to the 3.45 score from the aggregate group instruments), illustrating that their more conservative answers, although more accurate, were being overpowered by more people rating more generously. The result was the opposite, with the aggregation of the five respondent instruments achieving an overall score of 3.35, with a score of 3.69 for domain 1, 3.11 for domain 2, 3.54 for domain 3, 3.82 for domain 4, and 2.55 for domain 5. As a result, it was concluded that their scoring was not being overpowered by the other 29 instruments, and these results were not integrated into the analysis.

Recommendations

The recommendations are presented in two parts. The first part discusses recommendations developed in plenary and by consensus by all workshop participants. They are described in detail in the implementation plan (Appendix G). The second part presents, in greater breadth, recommendations that apply to the Nigeria context. They are based on the average scores in the D2AC data collection instrument, and were both generated from the priority actions for implementation tab in the D2AC Data Analysis Tool and inspired by the group discussions during the workshop.

Priority Recommendations from Combined and Validated Implementation Plan

As previously mentioned, the priority recommendations were developed in small groups, combined in a joint implementation plan in plenary, and validated by the workshop participants. The priority recommendations are:

1. Develop and use standardized electronic data collection tools at all levels
2. Integrate all electronic data tools
3. Develop SOPs for data collection at all levels
4. Build capacity on data collection and workflow
5. Align the unique identifier for TB cases with the national identifier
6. Integrate NTP facility list into the national master facility list
7. Harmonize and validate data at the LGA level on a monthly basis
8. Conduct effective supportive supervision at all service delivery points (state, facility, and community levels)
9. Build capacity in the area of documentation, data processing, validation, and reporting
10. Sustain data validation, harmonization, data sharing and exchange meetings across all stakeholders at national, state, and LGA levels
11. Deploy electronic data capturing tools (with in-built data quality checks) across all service delivery points
12. Review tools and their availability
13. Develop a policy for a centralized platform for the NETIMS to subsume every other platform currently in place, including guidelines and SOPs
14. Develop a central data repository with the capacity to interact with different electronic TB platforms
15. Procure a cloud service to house the central data repository
16. Review existing data sharing protocols, SOPs, and guidelines to assess its capacity to support seamless data sharing
17. Create specific profiles with defined levels of access to database for different stakeholders (funders, implementing partners, etc.)
18. Train of staff and stakeholders on the use of the access profiles created
19. Organize annual national-level and state-level M&E TWG meetings and use the monitoring data to review and update the existing MEL plan. The meeting should include discussions on performance findings, gaps/challenges, innovative solutions and future recommendations, and should use the measurement of health outcomes to prioritize program interventions.

20. Strengthen existing meetings of the national and state level TWGs (and potentially increase frequency)
21. Conduct in-process/mid-term evaluation for continuous monitoring and improvement of program interventions at the national and state levels
22. Hold capacity building and training events at the national and state levels
23. Conduct mentoring and supportive supervision at the national, state, and LGA levels
24. Conduct a DQA, data sharing and exchange at the national and state levels
25. Plan meetings at LGA level to discuss activities to be carried out daily, weekly or quarterly
26. Hold best practice routine meetings to discuss performance findings, gaps, challenges, find innovative solutions, and provide recommendations
27. Implement a DQA at the LGA level
28. Implement pre-service training at all levels of health trainings
29. Provide performance-based incentives from national to facility levels
30. Conduct monitoring and assessment of in-services training to determine the knowledge transfer
31. Expand partnership with relevant stakeholders to offer opportunities and incentives to promote continuous education of staff at all levels
32. Review routine assessment plan for the training programs as part of the MEL activities to gauge skill and knowledge of trainees
33. Establish peer mentorship between the state and national level, or between states (regarding data use, data management, M&E)
34. Assess hardware needs (what we have vs what we need) at all levels from the national level to the facility level
35. Procure laptops, printers, projectors and external hard drive for the national level
36. Procure laptops, printers, projectors Internet routers for states
37. Procure laptops, external hard drive and mobile WiFi for LGA TBLS
38. Procure tablets, power bank and data bundle for DOT facilities
39. Conduct hardware specification and follow-up
40. Replace hardware periodically

Other Recommendations, by Domain and Subdomain from the D2AC Toolkit and Group Feedback

This section lists the benchmarks and recommendations generated by the D2AC Toolkit's Priority Actions for Implementation function based on the subdomain scores, combined with the recommendations shared by the groups in small group discussions and in plenary.

Domain 1: Data Collection and Reporting

For **D1S1 (Data collection tools and workflow, score of 3.75)**, the requirements to go from an established to an institutionalized level on the D2AC are the following:

1. Standardized electronic data collection tools are used at all levels and integrated with the national HMIS data collection system.
2. The inventory information is used to inform the need for a new TB data collection system.

3. Data collection processes are monitored and assessed to check alignment with the service delivery guidance.
4. Unique identifiers for TB cases are aligned with the national unique (person or patient) identifiers.
5. The NTP web-based site list is integrated in the master facility list.
6. NTP monitoring and review assesses quality of disaggregated data collection.

To reach an institutionalized level, the specific recommendations are to:

1. Use standardized electronic data collection tools often at the national and district levels including retrospective data entry.
2. Use the inventory information to inform the need for a new TB data collection system.
3. Use data collection process monitoring and assessment findings to guide revisions and updates.
4. Ensure that unique identifiers for TB cases are aligned with the national unique (person or patient) identifiers.
5. Integrate the NTP site list into the master facility list.
6. The NTP routinely reviews and updates disaggregate data collection requirement in the monitoring and evaluation (M&E) plan.
7. Develop SOPs for data collection (recommendation from a group).
8. Retrain staff on new tools when updated (recommendation from a group).
9. Harmonize the TB data collection tools (recommendation from a group).
10. Work to update the FMOH's MFL and post the updated DOT facilities list online in the meantime (recommendation from a group).

For **D1S2 (Reporting, score of 4.04)**, the requirements to go from an institutionalized to an optimized level on the D2AC are the following:

1. Standardized real time case-based electronic data reporting tools are used.
2. The NTP routinely reviews and updates disaggregated data reporting requirements in the M&E plan.
3. Routine NTP guidance revision/update guides the revision of data reporting processes.

To reach an optimized level, the specific recommendations are to:

1. Integrate standardized electronic data reporting tools into the national HMIS.
2. Ensure that the NTP routinely reviews and updates disaggregated data reporting requirements in the M&E plan.
3. Ensure that routine NTP guidance revision/update, guide the revision of data reporting processes.
4. Retrain staff on new tools when updated (recommendation from a group).
5. Deploy and optimize electronic tools to capture and report real-time data to make critical decisions to improve implementation (recommendation from a group).

For **D1S3 (Data quality, score of 4.00)**, the requirements to go from an institutionalized to an optimized level on the D2AC are the following:

1. High quality data is available for at least the priority data elements for at least the last 5

years.
2. The NTP uses DQA findings to improve the data and capacity to collect and report good quality data.

To reach an optimized level, the specific recommendations are to:
1. Document data biases and adjusted in analysis for data to be comparable across sources and time.
2. Use DQA findings to improve the data and capacity to collect and report good quality data.

Domain 2: Data Analysis and Use

For **D2S1 (Data integration and exchange, score of 2.44)**, the requirements to go from a defined to an established level on the D2AC are the following:
1. An electronic central data repository collates aggregate program data only at the national level.
2. Data exchange between systems at points of service for TB cases and reporting and/or central repositories occurs extensively on a national level and is mostly automated.
3. Data exchange between systems at points of service for laboratory testing and reporting and/or central repositories occurs extensively on a national level and is mostly automated.
4. Standards for TB data management and exchange are approved and require certification of new exchange partners for compliance.

To reach an established level, the specific recommendations are to:
1. Collate aggregate program data at the national level into an electronic central data repository acting as a “one-stop shop.”
2. Exchange data extensively on a national level and the exchange is mostly automated.
3. Approve standards for TB data management and exchange that require certification of new exchange partners for compliance.

For **D2S2 (Analytics and visualization, score of 3.34)**, the requirements to go from an established to an institutionalized level on the D2AC are the following:
1. NTP staff at national, subnational, and facility levels are able to conduct advanced analysis (e.g., cascade analysis) and develop visualizations in real time (e.g., for identifying causes of poor performance, implementation problems, and monitor and forecast services/commodities demand) as part of their M&E activities.
2. The NTP's analytics and visualization requirements are monitored and budgeted in the NTP plan.
3. Ensure that program staff routinely make decisions with data incorporated from multiple sources (e.g., to provide scenario-based, health-system level specific decision-making support and to predict the impact of decisions and policy).
4. Assessments to ensure the knowledge relevance, value, and accuracy of decision support algorithms are conducted on a regular schedule.

To reach an institutionalized level, the specific recommendations are to:

1. NTP staff at national, subnational, and facility levels conduct advanced analysis (e.g., cascade analysis) and develop visualization in real-time (e.g., for identifying causes of poor performance, implementation problems, and monitor and forecast services/commodities demand) as part of the M&E activities.
2. Monitor and budget the NTP's analytics and visualization requirements in the NTP plan.
3. Ensure that program staff routinely make decisions that require combining data from multiple sources (e.g., to provide scenario-based, health-system level specific decision-making support, and predict the impact of decisions and policy).
4. Conduct assessments on a regular schedule to ensure the knowledge relevance, value, and accuracy of decision support algorithms.
5. Strengthen the use of source data through e-TB Manager (recommendation from a group).

For **D2S3 (Dissemination and communication, score of 4.06)**, the requirements to go from an institutionalized to an optimized level on the D2AC are the following:

1. A communication strategy and its implementation are adjusted based on the assessment findings.
2. Information product dissemination is improved using monitoring and evaluation data.

To reach an optimized level, the specific recommendations are to:

1. Adjust communication strategy and its implementation based on the assessment findings.
2. Ensure that strategic communications are informed by advanced analysis in near real-time.

Domain 3: Leadership, Governance, and Accountability

For **D3S1 (Data use guidance, score of 3.38)**, the requirement to go from an established to an institutionalized level on the D2AC is the following:

1. Implementation of data use guidance is monitored and assessed by the national governing/leadership body.

To reach an institutionalized level, the specific recommendations are to:

1. Monitor and assess the implementation of data use guidance by the national governing/leadership body.
2. Data use guidance should be provided by the NTBLCP to the facility level (recommendation from a group).

For **D3S2 (Data access and sharing, score of 2.50)**, the requirement to go from a defined to an established level on the D2AC is the following:

1. Access-based control and data sharing agreements are established to allow access to and sharing of NTP data within and outside the NTP.

To reach an established level, the specific recommendation is to:

1. Establish access-based control and data sharing agreements to allow access to and sharing of NTP data within and outside the NTP.

For **D3S3 (Organizational structure and function, score of 3.38)**, the requirement to go from an established to an institutionalized level on the D2AC is the following:

1. Supervisor(s) regularly review staff data use roles using the job description to offer constructive feedback.

To reach an institutionalized level, the specific recommendation is to:

1. Staff data use roles are regularly reviewed by supervisors using the job description to offer constructive feedback.

For **D3S4 (Leadership and coordination, score of 3.94)**, the requirements to go from an established to an institutionalized level on the D2AC are the following:

1. A formal leadership and coordination team is an integral part of the NTP review and assessment process.
2. The monitoring, evaluation, and learning (MEL) team monitors and assesses ability of leadership and coordination team to lead and coordinate regularly scheduled meetings.

To reach an institutionalized level, the specific recommendations are to:

1. Make a formal leadership and coordination team an integral part of the NTP review and assessment process.
2. Use assessment findings to improve leadership and coordination team meeting outcomes.

For **D3S5 (MEL, score of 4.56)**, the requirements to go from an institutionalized to an optimized level on the D2AC are the following:

1. Monitoring data are used to inform the annual review/update of the MEL plan.
2. Health outcome measurement data are used to revise and prioritize program interventions.
3. Program performance review findings are used to routinely revise/update MEL processes.
4. The MEL data are used to continuously improve the MEL plan for achieving better program goals.

To reach an optimized level, the specific recommendations are to:

1. Use monitoring data to inform the annual review/update of the MEL plan.
2. Use health outcome measurement data to revise and prioritize program interventions.
3. Use program performance review findings to routinely revise/update MEL processes.
4. Use the MEL data to continuously improve the MEL plan for achieving better program goals.
5. Include a budgetary allocation when developing and reviewing the MEL plan (recommendation from a group).

For **D3S6 (Financial resources, score of 3.63)**, the requirements to go from an established

to an institutionalized level on the D2AC are the following:

1. Budget for data use activities is monitored and reviewed during the program review process.
2. Availability and utilization of financial resources is monitored and measured by the MEL team.

To reach an institutionalized level, the specific recommendations are to:

1. Use monitoring and review findings to revise/update the budget allocated to data use activities.
2. The MEL team monitors and measures the availability and utilization of financial resources.

Domain 4: Capacity Building

For **D4S1 (Data interpretation, score of 3.63)**, the requirements to go from an established to an institutionalized level on the D2AC are the following:

1. Performance of data use forums is monitored and assessed as part of the program performance review.
2. MEL staff routinely monitor and assess implementation of actions identified in the data review.
3. Supportive supervision is monitored to help identify technical resources NTP staff can access to meet supportive supervision needs.

To reach an institutionalized level, the specific recommendations are to:

1. Use monitoring and assessment findings to improve the performance of data use forums.
2. Ensure that MEL staff routinely monitor and assess implementation of actions identified in the data review.
3. Monitor supportive supervision to help identify technical resources that NTP staff can access to meet supportive supervision needs.

For **D4S2 (Skill and knowledge development, score of 3.16)**, the requirements to go from an established to an institutionalized level on the D2AC are the following:

1. Pre-service training programs are monitored and assessed for their effectiveness and relevance.
2. The NTP offers opportunities and incentives to promote pre-service training of potential staff.
3. In-service training programs are monitored and assessed for their effectiveness and relevance.
4. Training institutions offer opportunities and incentives to promote continuous education of staff at all levels.
5. Assessment of training programs is routinely conducted as part of the MEL activities to gauge skill and knowledge of trainees.

To reach an institutionalized level, the specific recommendations are to:

1. Implement a national pre-service training program for all cadres of the NTP.
2. Ensure that the NTP offers opportunities and incentives to promote pre-service training

of potential staff.
3. Monitor and assess the in-service training programs for their effectiveness and relevance.
4. Make certain that training institutions offer opportunities and incentives to promote continuous education of staff at all levels.
5. Routinely assess the training programs as part of the MEL activities to gauge skill and knowledge of trainees.
6. Institute a behavioral change communication program to engender the right attitudes towards persons affected with TB (recommendation from a group).

Domain 5: ICT

For **D5S1 (Hardware, score of 2.81)**, the requirements to go from a defined to an established level on the D2AC are the following:

1. Hardware needs are documented and national offices have adequate hardware, including backup services.
2. Hardware specifications are documented and followed in procurement at all levels.

To reach an established level, the specific recommendations are to:

1. Guarantee that national and subnational offices have adequate hardware, including backup services.
2. Document and follow hardware specifications in procurement at all levels.

For **D5S2 (Network and connectivity, score of 2.63)**, the requirement to go from a defined to an established level on the D2AC is the following:

1. Adequate dedicated network and Internet connectivity exist at the national and subnational level sites.

To reach an established level, the specific recommendation is to:

1. Establish an adequate dedicated network and Internet connectivity at national and subnational levels to operate the TB HIS.

For **D5S3 (ICT business infrastructure, score of 2.13)**, the requirement to go from a defined to an established level on the D2AC is the following:

1. An ICT operations and maintenance plan is being implemented at the national level.

To reach an established level, the specific recommendation is to:

1. Implement an ICT operations and maintenance plan at the national level.

Conclusion

Despite progress toward ending TB worldwide, combating TB remains a high priority in Nigeria, especially in the COVID-19 era where TB case notification, screening, and contact tracing—all three imperative to contain the epidemic and strive to eliminate TB—are being severely impacted and where Nigeria still faces among the world's highest burdens for TB, TB/HIV, and MDR/RR-TB. The D2AC assessment in Nigeria highlighted both the high-performing elements of the NTBLCP's data use capabilities and the challenges that should be addressed to improve evidence-based decision making. The assessment revealed good performance in certain dimensions of the D2AC, such as MEL, dissemination and communication, reporting, and data quality. However, it also revealed important gaps, such as the availability of hardware at all levels, the reliability of network and connectivity, ICT business infrastructure, and data integration, access, sharing, and exchange. These findings provide evidence of the areas needing programmatic interventions, and can also inform policymakers, donors, and program managers who want to design and implement responsive programs and interventions to strengthen and improve data use capabilities for evidence-based decision making to provide targeted and informed high-quality services for all TB patients and their families.

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Appendix A. D2AC Nigeria Workshop Agenda

Wednesday, April 20, 2022 D2AC Assessment Workshop Day 1 Location: Corinthia Villa Hotel, Abuja		
Time	**Description**	**Participants**
8:30–9:00	Registration	
9:00–9:45	Welcome Workshop opening addresses Introduction of all participants	Abiodun Olusegun Hassan Obioma Chijioke-Akaniro Chukwuma Anyaike Chika Obiora-Okafo Jeanne Chauffour
9:45–10:30	Workshop Overview	Jeanne Chauffour
10:30–11:00	Tea break	
11:00–11:45	Introducing the D2AC assessment approach and Toolkit	Jeanne Chauffour
11:45–1:30	Step 1: Individual review of D2AC Toolkit	All (individually)
1:30–2:30	Lunch	
2:30–4:00	Step 2: Group work (building on individual review information)	All (in groups)
4:00–4:30	Step 3: Plenary discussion on group work	All Facilitator: Charles Ohikhuai
4:30	Tea break	
Thursday, April 21, 2022 D2AC Assessment Workshop Day 2 Location: Corinthia Villa Hotel, Abuja		
Time	**Description**	**Participants**
8:30–9:00	Registration	
9:00–9:15	Welcome, day one recap and overview of day two	Jeanne Chauffour
9:15–10:45	Step 4: Presentation of aggregate group assessment data	All Facilitator: Jeanne Chauffour
10:45–11:15	Tea break	

11:15–1:30	Step 5: Plenary discussion and finalization of findings	All Facilitator: Joseph Kuye
1:30–2:30	Lunch	
2:30–3:15	Step 6: Identify priority action items	All (individually)
3:15–4:30	Step 7: Draft implementation plan for priority action items	All (in groups)
4:30–5:00	Step 8: Discuss implementation plan and next steps	All Facilitator: Abiodun Olusegun Hassan
5:00	Closing words and acknowledgments Tea break	Jeanne Chauffour Abiodun Olusegun Hassan Chukwuma Anyaike

Appendix B. D2AC Nigeria Workshop Participants

Table B1. Workshop participant list

Names of participants appear in alphabetical order by last name.

Name	Affiliation	Role
Olufemi Adegoke	Centers for Disease Control and Prevention	Molecular Lab Lead
Segun Adeshina	NTBLCP	IT/M&E Officer
Oluwaseun Adeyemo	Institute of Human Virology, Nigeria	Program Officer GF TB PPM
Deborah Ageni	STBLCP	TB Linkage Coordinator
Oluwafemi Aina	TB, Leprosy and Buruli Ulcer Control Programme, Ondo State Ministry of Health	Programme Manager
Eucharia Ajusi	Enugu State TBLCP	TBLS Enugu North
Chizoma Patience Amaka	STBLCP Imo State	TBLS
Bashir Mohammad Aminu	Aminu Kano Teaching Hospital, Kano // Zonal TB Reference Laboratory	Medical Laboratory Scientist
Chukwuma Anyaike	NTBLCP	Program Manager
Grace Asha	Benue State, LGTBLS	TBLS
Modupe Ariyo	Damien Foundation (DFB) Nigeria	M&E Officer
Obioma Chijioke-Akaniro	NTBLCP	Monitoring and Evaluation Manager
Kenneth Ekpen	KNCV Tuberculosis Foundation, Nigeria	Data Officer
Emeka Elom	Federal Ministry of Health, Public health dept, TBL & BU Control program	Deputy Director, Medical laboratory Services
Rupert Eneogu	USAID	Program Management Specialist
Ibiyemi Modupe Fakande	Osun State TB network of community-based organizations	Patent and proprietary medicine vendor (PPMV)
Shehu Auta Gele	Kebbi State (KBSTBLCP)	State TB Program Manager
Austin Ihesie	USAID	Consultant/Coordinator iNTP Nigeria
Adaobi Ikechebelu	M&E/DHPRS	Senior Scientific Officer
Mamuda Abdullahi Kamba	Kebbi State TBLCP	Quality Assurance Officer (QAO)
Michael Kingsley	NTBLCP / FMOH	Head, M&E Unit
Ismail Lawal	USDOD- WRP-N	Care and Treatment Lead
Stella Makpu	NTBLCP	Chief Scientific Officer
David Meshak	Institute of Human Virology, Nigeria	Senior Program Officer, Strategic Information
Ifeyinwa Ndubuisi	APIN Public Health Initiatives	Technical Officer Monitoring and Evaluation
Chris Obanubi	Centers for Disease Control and Prevention	Senior/Clinical Head

Name	Affiliation	Role
Chimare Obasi	NTBLCP	Monitoring and Evaluation Officer
Felicits Ngozi Obiaju	Imo State STBLCP	M&E Officer
Chika Oiora -Okafo	USAID	Project Management Specialist (SI)
Kennet Ojobor	Institute of Human Virology, Nigeria	Senior Program Officer- Strategic Information
Inume Ojule	University of Port Harcourt Teaching Hospital (UPTH)	Consultant
Ojo Ol -Mathews	Association for Reproductive and Family Health (ARFH)	Monitoring and Evaluation Officer
Olawu Olarewaju	NTBLCP	M&E Unit
Amosmoniyi	WHO	National Professional Officer TB/HIV
Oluwafmilayo Omos	NTBCLP	M&E Officer
Micha Pedro	Institute of Human Virology Nigeria	Director of Strategic Information
Step Raji	NTBLCP	IT and Communications Officer
Uba So	National HIV/AIDS & STIs Control Program (NASCP)	M&E Unit
Alhasshauibu	NTBLCP	Supply Chain specialist
Abubak Mohaed Song	National Tuberculosis Reference Centre Saye, Zaria	Scientific/Quality Officer
Obianu Ugwumgbor	Enugu State (National Tuberculosis, Leprosy and Buruli Ulcer Control Program)	South East Zonal Logistics Assistant/Data Analyst
Atu Uzma	National HIV/AIDS & STIs Control Program (NASCP)	Supply Chain Specialist
Zara'akubu	Sokoto State PMV	CBO/PPMV
Josisa	Niger State	Retired. TB Program Manager

Table B2. Workshop participant characteristics

Participant information			Percentage and count
Gender		Men	59% (n=26)
		Women	41% (n=18)
Level	Central	NTP	23% (n=10)
		Other government	9% (n=4)
		Partners	32% (n=14)
		All (subtotal)	64% (n=28)
	State		20% (n=9)
	LGA		7% (n=3)
	Health facility		7% (n=3)
	Community		2% (n=1)
Roles affiliated with USAID TB pillars		Reach	28% *
		Cure	22% *
		Prevent	27% *
		Sustain	23% *
Years of work experience		0–5	23% (n=10)
		5–10	23% (n=10)
		10–15	16% (n=7)
		15–20	4% (n=2)
		20+	9% (n=4)
		Unknown	25% (n=11) †
Individual instrument responses			77% (n=34) †
Participated in group instrument			91% (n=40) †

* No *n* is provided here because participants were able to identify with more than one pillar (and up to all four pillars), so the percentages illustrate representativeness of each pillar.

† low responses rates are due to the fact that participants who only attended the first day of the workshop in Nigeria are also included in these totals; of participants who attended the full first day of the workshop, only six of the 40 did not submit an individual instrument

Appendix C. D2AC Toolkit Nigeria Country Profile

Demographic, Geographic, and Socioeconomic Features		Response	Year	Source
Demographic				
Area/size of the country (km2)		923,768 s. km	N/A	
Notable borders		Chad, Caeroon, Benin, Niger	N/A	
Estimation of population size		206,139,5	2020	World Bank Data[1]
Administrative structure				
Regions/provinces/states (#)		4 regions/tates	2022	N/A
Districts/councils/counties (#)		8 districts774 local government areas	2022	N/A
Service delivery sites	Facility-based (#)	17,699	2020	NTBLCP 2020 Annual Report
	Community-based (#)	N/A		
Socioeconomic features				
United Nations classification		Lower-mie income	N/A	
Population below the poverty line		83 million	2020	World Bank[2]
	Rural (%)	52.00%	2019	National Bureau of Statistics Nigeria[3]
	Urban (%)	18%	2019	National Bureau of Statistics Nigeria[3]
Major revenue sources		Petroleum	2020	Britannica[4]

TB Epidemiologic Burden and Trends	Response	Year	Source
TB mortality rate	75 per 100000	2020	WHO TB Global Report 2021[5]
TB incidence	452,000 (19 per 100,000)	2020	WHO TB Profile Nigeria[6]
TB case notification rate	138,591	2020	WHO TB Profile Nigeria[6]
TB treatment coverage	30%	2020	WHO TB Profile Nigeria[6]
TB treatment success rate	88%	2020	WHO TB Profile Nigeria[6]
MDR/RR-TB incidence	2,384	2019	WHO TB Global Report 2021[5]
MDR/RR-TB treatment enrollment rate	1,584	2020	WHO TB Profile Nigeria Diagnosis, notification and treatment of rifampicin-resistant TB (MDR/RR-TB)[7]
XDR-TB incidence	15	2019	WHO TB Global Report 2021[5]
HIV coinfection rate	34,000	2020	STOP TB Partnership Nigeria Dashboard[8]
TPT coverage	240,039	2020	CDC Nigeria Country Profile[9]
WHO impact indicators			

Demographic, Geographic, and Socioeconomic Features		Response	Year	Source
Reduction in TB incidence rate (compared with 2015)		219 per 100,000 (2015); 2019 per 100,000 (2020) = 0	2020	World Bank Data[10]
Reduction in TB deaths (compared with 2015)		85 per 100,000 (2015); 75 per 100,000 (2020) = 10 per 100,000	2020	WHO TB Global Report 2021[5]
TB-affected families facing catastrophic costs dues to TB (%)		71%	2017	WHO TB Profile Nigeria[6]
NTP Laboratory and Workforce Capacity		**Response**	**Year**	**Source**
Laboratory centers (#)				
Total number of laboratories conducting TB diagnosis (#)		3,505	2020	WHO TB Global Report 2021[5]
	Microscopy centers	1,765	2014	WHO TB Global Report 2021[5]
	GeneXpert sites	399	2019	WHO TB Global Report 2021[5]
	Culture laboratories	9	2020	WHO TB Global Report 2021[5]
	Reference laboratories	10	2020	NTBLCP 2020 Annual Report[5]
Does a lab referral network exist? (Yes/No)		Yes	2014	WHO TB Global Report 2021[5]
Human resources				
NTP staff supported by government (#)		62	2021	NTBLCP staff nominal roll
NTP M&E staff supported by government (#)		8	2021	NTBLCP staff nominal roll
Resources allocated toward M&E or TB M&E ($)		N/A		
TB/HIV officers recruited under partner's support absorbed into payroll (%)		0		
TB Health Financing		**Response**	**Year**	**Source**
WHO recommended level for the country		USD 384 million needed in funding as of 2020	2020	STOP TB Partnership Nigeria Dashboard[8]
TB treatment is free (Yes/No)		Yes	N/A	
People eligible for exemptions who receive those exemptions (%)		N/A		
Proportion of population with TB who received social protection under the national health insurance scheme (%)		0		
Proportion of health budget allocated to TB services (%)		84% TB Program 4% TB-HIV	2021	WHO TB Profile Nigeria TB Finance Profile Funding by Line Item[11]
Proportion of annual TB budget funded by donors (%)		24%	2020	WHO TB Profile Nigeria[6]
Proportion of domestic TB financing (%)		7%	2020	WHO TB Profile Nigeria[6]
Proportion of cases that led to catastrophic costs due to TB (%)		71%	2017	WHO TB Profile Nigeria[6]
Research and Development		**Response**	**Year**	**Source**

Demographic, Geographic, and Socioeconomic Features	Response	Year	Source
Proportion of national TB budget allocated to research	8,839,834	2010-2015	The National Strategic Plan for TB and Leprosy Control (2010–2015)[12]
Surveys and research being conducted (e.g., prevalence surveys). Please provide name, year, and implementing/financing entity.	Patient pathway survey, 2022, Global Fund TB stigma assessment, 2022, Global Fund TB gender assessment 2022, Global Fund		

[1] https://data.worldbank.org/indicator/SP.POP.TOTL?locations=NG

[2] https://www.worldbank.org/en/programs/lsms/brief/nigeria-releases-new-report-on-poverty-and-inequality-in-country

[3] https://nigerianstat.gov.ng/elibrary/read/1092

[4] https://www.britannica.com/place/Nigeria/Economy

[5] https://www.who.int/teams/global-tuberculosis-programme/data

[6] https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&entity_type=%22country%22&lan=%22EN%22&iso2=%22NG%22

[7]https://app.powerbi.com/view?r=eyJrIjoiZDhjNDM0YmMtOGExOS00ODIxLWEzMjktZDk0NmI4YTAwODgwIiwidCI6ImY2MTBjMGI3LWJkMjQtNGIzOS04MTBiLTNkYzI4MGFmYjU5MCIsImMiOjh9

[8] https://www.stoptb.org/static_pages/NGA_Dashboard.html

[9] https://www.cdc.gov/globalhivtb/where-we-work/Nigeria.pdf

[10] https://data.worldbank.org/indicator/SH.TBS.INCD?end=2020&locations=NG&start=2015

[11]https://app.powerbi.com/view?r=eyJrIjoiMGIwZDUzMmItODE5Yi00YjAzLTliMGEtNGVhMGVlYzA4YWVkIiwidCI6ImY2MTBjMGI3LWJkMjQtNGIzOS04MTBiLTNkYzI4MGFmYjU5MCIsImMiOjh9

[12] https://www.hfgproject.org/wp-content/uploads/2015/02/Nigeria-National-Strategic-Plan-for-Tuberculosis-and-Leprosy-Control_2010-2015.pdf

Appendix D. D2AC Toolkit Glossary

Term	Definition
ad hoc	Arranged or happening when necessary and not planned in advance.
aggregate data	Compilation of individual data systems and data that could result in the totality of the information being classified and stratified at a higher level.
algorithm	A process or a set of rules to be followed in calculations or other problem-solving operations, especially by a computer; a common term used to show decision trees for diagnostic or treatment procedures (e.g., treatment algorithm; diagnostic algorithm).
aligned	The fit between the data flow and data collection or program goals and data analysis and data collection.
analytics	The process of discovering, interpreting, and communicating significant patterns in data.
capacity building	Capacity building focuses on strengthening the skills and knowledge of personnel, the management and governance of a program or project, and organizational infrastructure.
cascade analysis	Cascades are frameworks for monitoring gaps in program services needed to achieve goals and health outcomes.
case-based data	Patient-level data for a series of key or sentinel (reportable) events, used to measure and monitor the incidence, progression, and outcome of a disease.
central data repository	A centralized place to store and maintain data.
client	An individual who is a potential or current user of health services; may also be referred to as a patient or beneficiary.
commodities	A raw material that can be bought and sold.
communication strategy	An outlined method used for exchanging information that can be visual, verbal, or in written form. A plan to achieve communications objectives internal or external.
data	A reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or processing (e.g., a sequence of bits, a table of numbers, the characters on a page, and the recording of sounds made by a person speaking).
data analysis	The examination of acquired data for its significance and probative value to the case.
data audit	A guided inspection of an organization's health data registries and forms, typically by an independent body.
data collection system	A computer application that facilitates the process of data collection, allowing specific, structured information to be gathered in a systematic fashion, subsequently enabling data analysis to be performed on the information.
data element	A basic unit of information that has a unique meaning and subcategories (data items) of distinct value (e.g., gender, race, and geographic location).
data exchange	The process of taking data structured under a source schema and transforming it into a target schema, so that the target data are an accurate representation of the source data. Data exchange allows data to be shared between different computer programs.
data governance	A set of processes that ensures that data assets are formally managed throughout the healthcare system. A data governance model establishes authority, management, and decision-making parameters related to the data produced or managed by the healthcare system.

Term	Definition
data quality parameters	Dimensions used to examine, evaluate, and improve data quality— they include accuracy (are the data collected and reported in a manner by which the data are to be trusted because they are a reflection of the reality, [i.e., there are no omissions or duplicates]?), timeliness (are the data collected, cleaned, reviewed, or reported according to issued protocol and guidance?), completeness (are the data submitted complete, and are all the variables and indicator data fields properly filled out?), among others.
data quality reviews	A process whereby data and associated data files are assessed and required actions are taken to ensure that files are independently understandable for informed reuse. This is an active process involving a review of the files, documentation, the data, and the code.
data reporting tools	The paper and electronic tools used to transfer collected or received data to a higher level in an organized, streamlined, and consistent manner.
data source	The location from which the data being used originates and can include primary, secondary, and tertiary data sources.
data use	Instances where data are currently reviewed, updated, processed, erased, accessed, or ready to inform a recommendation for action in strategic planning, policymaking, program planning and management, advocacy, or delivering services.
decision making	The selection of a course of action from among two or more possible alternatives in order to arrive at a solution for a given problem.
decision support tools	Electronic applications to assist decision makers (e.g., clinicians, policymakers) by providing evidence-based knowledge in the context of clinical decision making (e.g., drug interaction alerts at the time a medication is prescribed and reminders for specific guideline-based interventions during the care of patients with chronic disease) or policy/program decision making (e.g., providing alternative policy decisions based on resource efficiency and health outcomes).
descriptive analysis	Statistical techniques used to summarize and describe a data set, and also the statistics measures used in such summaries.
disaggregate data	Breaking down of data into smaller groupings, often based on such characteristics as sex, income, or racial/ethnic group.
exchange standards	Refers to the exchange of information according to a set of standards. Standards are agreed on methods for connecting systems together and may pertain to security, data transport, data format or structure, or the meaning of codes or terms.
evaluation	The systematic assessment of an ongoing or completed intervention to determine whether the intervention is fulfilling its objectives and to demonstrate an effect on health outcomes.
function	The functionality of a system is how well the system works when examining it against relevant documents that describe the conceptual design of the system(s).
guideline	A general rule, principal, or piece of advice.
health information system (HIS)	The HIS provides the underpinnings for decision making and has four key functions: data generation, compilation, analysis and synthesis, and communication and use. The HIS collects data from the health sector and other relevant sectors, analyzes the data, ensures their overall quality, relevance, and timeliness, and converts data into information for health-related decision making.
indicator	A quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement.
information and communications technology (ICT)	The means employed to provide access to information through Internet, wireless networks, cell phones, and other communication media.

Term	Definition
information products	Data that has been compiled, managed, and analyzed becoming evidence that can be used by decision makers.
in-service training program	Training concurrent to official responsibilities for improving professional qualifications or skills. Can be compulsory related to official professional development activities to maintain or upgrade professional qualifications or it can be optional for the sole purpose of improving skills.
in source documents	Documents from which data were originally collected (i.e., facility registers and tally sheets).
integration	The inter-connectivity requirements needed for two applications to securely communicate data to and receive data from another.
inventory	An itemized list of current information system/digital assets.
master facility list	A standard mechanism for uniquely identifying health facilities, which allows for information to be compared across time and across data sources for individual facilities.
mandate	An official order or commission to do something.
monitoring	The process of collecting and analyzing routinely collected data to compare how well an intervention is being implemented against expected results and measure changes in performance over time.
monitoring and evaluation plan	Describes and manages the process of assessing and reporting progress toward achieving project outputs and outcomes, and to identify what evaluation questions will be addressed through evaluation.
national health management system (HMIS)	A system whereby health data are recorded, stored, retrieved, and processed to improve decision making.
operational/ operationalized	In use or ready for use/put into use.
points of service	Of, relating to, or being a healthcare insurance plan that allows enrollees to seek care from a physician affiliated with the service provider at a fixed co-payment or to choose a nonaffiliated physician and pay more.
policy	A course or principal of action adopted or proposed by a government, party, business, or individual/a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions.
pre-service training program	Recognized and organized programs designed to train future professionals to formally enter the profession at a specified level of education.
procedures	An established or official way of doing something.
process	Services that the program provides to accomplish its objectives, such as outreach activities, curriculum development, materials developed, counseling sessions, workshops, and training events.
real-time data entry	Data that are not kept or stored, but are passed along/delivered to the end user immediately after being collected.
requirements (for data analysis and visualization)	Necessary components for bringing order and structure to collected data and putting data into a chart, graph, or other visual format that helps inform analysis and interpretation.

Term	Definition
retrospective (data entry)	Data recorded, or the process of recording data, later than the period or moment at which they should have been recorded (e.g., updating patient charts or registers days after the patient visit, when guidance instructs to update the charts and registers immediately following the patient visit).
scenario	A set of simple statements that summarize what the end-user needs the digital health intervention to do.
standard operating procedures (SOPs)	A set of descriptive directions that ensure the correct development of specific activities and processes.
stakeholder	Any person or party with an interest in the financing, implementation, or outcome of a service, practice, process, or decision made by another (e.g., healthcare, health policies).
standardize	Standardized measures are nationally recognized criteria for evaluating the quality of healthcare provided to patients. These measures are endorsed or developed by organizations, specialty medical boards, national accreditors, or government agencies.
standardized electronic data collection tools	A streamlined ensemble of digital data collection tools meant to be used in a consistent manner across a territory or system, as opposed to ad hoc or misaligned systems that make data difficult to compare or combine.
standards	Accepted methods or models of practice; they may be formally approved or de facto standards.
supportive supervision	A process of helping staff improve their own work performance continuously, carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve knowledge and skills of health staff and provide feedback.
synthesize (data)	A process of combining data into a coherent whole with the aim of drawing conclusions.
TB service delivery workflows (or just workflows)	A repeatable pattern of activity that can be organized with adequate resources, defined roles, and information and feed into a process that can be documented and learned.
unique identification	An identifier that is guaranteed to be unique among all identifiers; a long-lasting reference that allows for continued access to a digital object for a specific purpose.
visualization (data)	The representation of data in charts, infographics, video graphics, and dashboards or other images.

Appendix E. D2AC Field Test Data Collection Instrument

The highlighted sentences correspond to the average group response.

Domain 1	Data collection and reporting
Subdomain (D1S1)	**Data collection tools and workflows**
Definition	The tools/devices/instruments and processes used for the ongoing systematic data collection to support analysis, interpretation, and sharing of data according to the National TB Program (NTP) guidelines for TB treatment, prevention, and control.
1. To what extent are standardized electronic data collection tools used?	
1	Non-standardized paper-based tools are the primary tools for data collection at all levels.
2	Standardized paper-based data collection tools are the primary tools for data collection at all levels.
3	Standalone standardized electronic data collection tools are often used, including for retrospective data entry, at higher levels.
4	Standardized electronic data collection tools are used at all levels and integrated with the national health management information system (HMIS) data collection system.
5	National HMIS data collection system is used for real-time data entry.
2. Do you have an inventory of TB data collection systems (clinical, lab, commodities, training)?	
1	There is an ad hoc list of TB data collection system.
2	A list of all the TB data collection systems exists but information about its data and users is limited to the national level.
3	A complete inventory of all the TB data collection systems, its data, and target users is available with the NTP.
4	The inventory information is used to inform the need for a new TB data collection system.
5	TB data collection system inventory is routinely updated to add information about a new TB data collection system.
3. To what extent are data collection processes aligned with TB service delivery guidance?	
1	Data collection is ad hoc or mainly driven by donor or external stakeholder mandate for data collection.
2	Some data collection processes align with service delivery guidance.
3	Data collection processes are aligned with the TB service delivery guidance.
4	Data collection processes are monitored and assessed to check alignment with the service delivery guidance.
5	Data collection process monitoring and assessment findings guide revisions and updates.
4. To what extent is unique identification used for TB cases?	
1	Unique identification is absent or rarely used to identify TB cases.
2	Some TB program sites use their own unique identifiers to identify TB cases.
3	The NTP uses unique identifiers for TB cases across program sites.
4	Unique identifiers for TB cases are aligned with the national unique (person or patient) identifiers.
5	The NTP ensures use of unique identifiers to track and treat TB cases across all TB sites (program, testing, pharmacy).

5. To what extent is the NTP site list standardized and in what format is it?	
1	The NTP site list is absent or only includes site names.
2	The NTP has an electronic site list but it is incomplete.
3	The NTP has a web-based site list (similar to a master facility list) that is complete.
4	The NTP web-based site list is integrated into the master facility list.
5	The NTP web-based site list is routinely reviewed and updated together with the national master facility list.
6. How is data disaggregation (e.g., by sex or age, treatment/retreatment, drug-resistant/drug susceptible) addressed in data collection?	
1	Data are rarely or inadequately disaggregated in the site level data collection.
2	Data collection tools (paper or digital) and processes allow disaggregation of data but disaggregate data are not collected.
3	NTP guidance require collection of disaggregate data.
4	NTP monitoring and review assesses quality of disaggregated data collection.
5	The NTP routinely reviews and updates disaggregate data collection requirement in the monitoring and evaluation (M&E) plan.

Domain 1	**Data collection and reporting**
Subdomain (D1S2)	**Reporting**
Definition	The tools/devices/instruments and processes used for the ongoing systematic data reporting to support analysis, interpretation, and sharing of data according to the NTP guidelines for TB treatment, prevention, and control.
7. To what extent are standardized electronic data reporting tools used?	
1	Non-standardized paper-based tools are the primary tools for reporting at all levels.
2	Standardized paper-based reporting tools are used at all levels.
3	Standalone standardized electronic data reporting tools are used at national and district levels for aggregate data reporting, at higher levels.
4	Standardized electronic data reporting tools are used at all levels and integrated into the national HMIS.
5	Standardized real time case-based electronic data reporting tools are used.
8. How is data disaggregation (e.g., by sex or age, treatment/retreatment, drug-resistant/drug susceptible) addressed in reporting?	
1	Data are rarely or inadequately disaggregated in the site level reporting.
2	Data reporting tools (paper or digital) and processes allow disaggregation of data but data are incomplete or rarely collected.
3	NTP guidance require reporting of disaggregate data.
4	NTP monitoring and review assesses quality of disaggregated data reporting.
5	The NTP routinely reviews and updates disaggregate data reporting requirement in the M&E plan.
9. To what extent are data reporting processes aligned with TB service delivery guidance?	
1	Data reporting is ad hoc or mainly driven by donor or external stakeholder mandate for reporting.
2	Some data reporting processes align with TB service delivery guidance.

3	Data reporting processes are aligned with the TB service delivery guidance.
4	Data reporting processes are monitored and assessed to check alignment with TB service delivery guidance.
5	Routine NTP guidance revision/update guides revision of data reporting processes.

Domain 1	**Data collection and reporting**
Subdomain (D1S3)	**Data quality**
Definition	The accuracy, completeness, timeliness, consistency, reliability, and integrity of data.
10. To what extent are data quality parameters (e.g., accuracy, completeness, etc.) defined and applied?	
1	Data quality is defined and measured in an ad hoc manner.
2	Data quality parameters are clearly defined and documented by NTP.
3	Data are generally complete, consistent, and accurate for priority data elements for at least the last 12 months.
4	Data quality problems are documented and factored in data analysis to be comparable across sources and time.
5	High quality data is available for at least the priority data elements for at least the last 5 years.
11. For what reason and how frequently are data quality reviews and audits conducted?	
1	Data quality is not checked or ad hoc and non-standardized data quality assessments are conducted.
2	Application of standard data quality tool is limited to donor-funded programs.
3	The NTP conducts routine data quality reviews both in source documents at the facility and for the reported data.
4	Data quality parameters are integrated into program review and management.
5	The NTP uses data quality assessment findings to improve the data and capacity to collect and report good quality data.

Domain 2	**Data analysis and use**
Subdomain (D2S1)	**Data integration and exchange**
Definition	The mechanism for transforming and integrating data from multiple sources into a target destination environment; can also refer to the activities of matching, merging, and deleting records within a single data store.
12. To what extent has a central data repository been developed?	
1	The NTP lacks central data repository/ies (e.g., a national reporting system, a TB case report repository) where TB case report data are analyzed/reported to (at case or aggregate level).
2	The system requirements for a central data repository are documented but not implemented.
3	An electronic central data repository collates aggregate program data only at national level.
4	A standard-based central data repository collates data from all the TB data collection systems.
5	The central data repository is routinely used by NTP stakeholders to address program data analytics and visualization needs.

13. To what extent are there data exchange processes between systems at points of service for TB cases and reporting and/or central repositories currently in place?	
1	Data exchange processes are missing or are limited and require manual intervention.
2	There is some data exchange at the national level but limited automated exchange.
3	Data exchange occurs extensively on a national level and is mostly automated.
4	All data exchange is automated with adequate budgetary resources in the program to meet custom requirements.
5	All data exchanges are automated, resourced, and no specialized engineering efforts or expertise is needed to meet new requirements.
14. To what extent are there data exchange processes between systems at points of service for laboratory testing and reporting and/or central repositories currently in place?	
1	Data exchange processes are missing or are limited and require manual intervention.
2	There is some data exchange at the national level but limited automated exchange.
3	Data exchange occurs extensively on a national level and is mostly automated.
4	All data exchange is automated and integrated with the national health data exchange (if it exists).
5	All data exchanges are automated, integrated, and no specialized engineering efforts or expertise are needed to meet new requirements.
15. To what extent are exchange standards (interoperability and/or health data standards, e.g., XML, JSON, LOINC, FHIR) integrated into the data exchange implementation?	
1	No defined technical standards exist for use in the TB data management and exchange but may exist for other diseases or HIS activities.
2	The country has adopted and/or developed standards for TB data management and exchange, but standards may be localized to specific projects.
3	Standards for TB data management and exchange are approved and require certification of new exchange partners for compliance.
4	The national TB data management and exchange standards are integrated in the national HIS and/or health plan.
5	TB data management and exchange standards are tracked, monitored, and reviewed through a standardized process.

Domain 2	**Data analysis and use**
Subdomain (D2S2)	**Analytics and visualization**
Definition	The use of analytics and visualization techniques/tools to provide new insights and patterns from data analysis to stakeholders at different levels to enhance health and healthcare decision making.
16. To what extent are users able to conduct analysis and develop visualization?	
1	Basic or no knowledge/skill exists to conduct analysis and develop visualization.
2	NTP staff can conduct descriptive analysis and generate some visualization (tables, graphs, charts, etc.) to make comparisons and evaluate trends.
3	NTP staff are able to conduct advanced analysis (e.g., cascade analysis) and develop visualization in real-time mostly at the national level.
4	NTP staff at national, subnational, and facility levels are able to conduct advanced analysis (e.g., cascade analysis) and develop visualization in real-time (e.g., for identifying causes of poor performance, implementation problems, and monitor and forecast services/commodities demand) as part of the M&E activities.

5	NTP staff can develop customized analytics and visualization using the central data repository (e.g., to monitor stock availability and forecast demand at all levels).
17. To what extent are analytics and visualization requirements documented?	
1	Data analysis and visualization requirements/needs are missing or ad hoc.
2	Data analysis and visualization requirements/needs are documented to support NTP decision making.
3	The NTP has identified and documented a minimum set of standard data analyses and visualizations requirements/needs at all levels.
4	The NTP's analytics and visualization requirements are monitored and budgeted in the NTP plan.
5	The NTP routinely updates analytic and visualization needs using monitoring data.
18. To what extent are data sources used?	
1	Decision making is informal or only one data source is used for decision making.
2	Some guidance is available that explains how multiple data sources support decision making.
3	Decision making is focused only on program resources and/or patient data reports and summaries. Some decision support tools exist locally or for specific implementations.
4	Program staff routinely make decisions with data incorporated from multiple sources (e.g., to provide scenario-based, health-system level specific decision-making support, and predict the impact of decisions and policy).
5	Advanced models, used for decision making, incorporate multiple data sources (including the central data repository) to optimize and influence TB health outcomes.
19. To what extent are decision support tools used?	
1	The need for decision support tools has yet to be identified.
2	Decision support tools need is documented and exist locally or for specific implementations.
3	Decision support tools are automated to use the knowledge base for contextually relevant reference information.
4	Assessments to ensure the knowledge relevance, value, and accuracy of decision support algorithms are conducted on a regular schedule.
5	Assessment findings are used for continuous improvement of decision support algorithms (in terms of relevance of information and accuracy).

Domain 2	**Data analysis and use**
Subdomain (D2S3)	**Dissemination and communication**
Definition	The analyzed data are synthesized and can be shared in appropriate visualizations, understood, and used by the target audience.
20. To what extent is a communication strategy in place?	
1	Communication is informal and lacks documented communication strategy.
2	A documented national communications strategy is in place but not operationalized.
3	An approved communication strategy is being implemented but confined to the national level.
4	Implementation monitoring and assessment are routinely conducted to gauge the effectiveness of the communication strategy as part of the NTP review.
5	A communication strategy and its implementation are adjusted based on the assessment findings.

21. To what extent are information products developed and subsequently disseminated?	
1	Development and sharing of information products are ad hoc or driven by specific program needs.
2	Dissemination of information products is typically limited to senior-level decision makers.
3	Targeted information products are disseminated in multiple formats (print, digital) using electronic and web-based platforms at higher levels.
4	Information products are routinely produced and distributed to stakeholders at all levels of the health system is monitored and evaluated.
5	Information product dissemination is improved using monitoring and evaluation data.

Domain 3	**Leadership, Governance, and Accountability**
Subdomain (D3S1)	**Data use guidance**
Definition	The process, procedures, and actions of an organization associated with collection and sharing of their data.
22. Does the NTP have a data use guidance?	
1	The need for policies that govern data use at health system levels has been identified but no such guidance exists.
2	The NTP uses data use guidance to manage its data use activities at various levels.
3	The NTP has an approved and comprehensive data use guidance implemented at all health system levels to support data use for decision making.
4	Implementation of data use guidance is monitored and assessed by the national governing/leadership body.
5	The NTP's data use guidance is annually reviewed and updated using the monitoring data.

Domain 3	**Leadership, Governance, and Accountability**
Subdomain (D3S2)	**Data access and sharing**
Definition	The disclosure of data from one or more organizations to another organization(s), or the sending of data between different parts of a single organization. This can take the form of routine data sharing, where the same data sets are shared between the same organizations for an on-going established purpose and exceptional, one-off decisions to share data for a specific purpose or shared with external stakeholders.
23. What is the data access and sharing status within NTP and with external stakeholders?	
1	The NTP lacks a data sharing mechanism.
2	Data access and sharing processes and methods are mostly documented but data are shared mainly through email.
3	Access-based control and data sharing agreements are established to allow access to and sharing of NTP data within and outside the NTP.
4	Access-based control and data sharing agreement implementation is monitored to ensure compliance with data use guidance/policy.
5	The NTP uses monitoring data to support access to and sharing of data with all relevant stakeholders (e.g., NTP, external stakeholders).

Domain 3	**Leadership, Governance, and Accountability**
Subdomain (D3S3)	**Organizational structure and function**

Definition	The organizational structures and processes, including job titles and clear descriptions of duties and responsibilities with a focus on data management, data quality, data governance, data analytics, data integration, and exchange.
24. To what extent are data use roles and responsibilities documented for NTP staff?	
1	Job descriptions are absent or lack data use roles and responsibilities.
2	Job descriptions clearly document data use roles and responsibilities but only at the national level.
3	NTP staff at all levels have access to their written role and responsibilities related to data use.
4	Supervisor(s) regularly review staff data use roles using the job description to offer constructive feedback.
5	Supervisor(s) follow NTP guidelines to review and update data use roles and responsibilities of staff.

Domain 3	**Leadership, Governance, and Accountability**
Subdomain (D3S4)	**Leadership and coordination**
Definition	The exercise of technical, political, and administrative authority to manage the NTP at all levels of a country's health system. The leadership and coordination structure consists of the mechanisms, processes, and institutions through which actors and stakeholders (both internal and external) articulate their interests, exercise their rights, meet their obligations, mediate their differences, and oversee the performance of the NTP.
25. To what extent is the interagency leadership and coordination team (including internal and external stakeholders) structure developed?	
1	The leadership and coordination team structure is informal or ad hoc.
2	Some formal leadership and coordination team structure with a clearly defined scope of work exists.
3	A formal leadership and coordination team is managing implementation of the data use policy and data access and sharing guidance with attention to gender and equity.
4	A formal leadership and coordination team is an integral part of the NTP review and assessment process.
5	The formal leadership and coordination team facilitates an annual review of TB data use activities at all levels of the health system and decisions are evident in the updated program/guidance documents.
26. To what extent is the leadership and coordination team effective?	
1	An informal leadership and coordination team meets at the national level.
2	Meetings are held periodically among individual health system levels, but there is no standard operating procedure (SOP) related to meeting management.
3	Leadership and coordination team meetings occur on a periodic, regular schedule across the health system levels with SOPs to follow related to meeting management.
4	The monitoring, evaluation, and learning (MEL) team monitors and assesses ability of leadership and coordination team to lead and coordinate regularly scheduled meetings.
5	Assessment findings are used to improve leadership and coordination team meeting outcomes.

Domain 3	Leadership, Governance, and Accountability
Subdomain (D3S5)	**Monitoring, evaluation, and learning (MEL)**
Definition	A plan supporting management of program activities and informing the organization about what activities to implement, timeline, resources, responsible party, and whether and how an activity is contributing toward stated NTP goals including equity and inclusion.
27. To what extent is the MEL plan implemented?	
1	MEL activities are informal or ad hoc.
2	An MEL guidance document exists but is only accessible at the national level.
3	An approved MEL plan with adequate budget allocation is being implemented at the national level.
4	The MEL plan implementation is monitored and reviewed as part of the program/strategy review.
5	Monitoring data are used to inform the annual review/update of the MEL plan.
28. To what extent does MEL contribute to improved health outcomes?	
1	Health outcomes are yet to be defined or lack standardized outcome parameters.
2	Some health outcomes are defined and monitored at the national level.
3	Health outcome parameters are documented and monitored at all the levels.
4	Routine health outcome assessment and evaluation is conducted to measure improvement in individual and population level health outcomes.
5	Health outcome measurement data are used to revise and prioritize program interventions.
29. To what extent are MEL processes developed?	
1	MEL processes are ad hoc.
2	MEL processes are documented but project- or intervention-focused.
3	MEL processes are documented and aligned with the data collection and reporting at all levels.
4	MEL processes are routinely reviewed as part of the NTP performance review.
5	Program performance review findings are used to routinely revise/update MEL processes.
30. To what extent does MEL support program improvement?	
1	MEL is informal and relies on individual experiences.
2	MEL data are sometimes used to monitor implementation and program performance.
3	Leadership and coordination team(s) uses MEL data at the national level for program review and course correction.
4	The MEL data are used to monitor, measure, and improve program data use at all levels.
5	The MEL data are used to continuously improve the MEL plan for achieving better program goals.

Domain 3	Leadership, Governance, and Accountability
Subdomain (D3S6)	**Financial resources**
Definition	The legal and administrative systems and procedures in place that permit a government ministry and its agencies and organizations to conduct activities that ensure the correct use of public funds and that meet defined standards of probity and regularity. Activities include management and control of public expenditures, financial accounting, reporting, and asset management (in some cases).
31. To what extent are data use activities funded in the NTP budget?	
1	Budget for data use activities is absent or ad hoc.
2	Budget for data use activities is allocated but tied with specific interventions/projects.
3	Operations of data use activities have been secured with annual budgets.
4	Budget for data use activities is monitored and reviewed during the program review process.
5	Monitoring and review findings are used to revise/update the budget allocated to data use activities.
32. How are financial resources mobilized?	
1	Availability of financial resources is ad hoc or specific to interventions.
2	Financial resource needs are documented for national level data use activities.
3	The NTP has a comprehensive financial plan that diversifies funding (resources from NTP, donors, and private sector) in place.
4	Availability and utilization of financial resources is monitored and measured by the MEL team.
5	The leadership and coordination team revises financial plan using the monitoring data to align with the national TB goals.

Domain 4	Capacity building
Subdomain (D4S1)	**Data interpretation**
Definition	The organizational structure and individual ability that enables reading, writing, and communicating data in context, including an understanding of data sources and constructs, analytical methods, and techniques applied — and the ability to describe the use case, application, and resulting value.
33. To what extent are data use forums (e.g., monthly or quarterly program review meetings) developed?	
1	Data use forums are missing or ad hoc.
2	Data use forums with terms of reference are convened, but only at the national level.
3	Data use forums with approved terms of reference are operational at all levels.
4	Performance of data use forums is monitored and assessed as part of the program performance review.
5	Monitoring and assessment findings are used to improve performance of data use forums.
34. How often are data reviewed and by whom?	
1	Data review by program staff are rare or ad hoc.
2	Program staff review data at the national level for specific program implementation.

3	Program staff routinely conduct data review at all levels using the data use forums to identify corrective action.
4	MEL staff routinely monitor and assess implementation of actions identified in the data review.
5	Monitoring and assessment data are used to continuously improve implementation of actions identified in the data review.
35. Is NTP staff receiving supportive supervision for practicing data use?	
1	NTP staff receive ad hoc supervision support for data use.
2	NTP staff receive program specific supervision and mentoring to take action on reported findings from indicators.
3	NTP staff receive supportive supervision for data use at the national level.
4	Supportive supervision is monitored to help identify technical resources NTP staff can access to meet supportive supervision needs.
5	NTP staff can mentor/coach peers on data use.

Domain 4	**Capacity building**
Subdomain (D4S2)	**Skill and knowledge development**
Definition	The availability of adequate personnel with characteristics, attributes, and capabilities to perform a task(s) pertaining to data system, data quality, data analytics, and data use to achieve clearly defined results.
36. To what extent has the NTP developed a national pre-service training program for skill and knowledge development?	
1	A national pre-service training program to impart knowledge and skills is absent or ad hoc.
2	A national pre-service training program for imparting knowledge and skills exist but only for clinical staff.
3	A national pre-service training program for all cadres of the NTP is being implemented.
4	Pre-service training programs are monitored and assessed for their effectiveness and relevance.
5	The pre-service training program is routinely updated using the monitoring and assessment data.
[IF THE ANSWER TO Q36 IS "STATEMENT 1," SKIP THIS QUESTION] **37. To what extent are institutions offering pre-service training established in the NTP guidance?**	
1	Institutions offering pre-service training are identified in an ad hoc manner.
2	Pre-service training is conducted by government and/or private training institutions.
3	A designated NTP authority oversees pre-service training programs.
4	The NTP offers opportunities and incentives to promote pre-service training of potential staff.
5	Institutions and their pre-service training offerings are identified based on the NTP strategic goals.
38. To what extent has the NTP developed an in-service training program for skill and knowledge development?	
1	A national in-service training program to impart knowledge and skills is absent or ad hoc.
2	A national in-service training program for imparting knowledge and skills exist but only for clinical staff.
3	A national in-service training program for all cadres of the NTP is being implemented.
4	In-service training programs are monitored and assessed for their effectiveness and relevance.

5	The in-service training program is routinely updated using the monitoring and assessment data.
39. To what extent are institutions (both public and private) offering in-service training established in the NTP guidance?	
1	Institutions offering in-service training are identified in an ad hoc manner.
2	In-service training is conducted by government and/or private training institutions.
3	A designated NTP authority oversees in-service training programs.
4	Training institutions offer opportunities and incentives to promote continuous education of staff at all levels.
5	Institutions and their offerings are identified based on the program review findings.
40. How effective are the in-service training programs?	
1	In-service training offerings are limited or ad hoc.
2	In-service training offerings are aligned with training needs but only at the national level.
3	Training needs assessment data are used for identification and recommending appropriate trainings.
4	Assessment of training programs is routinely conducted as part of the MEL activities to gauge skill and knowledge of trainees.
5	Training assessment data are used to improve design and delivery of targeted in-service training programs.

Domain 5	**Information and communications technology (ICT)**
Subdomain (D5S1)	**Hardware**
Definition	An assembly of tangible physical parts of a system of computers, including servers and virtual private networks (VPN), that provide services to a user in the health information ecosystem. E.g., computers, printers, connecting devices.
41. To what extent does the NTP have adequate hardware?	
1	The NTP has few computers to support it or hardware is dedicated to specific TB HIS activities.
2	Less than half of the NTP's central and subnational offices have adequate hardware.
3	Hardware needs are documented national offices have adequate hardware, including backup services.
4	Hardware needs are monitored and assessed at all levels and is conducted annually as part of the program performance review.
5	Hardware needs for the program are updated and addressed routinely through annual program planning.
42. To what extent are hardware specifications developed and budgeted?	
1	No guidance exists on the minimum hardware specifications for TB data system.
2	Hardware specifications are documented at the national and subnational levels.
3	Hardware specifications are documented and followed in procurement at all levels.
4	Hardware specifications are supported by adequate budget in the program plan.
5	Hardware specifications are routinely updated based on the program data analytics, visualization, and data exchange needs.

Domain 5	**Information and communications technology (ICT)**

Subdomain (D5S2)	Network and connectivity
Definition	Network is the disparate elements of a system connected in a way that data and information can be shared among all elements. Connectivity is the ability to access the data in the system.
43. To what extent does Internet and Internet connectivity exist at NTP sites?	
1	No network and Internet connectivity exists or is limited to the national level.
2	Network and Internet connection exist at the national level and about half of subnational offices have a reliable network and Internet connection.
3	Adequate dedicated network and Internet connectivity exist at the national and subnational level sites.
4	Network and Internet connectivity needs are routinely monitored and assessed to identify and address gaps to support programmatic data collection, reporting, and analysis.
5	All or almost all of the NTP national and subnational sites have reliable network and Internet connections supported by a dedicated technology support team.

Domain 5	Information and communications technology (ICT)
Subdomain (D5S3)	**ICT business infrastructure**
Definition	Design and planning, operations management, and technical support for information and communications technology (ICT) infrastructure maintenance.
44. To what extent has ICT infrastructure been developed?	
1	There is basic or no support for ICT or electronic systems equipment installation and maintenance related to the TB HIS.
2	There is a recognized need to standardize processes to oversee and support ICT infrastructure, but no established or harmonized process exists specific to HIS needs.
3	An ICT operations and maintenance plan is being implemented at the national level.
4	Data are collected and regularly reviewed on the ICT infrastructure operations and maintenance plan as mandated by the NTP strategic plan.
5	The ICT operations and maintenance plan is continuously reviewed and adapted based on the review data.

Appendix F. D2AC Nigeria Summary Findings (Group and Individual Responses Aggregation)

Table F1. Continuum score from aggregate responses, by domain

Domain number	Domain name	Average group score (N=8)	Average individual score (N=34)	D2AC level
D1	Data Collection and Reporting	3.88	3.65	Established
D2	Data Analysis and Use	3.13	3.30	Established
D3	Leadership, Governance, and Accountability	3.88	3.46	Established
D4	Capacity Building	3.33	3.32	Established
D5	Information and Communications Technology	2.59	2.66	Defined
	Overall	**3.45**	**3.31**	**Established**

Table F2. Continuum score from aggregate responses, by subdomain

Subdomain number	Subdomain name	Average group score (N=8)	Average individual score (N=34)	D2AC level
D1S1	Data collection tools and workflow	3.75	3.71	Established
D1S2	Reporting	4.04	3.63	Institutionalized/Established
D1S3	Data quality	4.00	3.50	Institutionalized/Established
D2S1	Data integration and exchange	2.44	2.93	Defined
D2S2	Analytics and visualization	3.34	3.49	Established
D2S3	Dissemination and communication	4.06	3.64	Institutionalized/Established
D3S1	Data use guidance	3.38	2.87	Established/Defined
D3S2	Data access and sharing	2.50	3.12	Defined/Established

Subdomain number	Subdomain name	Average group score (N=8)	Average individual score (N=34)	D2AC level
D3S3	Organizational structure and function	3.38	3.25	Established
D3S4	Leadership and coordination	3.94	3.51	Established
D3S5	Monitoring, evaluation, and learning	4.56	3.85	Institutionalized/Established
D3S6	Financial resources	3.63	3.23	Established
D4S1	Data interpretation	3.63	3.60	Established
D4S2	Skill and knowledge development	3.16	3.16	Established
D5S1	Hardware	2.81	2.77	Defined
D5S2	Network and connectivity	2.63	2.70	Defined
D5S3	ICT business infrastructure	2.13	2.39	Defined

Appendix G. D2AC Toolkit Nigeria Implementation Plan

Domain and subdomain	Priority action	Specific gap addressed	Responsible party	Resources needed	Expected deliverable	Timeline
Domain 1 subdomain 1: Data collection tools and workflow	Develop and use standardized electronic data collection tools at all levels	Timeliness and completeness of TB data	NTP M&E team	1. Funding for system development 2. System developers	Standardized electronic data collection tool deployed	12–24 months
	Integrate all electronic data tools			Funding for integration	Integrated electronic data collection tools	6–12 months
	Develop standard operating procedures (SOPs) for data collection at all levels	Knowledge gap at health facility level		Funding for printing and distribution	SOPs for data collection distributed to all facilities	2–3 months
	Capacity building on data collection and workflow	Knowledge gap among health workers		Funding for training	Capacity of health facility officers on data collection built	3–6 months
	Align the unique identifier for TB cases with the national identifier	1. Duplication of TB cases 2. Loss to follow up cases 3. Suboptimal quantification of TB commodities	1. NTP M&E 2. Program teams	1. Meeting 2. List of possible national unique identifiers	National unique identifier for TB cases	9–12 months
	Integrate NTP facility list into the national master facility list	Incomplete facility list	NTP M&E team	1. Meeting 2. National master facility list 3. Directly observed treatment (DOT) facility list	Unified NTP facility list	9–12 months
Domain 1 subdomain 3: Data quality	Data harmonization and validation at the LGA level	Data discrepancy at the community and LGA levels	1. DOT officers 2. Community health workers 3. Community volunteers 4. LGA TBLS	Recording and reporting tools (paper based and electronic)	Validated health facility and LGA data	Monthly
	Effective supportive supervision at all service delivery points (state, facility, and community levels)	Inadequate and ineffective supervision of facilities	1. LGA TBLS 2. STBLCP	1. Funding 2. Project vehicle 3. Electronic monitoring tool	Effective supervision and mentoring	Quarterly

Domain and subdomain	Priority action	Specific gap addressed	Responsible party	Resources needed	Expected deliverable	Timeline
	Capacity building in the area of documentation, data processing, validation, and reporting	Capacity gap in the identified areas of documentation, validation, and reporting	1. TBLS 2. STBLCP 3. NTBLCP 4. Partners	1. Funding 2. Resource persons 3. Training guide, SOPs	Improved capacity for data management	As the need arises
	Sustained data validation, harmonization, data sharing and exchange meetings across all stakeholders at national, state, and LGA levels	Data discrepancy at the LGA, subnational, and national levels	1. NTBLCP 2. Partners	1. Funding for logistics 2. Human 3. Resources 4. Venue	Reliable data for program planning, programming, policy and resource allocation to improve TB prevention and control	Quarterly
	Deployment of electronic data capturing tools (with in-built data quality checks) across all service delivery points	1. Challenge of mobilizing real time data for critical decision-making processes 2. Under reporting 3. Inefficiency in data management		1. Electronic capturing and reporting tools 2. Human resources	Reliable program data across all service delivery points for decision making, planning, and programming	
	Tool review and availability	Inconsistency and missed data across all levels	1. NTBLCP 2. Partners 3. State 4. LGA	1. Funding 2. Standardized recording and reporting tools	Consistent and complete data	
Domain 2 subdomain 1: Data integration and exchange	A policy for a centralized platform for the National Electronic TB Information Management System (NETIMS) to subsume every other platform currently in place, including guidelines and SOPs	Multiple electronic platforms currently in use for data management by the NTP and partners	NTBLCP	1. Support for meeting of M&E technical working group (TWG) 2. Support for policy consultant 3. Support for printing and dissemination of policy	A new policy for a centralized data repository	Quarter 2, 2022
	Develop a central data repository with the capacity to interact with different electronic TB platforms	Missing electronic and automated data repository	NTBLCP	1. Funds 2. Human resources	A central data repository with the capacity to interact with different electronic TB platforms	Quarter 3, 2022
	Procure a cloud service to house the central data repository			$5,000 annually.	Hosting of the centralized data	Quarter 3, 2022

Domain and subdomain	Priority action	Specific gap addressed	Responsible party	Resources needed	Expected deliverable	Timeline
					repository with 24 hours uptime	
Domain 3 subdomain 2: Data access and sharing	**Capacity for existing data sharing SOP for seamless data sharing** Review existing data sharing protocols, SOPs, and guidelines to assess its capacity to support seamless data sharing	Establish access-based control and data sharing agreements to allow access and sharing of NTP data within and outside the NTP	1. NTBLCP 2. M&E experts from NTBLCP 3. Key stakeholders	1. Funding for meetings 2. External technical assistance (ICT & database management)	Updated SOPs and guidelines for data sharing	2 months
	Access to database Create specific profiles with defined levels of access to database for different stakeholders (funders, implementing partners, etc.)				Defined access specific to different stakeholders	2 months
	Capacity Training of staff and stakeholders on the use of the access profiles created			Funding for training	Capacity building of end users and stakeholders on eventual usage familiarization	1 month
Domain 3 subdomain 5: MEL	**National-level** and **state-level** M&E TWGs should meet annually and use the monitoring data to review and update the existing MEL plan. The meeting should include discussions on performance findings, gaps/challenges, innovative solutions, and future recommendations, and should use the measurement of health outcomes to prioritize program interventions.	1. No proactive implementation of the MEL plan at the national and state levels 2. No annual review of the existing MEL plan at the national and state levels	NTBLCP M&E TWG or STBLCP M&E TWG	1. Financial 2. Human 3. Material	Annual revised plan	Annually
	Strengthen existing meetings of the national and state level TWGs (and potentially increase frequency)		1. NTBLCP M&E TWG or STBLCP M&E TWG 2. Other relevant stakeholders (partners, funders, donors)	1. Financial 2. Human 3. Material	1. Quarterly/Bi-annual revised plan 2. End process evaluation to see if objectives and goals were met and respond accordingly	
	In-process/mid-term evaluation for continuous monitoring and improvement of program interventions at the national and state levels	1. Non-proactive implementation of performance findings at the national and state levels 2. Challenges encountered during the MEL plan				
	Capacity building/trainings at the national and state levels					
	Mentoring and supportive supervision at the national, state, and LGA levels					

Domain and subdomain	Priority action	Specific gap addressed	Responsible party	Resources needed	Expected deliverable	Timeline
	Data quality assessment, data sharing and exchange at the national and state levels	implementation not addressed				
	Planning meetings at **LGA level** to discuss activities to be carried out daily, weekly, or quarterly		1. LGAs 2. Health facilities	1. Financial 2. Human 3. Material		
	Hold best practice routine meetings to discuss performance findings, gaps, challenges, find innovative solutions, and provide recommendations	Non-proactive implementation of performance findings	1. STBLCP M&E TWG 2. Other relevant stakeholders		Quarterly/bi-annual revised plan	Bi-annually/ Quarterly
	Data quality assessment at the LGA level					
Domain 4 subdomain 2: Skill and knowledge development	Implement pre-service training at all levels of health trainings	Inadequate pre-service training and knowledge in health training institutions	1. NTBLCP 2. Stakeholders	Funding for development of policy guidelines, training manual, and SOPs	1. Schools engaged, curriculum developed 2. Policy documents, manual, SOPs, and modules developed	6 months
	Provide performance-based incentives from national to facility levels	Insufficient incentives to motivate staff at all levels	1. NTBLCP 2. Stakeholders	Technical teams to develop tools to measure performance *(should be tied to an activity)*	Performance measuring tools developed	2 months
	Conduct monitoring and assessment of in-services training to determine the knowledge transfer	Inadequate monitoring and assessment of in-service training	1. NTBLCP 2. Stakeholders	Monitoring plan and schedules, harmonize indicators	Plans, schedules, and monitoring indicators developed	3 months
	Expand partnership with relevant stakeholders to offer opportunities and incentives to promote continuous education of staff at all levels	Suboptimal engagement of relevant stakeholders (e.g., private sector) on promotion of continuous education	1. NTBLCP 2. Stakeholders	Advocacy visits, memoranda of understanding (MoUs)	MoUs, advocacy visit reports	3 months
	Review routine assessment plan for the training programs as part of the MEL activities to gauge skill and knowledge of trainees	Non harmonized training programs among stakeholders on MEL activities plans	1. NTBLCP 2. Stakeholders	Funding to host expert meetings	Meeting agenda	3 months
	Peer mentorship between the state and national level, or between states (regarding data use, data management, M&E)					

Domain and subdomain	Priority action	Specific gap addressed	Responsible party	Resources needed	Expected deliverable	Timeline
Domain 5 subdomain 1: Hardware	Assessment of hardware needs (what we have vs what we need) at all levels from the national level to the facility level	Hardware needs are documented at the national and subnational levels	NTBLCP	Human	Inventory of hardware at all levels	May and June 2022
	Procurement of laptops, printers, projectors, and external hard drive for the national level	Less than half of the NTP's central and subnational offices have adequate hardware	NTBLCP	Financial	Hardware need procured for national level	2023
	Procurement of laptops, printers, projectors Internet routers for states		1. NTBLCP 2. STBLCP	Financial	Hardware need procured for state level	2023
	Procurement of laptops, external hard drive and mobile WiFi for LGA TBLS		1. NTBLCP 2. STBLCP 3. LGA health department	Financial	Hardware need procured for LGA level	
	Procurement of tablets, power bank and data bundle for DOT facilities		1. NTBLCP 2. STBLCP 3. Facility administration	Financial	Hardware need procured for facility level	2023
	Hardware specification and follow-up			Financial (funding from partners)		
	Longer term: periodic replacement					

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This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of the TB Data, Impact Assessment and Communications Hub (TB DIAH) Associate Award No. 7200AA18LA00007. TB DIAH is implemented by the University of North Carolina at Chapel Hill, in partnership with John Snow, Inc. Views expressed are not necessarily those of USAID or the United States government. TR-22-481 TB

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