

**Status Review and Roadmap for the
Use of Digital Health to Support END TB in Bangladesh
Challenge TB Project**

June 2019



This report was made possible through the support for Challenge TB (CTB) Project provided by the US Agency for International Development (USAID), under the terms of cooperative agreement number AID-OAA-A-14-00029.

Disclaimer

The authors' views expressed in this publication do not necessarily reflect the views of the US Agency for International Development or the United States Government.

Acknowledgments

Challenge TB (CTB) Bangladesh appreciates the wholehearted support received from the National TB Control Program (NTP) and the Directorate General of Health Services (DGHS) under the Ministry of Health and Family Welfare, Government of Bangladesh.

The contributions of the implementing, technical, and academic partners are gratefully acknowledged. CTB thanks them for their enthusiastic participation and support in implementing the project's activities.

CTB Bangladesh would like to extend heartfelt thanks to all of the staff of Management Sciences for Health, Interactive Research and Development, and KNCV and front-line health care workers for their contributions in reaching the goal, saving lives, and reducing the suffering of TB and DR-TB patients, their families, and their communities.

Finally, we thank USAID for providing Challenge TB Bangladesh with financial and technical support.

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Abbreviations and Acronyms

CTB	Challenge TB
DGHS	Directorate General of Health Service
DHIS2	District Health Information System 2
DOT	directly observed treatment
DSCC	Dhaka South City Corporation
FAST	Find patients Actively, Separate safely, and Treat effectively
GIS	geographic information system
HAEFA	Health and Education for All
ICT	information and communication technology
MDR-TB	multidrug-resistant TB
MIS	management information system
NGO	nongovernmental organization
NIDCH	National Institute of Diseases of the Chest and Hospital
NTP	National TB Control Program
NTRL	National TB Reference Laboratory
PET	post-exposure therapy
SEM	social enterprise model
SOP	standard operating procedure
STTA	short-term technical assistance
USAID	US Agency for International Development
WHO	World Health Organization

Executive Summary

Bangladesh is one of the world's high TB burden countries and, with seven other countries, accounted for two-thirds of new TB cases in 2017 according to the World Health Organization. Increased use of digital technologies for health (digital health) and the effective use of the data that digital health tools can provide is one method for supporting progress toward the End TB goals. The innovation and utilization of digital technology to end TB is a priority for the NTP and is in line with the highest level of political commitment from The People's Republic of Bangladesh to build a "Digital Bangladesh".

In collaboration with the NTP in its efforts to end TB in Bangladesh and to ensure proper monitoring and better health care service, CTB and its predecessor programs have developed and supported digital solutions in collaboration with stakeholders. Other implementers and nongovernmental organizations (NGOs) are also using digital tools for TB screening and care. This report was designed to fill the need for documentation of the key digital health tools in current or recent use for TB in Bangladesh, review the implementation of the Multidrug-resistant TB (MDR-TB) Directly Observed Treatment (DOT) Monitoring app, and summarize the vision of NTP and other key stakeholders for implementing next steps to further the introduction and use of digital health for TB control.

Moving forward, it is key for the NTP to take a leadership role in determining what digital health initiatives to implement and scale in what order. From the conversations held, a key initial priority area is scaling electronic reporting systems. Following that, the current primary challenges for Bangladesh's TB program should be weighed in selecting priority areas for digital health initiatives and deprioritizing others. For example, while there are a number of methods and innovations for utilizing digital technology in medicine adherence, if the need for improvement in case detection is most pressing, consider focusing—and requesting that implementing partners focus—on solutions to address that.

In line with recommendations from a number of stakeholders, digital health prioritization and planning should be taken up as an ongoing agenda item, possibly with the creation of a standing sub-group of the TB Technical Working Group. Coming together and having a standing forum for discussion and decision making regarding digital health for TB—including stakeholders from DGHS-management information system (MIS), implementing partners, and donors—will allow the NTP to create and share its priorities and ensure that activities and support from the partners and donors are working toward that vision.

Background

Bangladesh is one of the world's high TB burden countries and, with seven other countries combined, accounted for two-thirds of new TB cases in 2017. According to the 2017 Global TB Report, 244,201 TB cases were notified in Bangladesh that year. The country and the global community continue to work toward meeting the End TB Strategy and Sustainable Development Goals' TB goals. Increased use of digital technologies for health (digital health) and the effective use of the data that digital health tools can provide is one method for supporting progress toward the End TB goals.

National governments, their ministries of health, donors, and the global health community have recognized the potential for digital health technologies to enable improved health and movement toward universal health coverage. In recent years, efforts at the global and national levels have increased focus on scalable and sustainable digital health tools and information systems and the resources needed to integrate and utilize them in the health system. In March 2019, the World Health Organization (WHO) announced the creation of a new Department of Digital Health to support countries to "assess, integrate, regulate and maximize the opportunities of digital technologies" in alignment with their national health priorities.

The innovation and utilization of digital technology to end TB is a priority for the NTP and is in line with the highest level of political commitment by The People’s Republic of Bangladesh to build a “Digital Bangladesh”. The government established a vision of a Digital Bangladesh by 2021 that proposed to “mainstream information and communication technologies (ICTs) as a pro-poor tool to eradicate poverty, establish good governance, ensure social equity through quality education, healthcare and law enforcement for all, and prepare the people for climate change.”¹

The Digital Bangladesh Vision 2021 emphasizes ICT-based interventions in the health sector to support universal quality health care. The document acknowledges the importance of building the capacity and management strength of the health care delivery system to ensure that citizens have access to quality health care service and to be prepared for emerging health threats and challenges. In the 4th Health, Population, and Nutrition Sector Programme Operational Plan for the implementation period of January 2017–June 2022, the Government of Bangladesh identified the objective to improve the national health information system, eHealth, and medical biotechnology.

Purpose of Report Development

In collaboration with the NTP in its efforts to eradicate TB in Bangladesh and to ensure proper monitoring and better health care service, CTB and its predecessor programs have developed and supported digital solutions in collaboration with stakeholders. Other implementers and NGOs are also using digital tools that touch on TB screening and care. Use of the systems has often been limited to pilot programs; to plan for sustainability and scale, an understanding of what currently exists, potential challenges, and stakeholder priorities is necessary.

While a number of digital health interventions have been developed and used for TB care and prevention in Bangladesh, a summary of all TB-related digital health activities in the country was not available. This report was designed to fill that gap and document the key digital health tools in current or recent use for TB in Bangladesh and to summarize the vision of the NTP and other key stakeholders for implementing next steps to further the introduction and use of digital health for TB control. User experience with the MDR-TB DOT Monitoring mHealth application—a digital health tool of particular interest that was used for a number of years and supported by CTB—is also documented in the report. This report is intended to be useful to the NTP, donors supporting TB care and prevention, and implementing partners. The roadmap was developed in alignment with the framework set out in the WHO Handbook for the Use of Digital Technologies to Support TB Medication Adherence² to compile information on current use, gaps, and the NTP vision for digital technology.

Stakeholder Engagement Process

CTB Bangladesh undertook a series of key stakeholder discussions with the support of short-term technical assistance (STTA) from Management Sciences for Health to document the current digital health initiatives utilized in the TB program, gather feedback on the user experience with the MDR-TB DOT Monitoring app, and determine



¹ Strategic Priorities of Digital Bangladesh. Accessed January 2011

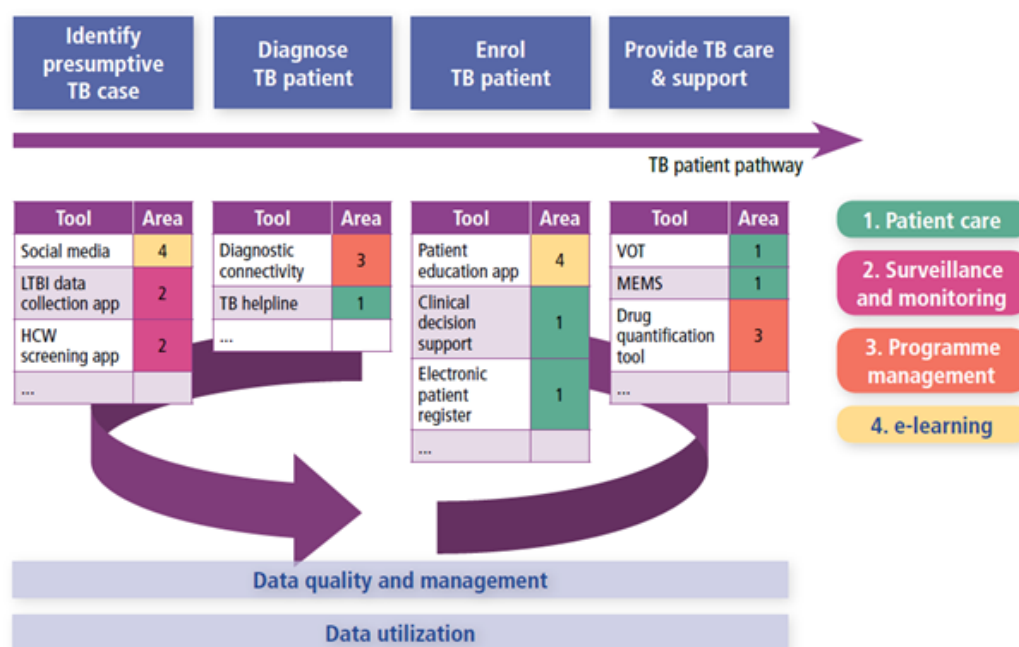
² Handbook for the Use of Digital Technologies to Support Tuberculosis Medication Adherence. World Health Organization. 2017. WHO/HTM/TB/2017.30

potential challenges and opportunities for furthering the use of digital health to support the NTP’s vision to end TB. Stakeholder discussions were held one on one and in small groups, and participants were asked about other digital programs for TB or interested parties to ensure that primary stakeholders were included in the conversations. The full list of groups and individuals spoken with during the process is provided in annex A. The discussions were tailored to the particular participant(s) and their relevant programs/digital health experience and included conversations on:

- Experiences with specific digital health tools previously and/or currently in use
- Key challenges seen previously or expected to continue when scaling and sustaining digital health to support the End TB strategy
- Promising opportunities that could be prioritized
- Their vision for the future, looking five years forward to what goals they have for the use of digital health

Framework

The following framework for organizing potential digital health initiatives along the TB patient pathway was proposed and described in the Handbook for the Use of Digital Technologies to Support TB Medication Adherence (WHO 2017). Figure 1 shows an illustrative example from the handbook.



HCW: health-care worker; LIMS: laboratory information management systems; LTBI: latent tuberculosis infection; MEMS: medication event monitoring system; VOT: video-supported treatment for TB

Figure 1. Example digital health initiatives along the TB patient pathway, source: Handbook for the Use of Digital Technologies to Support TB Medication Adherence. (WHO 2017)

Digital Health Initiatives for TB

CTB has supported a number of digital health solutions over the course of the project. With the CTB project closing in 2019, transition plans for the digital tools have been identified. These solutions, their status, and the current transition plans are shown in table 1 in the format prescribed by the framework shown in figure 1. Digital solutions in use for TB prevention and care

in Bangladesh that were identified but are not supported by CTB are also included. Systems with primary functions in multiple areas are listed in more than one column.

Table 1. Overview of digital solutions for TB care and prevention identified in Bangladesh

Identify Presumptive TB Case	Diagnose Patient	TB	Enroll TB Patient	Provide TB Care and Support
Child TB screening tool (FAST) CTB used app in 13 hospitals	GxAlert 39 machines with software in use		Child TB screening tool (FAST) CTB used app in 13 hospitals	Psychosocial support app - Astha Sustho Hoboi Patients are using it at NIDCH
Adult TB screening app using FAST CTB used screening app in 10 hospitals	eLMIS CTB implemented eLMIS in 10 microscopy centers, including NTRL		Adult TB screening app using FAST CTB used screening app in 10 hospitals	MDR-TB DOT monitoring application App developed and used under TB CARE II and CTB; not currently in use
ICDDR,b Digital Screening and Enrollment Tool Non-CTB tool. In use in the Social Enterprise Model Centers	GIS Mapping of all GeneXpert machines in the country GIS map of GeneXpert machines' URLs available on the NTP website		ICDDR,b Digital Screening and Enrollment Tool Used for screening and management in SEM centers	DHIS2 Integrated TB forms 10, 11, and 12 • CTB facilitated training NTP • CTB facilitating monitoring
HAEFA Electronic Patient Management System Health and Education for All utilizes an enrollment and management system, including for TB screening			Preventive Therapy app (PET) CTB using app in DSCC under the demonstration project for preventive treatment	TB eLearning app App developed to enhance health worker knowledge of TB and TB care
			Mandatory Notification app Being validated with 500 private physicians and 300 DOTS providers • SOP and user manual developed	
Digital Archive CTB developed a digital archive to upload all TB-related materials that is hosted on the DGHS server.				
e-TB Manager Further scale-up of e-TB Manager in being discussed with the NTP and MTaPS.				

Color coding for the primary purpose of the digital tool

Patient care
Surveillance and Monitoring
Program Management

Digital Health Tool Details

A brief overview of the digital health tools is provided here, with rollout information and statistics for CTB-supported systems in annex B. Figure 2 summarizes the digital systems and activities supported by CT.

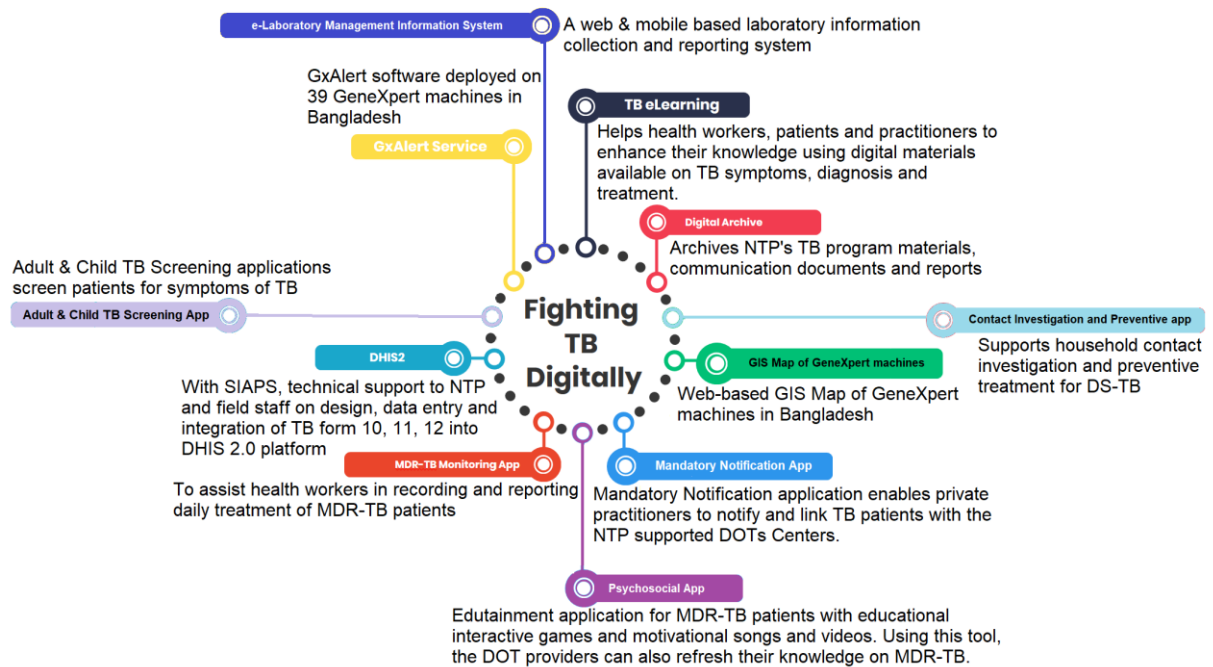


Figure 2: CTB digital health solutions for comprehensive TB management

Child TB screening tool: To improve identification of childhood TB in urban settings, the NTP, with technical support from CTB, has developed an electronic TB screening tool to help health workers conduct active screening among children. The screening program and the application were rolled out in 12 public and private tertiary care hospitals in Dhaka.

Adult TB screening tool: A mobile phone-based screening application developed to help health workers conduct hospital-based adult active screening program with technical support from CTB, at 14 high volume tertiary care hospitals.

Social Enterprise Model Screening and Management Tool: The SEM Centers operated by icddr,b utilize an OpenMRS-based electronic tool for initial contact and screening and as a patient management system.

HAEFA Patient Registration and Management System: International NGO Health and Education for All (HAEFA) utilizes a fully electronic patient enrollment and management system, including for TB screening, in its primary health care activities in the Rohingya camps as well as activities in the Dhaka region. To address a lack of network connectivity and reliable power in the camps, HAEFA established a system utilizing solar power as well as a local area network that later syncs with the server when connectivity becomes available.

TB eLearning tool: An eLearning tool to enhance health worker knowledge. Behavior change and communication materials are available in the tool to educate patients about symptoms of TB as well as information about TB diagnosis and treatment.

Psychosocial support application for MDR-TB patients: Psychosocial support is critical for ensuring patient-centered care and improving the overall health and well-being of MDR-TB patients. An electronic “edutainment” application for MDR-TB patients comes with preloaded educational interactive games and materials on TB, motivational songs and videos, and other resources. This digital application also helps providers upgrade/refresh their knowledge on MDR-TB through interactive training materials available in the digital application.

Janao - Mandatory Notification Application: Developed to improve TB case notification from private-sector providers. The tool enables private practitioners to notify and link TB patients with NTP-supported DOT centers. It is intended to scale this up to approximately 4,000 providers in the next phase.

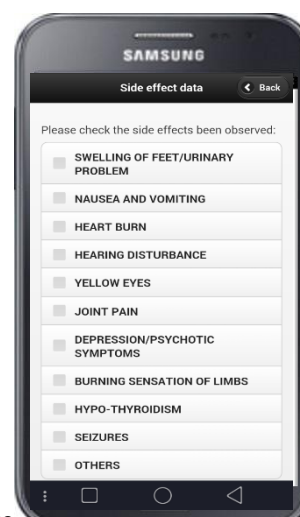
e-TB Manager: A web- or desktop-based tool that allows the health system to manage all information needed for TB control. The tool enables health workers to monitor in real time the status of TB treatment and flow of medicines by integrating data across key aspects of TB control (presumptive cases, patients, medicines, laboratory testing, diagnoses, treatments, and outcomes). The NTP has been using e-TB Manager since 2010. e-TB Manager in Bangladesh has been configured to allow for data exchange with the national digital health information system 2 (DHIS2).³

As part of TB reporting system strengthening, the NTP also integrated TB forms 10, 11, and 12 into the national DHIS2 to enable regular and accurate online reporting from across the country. A digital archive hosted on the DGHS MIS server was developed to store all TB-related documents produced by the NTP and implementing partners. CTB has developed the implementation plan, SOPs, and monitoring tools for the GeneXpert network and introduced the GxAlert connectivity solution for remote monitoring.

MDR-TB DOT Monitoring App User Experience

Field visits were held to speak with individuals who had direct experience with implementing the MDR-TB DOT monitoring application. The first was at the Civil Surgeon’s Office, Narayangong. Interviews were held with the acting civil surgeon, medical officer, program organizer, DOT providers who had used the app, and former patients. Another visit was held to Nari Maitree DOT Center, Mohammadpur, where DOT providers showed the application and shared their experience using it.

The MDR-TB DOT monitoring app is one of the earlier-developed mobile tools for TB care support in Bangladesh. It was initially developed under the TB Care II project in 2012 and updated and converted from the previous platform with CTB support in 2016. Given the priority focus on the Dhaka area, the system was closed in regions outside the city by



³ DHIS2 and e-TB Manager Interoperability: Creating a Stronger Digital Health System in Bangladesh. SIAPS program. August 2017. Available at: <http://siapsprogram.org/publication/altview/dhis2-and-e-tb-manager-interoperability-creating-a-stronger-digital-health-system-in-bangladesh/english/>

September 2018 when CTB withdrew its field staff. Support for utilization of the MDR-TB DOT monitoring app by CTB had also been phased out within Dhaka by the time of the site visits in April 2019.

Conversations with several DOT providers who previously used the mobile app yielded generally positive opinions of the system. It was found to be easier to track patient side effects, and one provider noted that using the system and his program officer's monitoring of the system led to greater communication between them. When asked if they would prefer a mobile option to paper based if it required using their personal mobile devices, some indicated interest in doing so while others noted they would prefer not to use their personal phones and would instead want paper tools. One provider mentioned that when "it's on the phone they were provided, it's her responsibility to use the app".

Points that would need to be addressed if the system were relaunched and scaled include the apparent inconsistent use of the system by those trained in it. It was noted that monitoring of information in the system should be made possible at the upazilla and district levels. DOT providers who used the application did not always bring a phone with them to use with the patient as intended. Some would leave it at home for security purposes, with particular mention of the challenges in the rainy season, and would instead enter the information into the program at a later time. From the stakeholder conversations held, the GIS capabilities of the program—developed to review the location where the DOT provider utilized the program—were not regularly used. In addition, updates to the program would be needed to ensure that it supports the current prescribed treatment regimen.

With the implementation of the MDT-TB DOT monitoring app closed and the phones transferred from the DOT providers when possible, continuing or scaling use of the system would require an effort to relaunch the activity. Several individuals mentioned the provision of phones as a cost-prohibitive piece of scaling a similar program and recommended that if the program were to be continued, personal ownership of a compatible smartphone could be a requirement for the MDR-TB DOT role. However, as some providers noted, provision of the phone was important for them to see the importance of the tool and the responsibility of the provider entrusted with the phone to use it regularly.

It was reported that another health (non-TB) program was implementing this requirement in selecting participants. As individual smartphone ownership rises, this may be a potential cost-saving method, with a recommendation that workers to be provided support for data plan expenses. However, this method would need to be examined further to determine whether personal phone use would be feasible in all program locations. It would also need to be examine whether this type of requirement could make it unduly difficult for otherwise qualified individuals to be selected for the role, particularly as a gender divide often exists where men are more likely to own newer technology than women.

Key Findings

The NTP, with support from CTB and other programs and organizations, has demonstrated some of the potential for digital health solutions for TB prevention and care in Bangladesh. Stakeholder discussions with the NTP, DGHS-MIS, implementing organizations, and USAID indicated a broad consensus on need and the potential for digital health tools and resulting data to support the country's ongoing TB control efforts.

Many agreed that challenges to implementation of digital initiatives are decreasing—for example, network connectivity is improving. However, the resource constraints, particularly of human resources, are acutely felt in considering how to plan to roll out and scale programs. The Child TB Screening application was implemented through additional staff resources dependent on CTB. Ongoing implementation of the child screening program would require support for the human resources to conduct the work. Early and deep involvement of the NTP in deciding whether to

implement a digital system and plan for its scale and sustainability was identified as a need and a recommendation going forward. The full requirements (including people, processes, and technology) to scale and sustain a new digital system should be determined early in discussions and close collaboration with all stakeholders involved.

NTP staff expressed visions of a national TB program that would move from paper-based reporting to electronic data collection and reporting. A fully digital reporting system would greatly reduce the time to receive data and increase the level of detail. This was shared as being a realistic five-year goal for the TB program. The broad range of activities supported by various actors to date have demonstrated a range of possibilities, primarily on relatively small scales. Dr. Ahmadul Hasan Khan of the NTP reiterated the importance of large-scale implementation to get the full benefit of a digital system, stating that “whatever we do; it needs to be nationwide coverage.” NTP staff noted that increasing the opportunity to scale programs would require focused efforts on a much narrower set. This sentiment was captured by the NTP’s Dr. Pronab Kumar Modak, who noted that he appreciated all of the various tools, but we cannot do all of them at once, and “we should choose one program at a time, do that, and make it sustainable.”

Conclusions and Recommendations

Moving forward, it is key for the NTP to take a leadership role in determining what digital health initiatives to pursue scaling up and when. From the conversations held, a key initial priority area is scaling electronic reporting systems. Beyond that, the current primary challenges for Bangladesh’s TB program should be weighed in selecting priority areas for digital health initiatives and deprioritizing others. For example, while there are a number of methods and innovations for utilizing digital technology in medicine adherence, if the need for improvement in case detection is more pressing, then consider focusing—and requesting implementing partners focus—on solutions to address the most pressing concerns. The framework outlined above clarifies the various points at which digital technologies can fit within the TB care and treatment system. In Bangladesh’s case, the priority should be planning and resourcing scale-up of one or two systems rather than limited implementation across a broad range of tools.

In line with recommendations from a number of stakeholders, digital health prioritization and planning should be taken up as an ongoing agenda item of the TB Technical Working Group. Creating a new standing sub-group for this purpose was also recommended. The donors supporting this space have all in the past year come together globally to create the Principles of Donor Alignment for Digital Health. These guidelines for investment⁴ prioritize collaborative action to support scalable systems aligned to a country’s identified strategy. The NTP’s interests in focusing on scalable and sustainable systems align well with the global efforts in this space. The recent creation of the Department of Digital Health within WHO and its focus on supporting countries in their strategy development and building sustainable systems also offers a potential new resource for Bangladesh to tap in to.

Coming together and having a standing forum for discussion and decision making regarding digital health for TB—including interested stakeholders from DGHS-MIS, implementing partners, and donors—will allow the NTP to create and share its priorities and ensure that activities and support from partners and donors are working toward that vision.

⁴ The Principles of Donor Alignment for Digital Health. <https://digitalinvestmentprinciples.org/>

Annex A: Stakeholder Discussions

Key stakeholder discussions were held with the following individuals and groups during the STTA:

- Dr. Pushpita Samina, USAID
- Line director, NTP
- Director of MIS and line director of HIS and eHealth, DGHS
- NTP and advisors, including Dr. Pronab Kumar Modak, Dr. Ahmadul Hasan Khan, Dr. Nazis Arefin, and Dr. Md Abdul Hamid Salim
- Civil Surgeon's Office, Narayangong: acting civil surgeon, medical officer, program organizer, DOT providers, and former patients
- Nari Maitree DOT Center, Mohammadpur: DOT providers
- ICDDR,b Social Enterprise Model Center
- ICDDR,b
- BRAC, Director Communicable Diseases and WASH
- USAID MTaPS team
- USAID MEASURE Evaluation
- Better Health in Bangladesh program
- HAEFA

Annex B: Challenge TB Digital Health Implementation Statistics

Tool	Year Developed (Developer)	Implementation Statistics	
FAST and PET Screening Tool	2018 (StreamsTech)	<p>FAST Screening Data: Number of adult screened: 335,924 Number of adults identified as presumptive: 14,385 Number of adult investigation orders given: 11,393 Number of adults investigated: 4,461 Number of adults identified as TB patients: 1,377 Timeline: October 2018—March 2019</p> <p>Orientation/Training Data: Orientation for FAST screener: 29 participants Orientation on FAST for NGO staff: 39 participants Refresher orientation on FAST implementation for hospital doctors: 464 participants Orientation on FAST implementation for field supervisors and health workers: 81 participants</p>	<p>PET Screening Data: Number of index TB cases eligible for contact investigation: 121 Number of index TB cases bacteriologically positive: 98 Number of household contacts: 387 Number of contacts verbally screened: 369 Number of contacts of bacteriologically positive index cases verbally screened: 297 Number of contacts clinically evaluated: 194 Number of contacts of bacteriologically positive index cases clinically evaluated: 158 Timeline: October 1, 2018–April 17, 2019</p>
Child TB screening tool	2018 (IHS)	<p>Number of children screened: 790,228 Number of children identified as presumptive: 21,136 Number of children investigated: 16,963 Number of children identified as TB patients: 1,282 Timeline: March 1, 2017–April 25, 2019</p>	
Astha Sustho Hoboi (Psychosocial app for MDR-TB patients)	2018 (IWF and Dnet)	<p>Orientation/Training Data: Training on counseling TB patients for nurses working at NIDCH</p>	

Tool	Year Developed (Developer)	Implementation Statistics	
		Date: March 3, 2019 Participants: 12 (3 male, 9 female)	
TB eLearning	2017 (mPower Social)	Orientation/Training Data: Workshop on TB eLearning: 22 participants	
MDR-TB Monitoring	DOT 2018 (4axiz)	Number of districts covered: 42 Number of TB patients enrolled: 1,841 Number of DOT providers enrolled: 908	680 smart phones were distributed and 1,239 DOTS providers along with Government staff have been trained Not currently supported
eLMIS	2017 (IHS)	CTB deployed eLMIS application in 10 microscopy center, including the NTRL Orientation/Training Data: Training on eLMIS: 24 participants	
GIS Mapping	2019 (StreamsTech)	185 GeneXpert sites have been covered that include 207 GeneXpert machines	
Janao (mandatory notification app)	2019 (icddr,b)	Total TB cases: 195 DOTS enrolled patients: 66 Timeline: February 1, 2019–April 28, 2019	3 batch trainings completed for 88 DOTS staff; 5 batch training completed for 292 doctor's assistants; 10 batch trainings of 334 doctors completed 714 providers oriented on MN web-based application As of March 31, 2019, 153 (PTB 92, EPTB 61) patients notified by doctor and 49 patients for DOTS enrolled
GxAlert	2017 (SystemOne)	39 GeneXpert machines (funded by USAID) are covered by GxAlert Orientation/Training Data: Workshop on implementation plan and finalizing the SOP for GeneXpert: 31 participants Workshop on implementation of GxAlert machine in Bangladesh: 15 participants GxAlert training for GeneXpert sites: 48 participants	
Digital Archive	2018 (4axiz)	CTB supported the implementation of NTP digital archive and facilitated technical orientation of the respective NTP staff. NTP is regularly archiving TB program-related materials on the digital archive.	

Tool	Year Developed (Developer)	Implementation Statistics
		<p>Orientation/Training Data: Consultative workshop for development of digital archive: 24 participants</p>
DHIS2		<p>CTB supported the integration of TB forms 10, 11, and 12 into the DGHS DHIS2 and is continuously providing technical assistance in extracting quarterly data on TB activities throughout Bangladesh.</p> <p>Orientation/Training Data: Training of trainers on DHIS2: 77 participants Training on TB reporting through DHIS2: 771 participants</p>