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Implementing QuanTB to Improve Forecasting, Supply Planning, and Early Warning Systems for TB Medicines: Bangladesh Report

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About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to ensure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

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ACRONYMS

DPM deputy program manager
DR-TB drug-resistant tuberculosis
EWS early warning system
GDF Global Drug Facility

HPNSDP Health Population and Nutrition Sector Development Program

MDR-TB multidrug-resistant tuberculosis
MIS management information system
Ministers of Health and Familie W

MOHFW Ministry of Health and Family Welfare MSH Management Sciences for Health

NFM New Funding Model

NTP National TB Control Program

PSM procurement and supply management

PSMWG Procurement and Supply Management Working Group

SCW Shyamoli Central Warehouse

SIAPS Systems for Improved Access to Pharmaceuticals and Services

TB tuberculosis

USAID US Agency for International Development

WHO World Health Organization

XDR-TB extensively drug-resistant tuberculosis

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Name	Designation	Role
Dr. Md. Quamrul Islam	Director, MBDC, and Line Director, TB Leprosy, Directorate General of Health Services, Bangladesh	Director NTP (during the time of the survey)
Dr. Md. Abdul Hamid	DPM, Procurement and Logistics, NTP	Participated in the survey as respondent
Mr. Shah Alam	Procurement Assistant, NTP	Participated in the survey as respondent
Dr. M A Hamid Salim	Advisor to NTP Bangladesh on Global Fund and MDR-TB	Participated in the survey as respondent
Dr. Sabera Sultana	National Professional Officer, TB Drug Resistance, WHO (former)	Participated in the survey as respondent
Dr. Vikarunnessa Begum	National Professional Officer (TB Control), WHO	Participated in the survey as respondent
Dr. Asif Mujtaba Mahmud	Senior Technical Advisor Challenge TB (from KNCV), Bangladesh (former)	Participated in the survey as respondent
Md. Rosidur Zaman	PSM Expert, National Tuberculosis Control Program, Bangladesh	Currently taking responsibility for quantification as part of SIAPS transition

INTRODUCTION

This report summarizes the information gathered as part of a review of the implementation of QuanTB and related technical assistance to strengthen TB pharmaceutical management in Bangladesh.

Background

TB is a preventable and curable infectious disease that ranks alongside HIV/AIDS as a leading cause of death worldwide. If untreated, the disease can be debilitating and can kill approximately 50% of those infected. Proper forecasting, supply planning, and stock monitoring are key to ensuring an uninterrupted supply of TB commodities to meet the evolving needs of TB programs as treatment is scaled up and treatment regimens change. The US Agency for International Development (USAID)-funded SIAPS Program has provided technical assistance to NTPs in 12 USAID-focus countries since 2013. SIAPS regional or in-country technical advisors have collaborated with NTPs to address challenges that hamper uninterrupted access to TB medicines, such as the lack of reliable information for effective decision making in TB supply chain management, an EWS to prevent stock-outs or expiries, and supply chain system monitoring mechanisms, as well as limited institutional and human resource capacity in these areas. The support included the use of QuanTB—an electronic forecasting tool and EWS that transforms complicated calculations into a user-friendly dashboard that displays key quantification and supply planning information and alerts on risks of stock-outs or expiries¹. Implementation of the tool was complemented by other SIAPS TB technical assistance activities, such as quantification capacitybuilding training and participation in country monitoring missions.

Bangladesh is a lower- to middle-income country in South East Asia with a 2015 population of approximately 161 million and a life expectancy at birth of 70.4 years for males and 72.9 years for females². In 2014, the prevalence of TB was 404 per 100,000 population, and 196,797 TB cases were reported³. The health system is organized into eight divisions and 64 districts, including 11 city corporations/metropolis and 490 subdistricts. The subdistricts have 323 municipalities/suburbs and thousands of Union Parishads. In 2014, the public health expenditure comprised approximately 27.9% of the total health expenditure⁴. The health system is primarily funded through the government's public health budget and international development assistance, which covered 26% of the expenditure in 2012 and included pool, non-pool, and parallel funding. The Government of Bangladesh has implemented five-year sectorwide programs for overall improvement of the health, population, and nutrition subsectors since 1998. At the time of this writing, the MOHFW was implementing the pool-funded Health Population and Nutrition Sector Development Program (HPNSDP) (2011 to June 2016), the goals of which included

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¹ SIAPS Program. 2013. *QuanTB User's Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

² World Development Indicators. Available at: http://data.worldbank.org/indicator.

³ WHO Global TB Report Bangladesh Country Profile. Available at: https://extranet.who.int/sree/Reports?op=Replet&name=%2FWHO_HQ_Reports%2FG2%2FPROD%2FEXT%2FT BCountryProfile&ISO2=BD&LAN=EN&outtype=html.

⁴ World Development Indicators. Available at: http://data.worldbank.org/indicator.

reducing morbidity and mortality by increasing access to and utilization of health, population, and nutrition services. Key program strategies included increasing the availability of medicines through improved pharmaceutical management. The HPNSDP is funded by a consortium of donors led by the World Bank and the International Development Association. Most of the United Nations agencies are non-pool contributors. Other development donors provide credit and grants (e.g., the Global Fund)⁵.

Key Gaps that Necessitated QuanTB Implementation

- Inadequate forecasting and supply planning: Insufficient technical skills and tools to forecast and plan for the supply of required TB medicines resulted in under or overestimation of first-and second-line TB medicines (previously the country was using an Excel-based Global Drug Facility (GDF) tool). Supply planning and order tracking were challenging due to inadequate pipeline data visibility. This resulted in acute overstocking of TB medicines, including expensive multidrug-resistant TB (MDR-TB) medicines.
- Lack of a stock status monitoring system for TB drugs
- Lack of a proper EWS for medicine inventory, stock-outs, and expiry of TB medicines
- No proper recording and reporting system for TB medicines and supplies
- Challenges in monitoring of TB patient enrollment: There was no capacity to analyze actual
 patient enrollment against planned enrollment and its effect on the availability of medicines
 in the country
- Inventory management deficiencies: There was no timely and accurate inventory system in the Shyamoli central TB warehouse.

The implementation of QuanTB helped to address these gaps.

Goal and Objectives

The goal of this project was to conduct a review of SIAPS TB technical assistance and QuanTB implementation in Bangladesh. Specific objectives were to determine:

- Key achievements or results of SIAPS QuanTB technical assistance in Bangladesh
- Experiences and perspectives of the beneficiaries from the NTP
- Challenges and lessons learned

This brief summarizes key aspects and results of the analysis for Bangladesh.

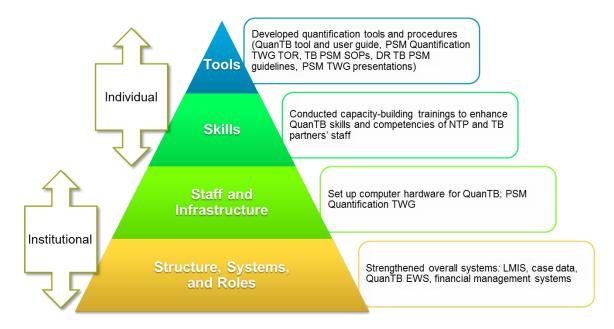
⁵ WHO. 2014. WHO country cooperation strategy Bangladesh 2014–2017. Available at: http://www.who.int/countryfocus/cooperation_strategy/ccs_bgd_en.pdf.

METHODOLOGY

Data were collected through a review of relevant background documents and reports; interviews with SIAPS TB staff; and remote data collection through telecommunication with SIAPS TB field advisors (using a questionnaire for SIAPS field advisors) and local beneficiaries of the technical assistance (using one questionnaire for active users of QuanTB and another for senior NTP officials/decision makers). Data were analyzed by content (mostly qualitatively) and by prevalent themes relating to key achievements or success areas. In addition, online experience and satisfaction surveys were conducted with in-country beneficiaries and global partners. Results of the online surveys have been reported separately⁶.

Strategic Approach

SIAPS developed QuanTB to promote a systems-strengthening approach to TB medicines management ⁷. As shown in figure 1, implementation of QuanTB was expected to strengthen the country quantification system through systemic institutional and individual capacity building. Optimum capacity at all levels of the hierarchy is key to ensuring timely reporting of valid data; timely updating of QuanTB files; and the generation of accurate forecasts, supply planning information, and EWS alerts. The information informs proper decision making and development and implementation of remedial actions through a technical working group or partner coordination forum.



 ⁶ Goredema W, Sawyer K, Mwatawala S, Owuna C. 2017. *Implementing an Early Warning System for TB Medicines: Global Report*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.
 ⁷ SIAPS Program. 2013. *QuanTB User's Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

Figure 1. Systemic institutional and individual capacity building in quantification⁸ Key interventions implemented in Bangladesh included:

- Capacity building: Key NTP staff have been trained on quantification of TB medicines using QuanTB.
- Ongoing implementation of QuanTB in quantification, stock status monitoring, and EWS: The country is using QuanTB to forecast and plan supplies of TB medicines and to track stock status, generate EWS alerts, and take appropriate actions to prevent or minimize risks such as medicine overstocking and expiry.
- Stock and patient enrollment reporting in coordination with the NTP for accurate quantification was introduced and implemented.
- The implementation of e-TB Manager complemented QuanTB by strengthening collection and up-to-date reporting of TB case data.

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⁸ Adapted from: Potter C, Brough R. Systemic Capacity Building: A Hierarchy of needs. Health Policy and Planning 2004; 19(5): 336–345.

RESULTS AND DISCUSSION

Process

SIAPS has provided TB technical assistance in Bangladesh since 2011. The MOHFW/NTP implemented QuanTB in 2014 with SIAPS technical assistance and in collaboration with local TB partners and stakeholders, including the USAID-funded Challenge TB (implemented by Management Sciences for Health (MSH)), WHO, the Bangladesh Rural Advancement Committee, the Damien Foundation, Lepra, and HEED Bangladesh. The country is using QuanTB for forecasting, procurement, supply planning, cost analysis, introduction of new medicines or regimens, and as an EWS. The DOTS center prepares quarterly patient data reports and sends them to the NTP management information system (MIS) (TB and Leprosy Control Assistant of both the NTP and nongovernmental organization partners at the upazila level). Program organizers of the NTP and nongovernmental organization partners consolidate the data at the district level, and the NTP MIS and M&E teams consolidate, validate, and analyze the data at the national level. The processed information is shared with the Procurement and Supply Management Working Group (PSMWG). SIAPS played a critical role in creating and supporting this PSMWG.

Drug-resistant TB (DR-TB) patient data. All six MDR sites report their monthly enrollments. Each month, the NTP central warehouse compiles and validates the monthly stock data with assistance from the SIAPS TB technical advisor. The data are then shared with NTP management through the deputy program manager (DPM) of the Procurement and Logistics Unit and then with the PSMWG.

Peripheral second-line medicine data. Each month, the peripheral stores send data to the NTP, which shares them with the PSMWG. Another key source of data is e-TB Manager. This electronic tool has been rolled out in all MOHFW MDR sites and provides real-time data. It is also used to verify data collected through other sources. Quantifying and forecasting the data capture, processing the data, and analyzing the output are done collaboratively by the DPM, NTP, and procurement and supply management (PSM) with direct assistance from SIAPS. Overall decision making is done in PSMWG meetings or in ad hoc meetings. Meeting minutes, including action-oriented decisions, are signed by the NTP director and shared with stakeholders.

Beneficiary Experiences and Perspectives

Questionnaire respondents rated key attributes of QuanTB favorably. Users consider it simple and user friendly when compared to the Excel-based GDF tool that was used for both case data and medicine stock data before QuanTB. In the Excel-based system, patient data were captured on a quarterly or annual basis; the same data can be distributed monthly using QuanTB. Medicines also had to be quantified individually. With QuanTB, it is simple to interpret results through visual dashboard outputs, and a medicine report provides accurate quantities. Users also like that the tool enables easy tracking of patient enrollment trends and facilitates checking and determining whether the GDF's proposed shipment and expiry dates will meet program needs.

Users are confident that the tool produces accurate, valid, and reliable forecasts, supply planning data, and EWS alerts needed for programs. However, this depends on the quality and validity of case and stock data that are fed into the tool. One key official noted that there is room for improvement in the accuracy and validity of data used for child TB weight categories because the data are assumed, and available MIS data on the percentage of children taking different formulation of medicines are not used.

Respondents also agreed that the tool generates timely results once case and stock data have been captured. Key users find the tool acceptable and useful because the program benefits from the information it produces. It readily provides key pipeline information, such as months of stock on hand, stock on order, and when new consignments are expected, as well as EWS dashboard alerts that help prevent stock-outs and expiry of medicines. The tool has improved the speed and timelines of forecasting and supply planning. TB stock status reports are shared quarterly with NTP decision makers and stakeholders to facilitate corrective action to avert or minimize risks. NTP officials consider the costs to sustain continued use of the tool reasonable. The NTP has hired a national PSM expert as well as a short-term international PSM consultant. However, there is no budget line identified for capacity building in the current Global Fund New Funding Model (NFM) grant or the Bangladesh MOHFW's operational plan, so there could potentially be a gap in funding if human resource capacity building is escalated in the future.

Accomplishments

Key accomplishments and results of the QuanTB implementation in Bangladesh to date include:

- Adopting and institutionalizing QuanTB: With ongoing SIAPS technical assistance, the NTP is working toward adopting and institutionalizing QuanTB as the national quantification tool for TB medicines in the country.
- Enhanced NTP quantification capacity and skills: SIAPS provided technical assistance to enhance the country's TB medicine quantification capacity and skills. Quantification trainings were held in August 2013 and March 2015, and 13 NTP staff and 9 staff from partner organizations were trained. The NTP has a dedicated PSMWG that spearheads the use of QuanTB forecasting and related information in procurement decision making. The country used QuanTB from January 2014 to February 2015 with a limited scope and then more comprehensively starting in March 2015. The NTP conducts QuanTB reviews on a monthly or quarterly basis and generates data for forecasting and supply chain decision making. SIAPS is supporting the NTP PSMWG on an ongoing basis in implementing QuanTB to facilitate procurement and supply chain decision making.
- Improved forecasting and supply planning: QuanTB forecasts and supply plans are reviewed quarterly to adjust for updated patient enrollment numbers, stock on hand, and expiry dates. The results are more timely, accurate, and reliable than were the quantification results prior to QuanTB. Implementation of the tool highlights the need to review trends in actual enrollment of TB cases and to take necessary steps (particularly in the event of a decrease in MDR-TB or extensively drug-resistant tuberculosis (XDR)-TB

cases) to minimize the risk of overstock of certain medicines. EWS dashboard data on potential stock-outs and expiries and on months of stock on hand helps give an overall idea of the pipeline for all stock, and the "order and costs report" is used to budget for and order TB medicines. For example, the QuanTB pipeline information was helpful in developing the July 2015 to –December 2017 budget for the Global Fund NFM grant for procurement of first-line medicines in the first year of procurement for the NFM and in ordering shorter MDR-TB medicine regimens as part of operational research that was implemented by Challenge TB. This operational research was cancelled because WHO endorsed the shorter regimen, and Bangladesh will start rolling it out as part of the regular program at the end of 2016 or the beginning of 2017. Therefore, the ordered medicines will be used to treat patients enrolled in the shorter regimen. The tool also facilitates tracking of nonreporting facilities and can be used as a central repository for patient and logistics data. This has made decision making easier and more comprehensive, thereby improving the effectiveness and efficiency of the TB medicine procurement and supply chain logistics management system.

Implemented an EWS to prevent stock-outs and wastage of TB medicines: SIAPS has assisted the Bangladesh MOHFW/NTP in quarterly monitoring of TB stock status since November 2013. The support includes reviewing and analyzing QuanTB outputs and using QuanTB dashboard alerts to propose corrective actions. TB stock status monitoring has informed corrective action in cases of national-level stock-outs, facility over- or understocks, and expiry of stock. In 2014 and 2015, QuanTB helped inform NTP decisions to defer or cancel some shipments of second-line medicines to avoid overstock and wastage. The medicines were successfully redistributed to other countries, resulting in an estimated savings of approximately USD 900,000. The NTP also identified pediatric TB medicines at risk of expiry in early 2017 and took corrective actions in 2016. Other actions included in-country redistribution of cycloserine to avoid a stock-out when the planned shipment from the GDF was delayed in 2015 and fast tracking a shipment of 2-FDC adult tablets to avoid an impending stock-out in 2016, identified in August 2015, and another shipment that would otherwise have been delayed in the order for 2016–17. In 2016, the NTP generated forecasts under alternate scenarios to avoid potential expiries of some child TB medicines. Regular monitoring of the availability of TB medicines informs their rational supply and distribution. Good coordination and collaboration were established between the NTP PSMWG and the GDF, and QuanTB data provided sound evidence to give to the GDF to quantify concerns about the adverse impact of stock-outs or expiries if shipments were not fast tracked or delayed. QuanTB also enabled the NTP to easily monitor medicine availability in complex, multiple-drug TB treatment regimens.



Figure 2. Sample QuanTB dashboard

Trend of Stock-outs of TB Medicines

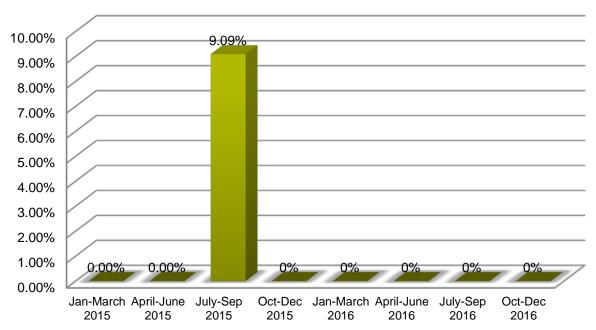


Figure 3. Percentage of stock-outs of first-line TB medicines 9,10

Stock inventory register, Shyamoli Central Medical Warehouse, Bangladesh
 SIAPS. January 2017. Monitoring TB Medicine Availability: Quarterly Report – Bangladesh.

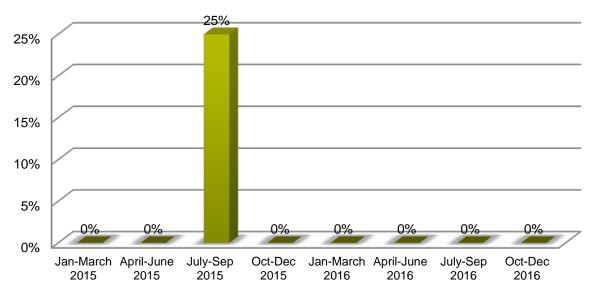


Figure 4. Percentage of stock-outs of second-line TB medicines¹¹

No credible data were available before January 2015.

As a result of timely decisions and actions to redistribute stock or expedite or delay GDF shipments based on QuanTB dashboard alerts, at the time of the evaluation there had been no stock-outs of first-line medicines since September 2015 and no serious threat of a stock-out or alert for second-line medicines with fewer than three months of stock since that time. Although the first-line medicine 2FDC RH (60+60) was out of stock at the Shyamoli Central Warehouse (SCW), the country used a new formulation (2FDC RH (60+30)) during the stock-out and stopped using the 60+60 formulation after it had received and used up the order that was in the pipeline. The country has since been using the new formulation. For second-line medicines, cycloserine was out of stock for a few days at the SCW before an expedited shipment was received, but the stock was available at the National Institute of Diseases of the Chest and Hospital and peripheral MDR treatment sites. Capreomycin was also out of stock at the SCW because all supplies had been issued to treatment sites. However, smaller amounts of the medicine were used due to fewer XDR-TB patients than anticipated and intolerance by MDR-TB patients who had tried the medicine. Although amoxyclav was out of stock at the SCW, the two patients that needed the medicine received it at the National Institute of Diseases of the Chest and Hospital, whose stock was not procured through the Global Fund and therefore was not reflected in the SCW stock.

• Identified and addressed TB PSM challenges through GDF monitoring missions and external TB program review: The missions identified several TB supply chain challenges and recommended interventions to address them. SIAPS provided technical assistance and collaborated with the NTP and other partners to address the identified challenges.

¹¹ SIAPS. January 2017. Monitoring TB Medicine Availability: Quarterly Report – Bangladesh.

- Strengthened information systems and improved data quality and reporting for informed decision making: The implementation of QuanTB has improved the TB logistics management information system and reporting.
- Strengthened systems: The EWS strengthened information for decision making by ensuring linkages between patient- and stock-related data. Therefore, early detection of potential over- and understocks and better quantification and supply planning resulted in improved procurement. Stock status monitoring has helped to inform the redistribution of commodities within and among countries in the event of under- or overstocks; capacity has been built through training and supportive supervision; and financial management systems have optimized through better estimation of national needs and less wastage.
- *Improved collaboration:* Strong collaboration among the MOHFW/NTP, SIAPS, MSH bilateral projects, and other partners in Bangladesh was established.
- *Improved services:* SIAPS TB technical assistance, the implementation of QuanTB, and improved Shyamoli warehousing operations and management systems have improved the availability of TB medicines and TB control services.

Challenges, Lessons Learned, and Recommendations

Challenges

- Human resource and capacity constraints: The NTP lacks skilled and competent
 quantification staff. Key PSM personnel have been recruited. Staff turnover is problematic,
 particularly in peripheral health institutions. Staff computer literacy is also a challenge. The
 commitment and engagement of the NTP and key partners can be problematic due to
 competing commitments or the perception that QuanTB is a complex tool.
- Information systems/reporting: Data quality (accuracy, timeliness, and completeness) from multiple data sources can be a challenge, but the NTP strives to improve data quality. Sometimes MDR stock and patient data are received late. There is no effective M&E system in place due to the existing MOHFW organizational structure.
- Deficiencies in inventory management continue to be a challenge.

Lessons Learned

- Regular monitoring of TB stock levels against patient enrollment is key to ensuring the early identification of potential wastage of TB medicines. However, more effort is needed to address other factors contributing to overstocks or stock-outs of TB medicines.
- Comprehensive system strengthening interventions may require more time and resources than initially assumed, particularly in resource-constrained settings like Bangladesh.

• Clinicians may switch patients to customized regimens because of adverse drug reactions but not systematically track the number of patients on the new regimens. To track enrollment by regimen for accurate quantification, regular data collection and review are necessary.

Recommendations

- Foster the implementation of e-TB Manager to improve reporting of stock and patient data. Strengthen the MOHFW M&E unit.
- Scale up implementation of the Warehouse Inventory Management System software to address deficiencies in warehouse operations and inventory management.
- Sustain efforts and resources for quantification, forecasting, and EWS from NTP and partners after SIAPS closes.

CONCLUSION

With USAID/SIAPS technical assistance, the Bangladesh MOHFW NTP is successfully implementing the QuanTB EWS using a locally led, effective, and sustainable approach to improve forecasting, monitor stock, track expiries and stock-outs, make informed decisions, and take appropriate actions to close underlying PSM gaps. The trend of stock-out rates is evidence that implementation of the tool is contributing to achieving the goal of ensuring an uninterrupted supply of TB medicines. However, continued investment is needed to address the remaining gaps, and TB stakeholders and partners should continue to collaborate to sustain implementation of the tool.