

# National Anti-TB Drugs and Laboratory Reagents and Supplies Quantification Bangladesh 2012-2016

December 2012



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## **National Anti-TB Drugs and Laboratory Reagents and Supplies Quantification Bangladesh 2012-2016**

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## **About SIAPS**

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to assure 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.

## **Recommended Citation**

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## **Key Words**

tuberculosis, quantification, Bangladesh

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## ACRONYMS AND ABBREVIATIONS

BRAC	Bangladesh Rural Advancement Committee
DGFP	Directorate General of Family Planning
DGHS	Directorate General of Health Services
DPM	Deputy Program Manager
FDC	fixed-dose combination
GDF	Global Drug Facility
GoB	Government of Bangladesh
IPA	International Procurement Agent
LMIS	Logistics Management Information System
MDR	multidrug resistance
MOHFW	Ministry of Health and Family Welfare
NGO	nongovernmental organization
NTP	National Tuberculosis Control Program
PM	Program Manager
SIAPS	System for Improved Access to Pharmaceuticals and Services
TB	tuberculosis
USAID	US Agency for International Development
USD	US dollar
WHO	World Health Organization

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## EXECUTIVE SUMMARY

Since 1965, tuberculosis (TB) services in Bangladesh, which are based in 44 TB clinics, 8 segregation hospitals, and 4 TB hospitals have been focused on curing patients. TB services were expanded to 124 upazila health complexes during the Second Health and Population Plan (1980-86), and were operationally integrated with leprosy during the Third Health and Population Plan (1986-91) under the Mycobacterial Disease Control Directorate of the Directorate-General of Health Services (DGHS).

The National Tuberculosis Control Program (NTP) adopted the World Health Organization's (WHO) internationally recommended strategy for TB control—DOTS—in November 1993 during the Fourth Population and Health Plan (1992–98) to increase case detection rate and cure rate. In July 1998, the NTP was integrated into the Communicable Disease Control component of the Essential Services Package under the Health and Population Sector Program. In 2003, the program was renamed Health, Nutrition and Population Sector Program and NTP was recognized as one of its priority programs.

In 2011, the Government of Bangladesh further revised its strategic approach and renamed as Health Population and Nutrition Sector Development Programme (HPNSDP) (July 2011-June 2016) prioritizing TB control under communicable diseases.

The overall vision of NTP is “Tuberculosis is no more a public health problem in Bangladesh.” To achieve the vision, the program has now adopted the new activities for universal access of quality diagnosis and treatment for all TB patients in the community. For TB commodities to be available at a sustainable level and meet the Millennium Development Goals by 2015, the demand of the commodities has to be quantified properly and resources have to be allocated. The NTP organized a quantification exercise in collaboration with SIAPS to develop a five-year (2012-2016) forecast of TB commodities with a two-year supply plan. This plan will provide evidence-based procurement decisions which will guide future procurement actions and ensure sustainable commodity availability for the program. The quantification exercise was undertaken with active participation of the relevant partners in the program. The exercise sets the stage for the establishment of a consistent mechanism for regular updates of the national forecast and supply plans for TB commodities to ensure TB commodity security at national level.

Generally, the total cost of estimated requirements during the years 2012–2106 for the quantified TB commodities first-line TB medicines for adults , first-line TB medicines for pediatrics, adult multidrug-resistant (MDR)-TB, and slide test kits for smear tests) using the morbidity forecasting methodology is 50,108,320 US dollars (USD). These values include the requirements by the clients, wastages, and 17 percent additional costs for freight and logistics.

## INTRODUCTION

### County Profile

Bangladesh is one of the world's most densely populated countries struggling with the negative effects of high population growth rates. It is situated in the southern part of Asia, bordered on the west, north and east by India, on the southeast by Myanmar, and on the south by the Bay of Bengal with a total area of 147,570 square kilometers. Bangladesh is now world's eighth populous country having 152.5 million people, and it is estimated that the population will be 180 million by 2025 and 254 million by 2050 with 1.37 percent growth rate.

In 1965, tuberculosis services were mainly curative and based in TB clinics and TB hospitals. TB services were expanded to 124 upazila health complexes during the Second Health and Population Plan (1980-86), and were operationally integrated with leprosy during the Third Health and Population Plan (1986-91) under the Mycobacterial Disease Control Directorate of the Directorate General of Health Services (DGHS).

The NTP follows the DOTS strategy to improve the quality of the TB services. Implementation of the strategy started in November 1993 in four upazilas in two districts. By 2003, the program had been established in all upazilas, 44 chest disease clinics, and 6 metropolitan cities in collaboration with nongovernmental organizations (NGOs).

The NTP adopted the DOTS strategy starting in November 1993 during the Fourth Population and Health Plan (1992-98) under the project "Further Development of TB and Leprosy Control Services" considering low case detection and cure rates at 10 percent and 40 percent respectively as reported by a study conducted by the World Bank in 1990. NTP started its field implementation in November 1993 in four pilot upazilas (sub-districts) and progressively expanded to cover all 460 upazilas by June 1998.

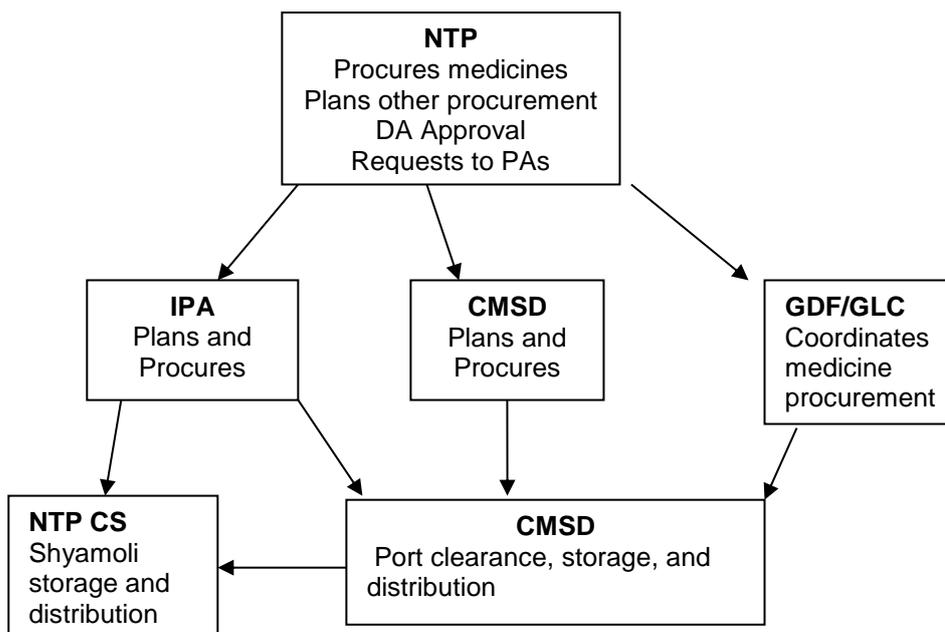
## BACKGROUND

The System for Improved Access to Pharmaceuticals and Services (SIAPS) Program funded by the US Agency for International Development (USAID) has been providing technical assistance to the Ministry of Health and Family Welfare (MoHFW) of Bangladesh and its entities, such as Directorate General of Family Planning (DGFP), Directorate General of Health Services (DGHS), and National Tuberculosis Control Program (NTP). SIAPS has been working with the MoHFW to strengthen program procurement systems and address supply chain management issues related to family planning, TB, and other essential health commodities in Bangladesh.

Under the DGHS Mycobacterial Disease Control unit, the NTP's mission is to strengthen the effort of TB Control through effective partnership, mobilizing resources and ensuring quality diagnostic and treatment services under DOTS, the internationally recommended strategy for tuberculosis control. The service should be equally available to all people of Bangladesh irrespective of age, sex, religion, ethnicity, social status and race. The program initially aims to sustain the global targets of achieving at least 70 percent case detection and 85 percent treatment success among smear-positive TB cases under DOTS. The next steps are to reach the TB-related Millennium Development Goals of halving TB death and prevalence by 2015. Ultimately, the NTP wants to reduce morbidity, mortality, and transmission of TB until it is no longer a public health problem.

The TB Program Manager under the guidance of Line Director TB-Leprosy is the national coordinator for all TB related activities in both the public and private sector. NTP organizes quarterly national and district level meetings to ensure coordination and linkages among stakeholders both in the public and private sector. Nongovernmental organizations (NGOs) receive TB-related supplies from the NTP, removing any coordination gaps in the public and private sector.

To comply with the Global Fund to fight against AIDS, Tuberculosis and Malaria (Global Fund) guidelines, management actions has been taken on how to address the coordination gap and the NTP is holding regular weekly meetings with WHO and Procurement and Supply Management (PSM). A joint plan has been prepared to strengthen management systems to minimize coordination gap between NTP and its partner agencies, such as Bangladesh Rural Advancement Committee (BRAC).



**Figure 1. Roles and responsibilities: procurement, clearance, storage, and distribution of TB commodities**

NTP is responsible for collecting, validating, analyzing, and utilizing the information on procurement and supply to ensure an uninterrupted supply of TB commodities that are provided by Global Fund or procured by NTP. There is no comprehensive management information system in place so NTP with SIAPS technical assistance is working with TB CARE II project to implement an information system. It is expected that the management information system of NTP to be fully operational by June 2012.

NTP collaborates with its partner NGOs in all urban and peri-urban areas, districts, and upazilas. Drugs, reagents, and other logistics are supplied from the central warehouse to district levels based on the quarterly commodity requirements that prepared at the district level. To ensure year-round availability of TB commodities at the national level, Quantification of anti-TB medicines and other diagnostic laboratory reagents is required to accurate estimate of commodities for procurement and timely supply.

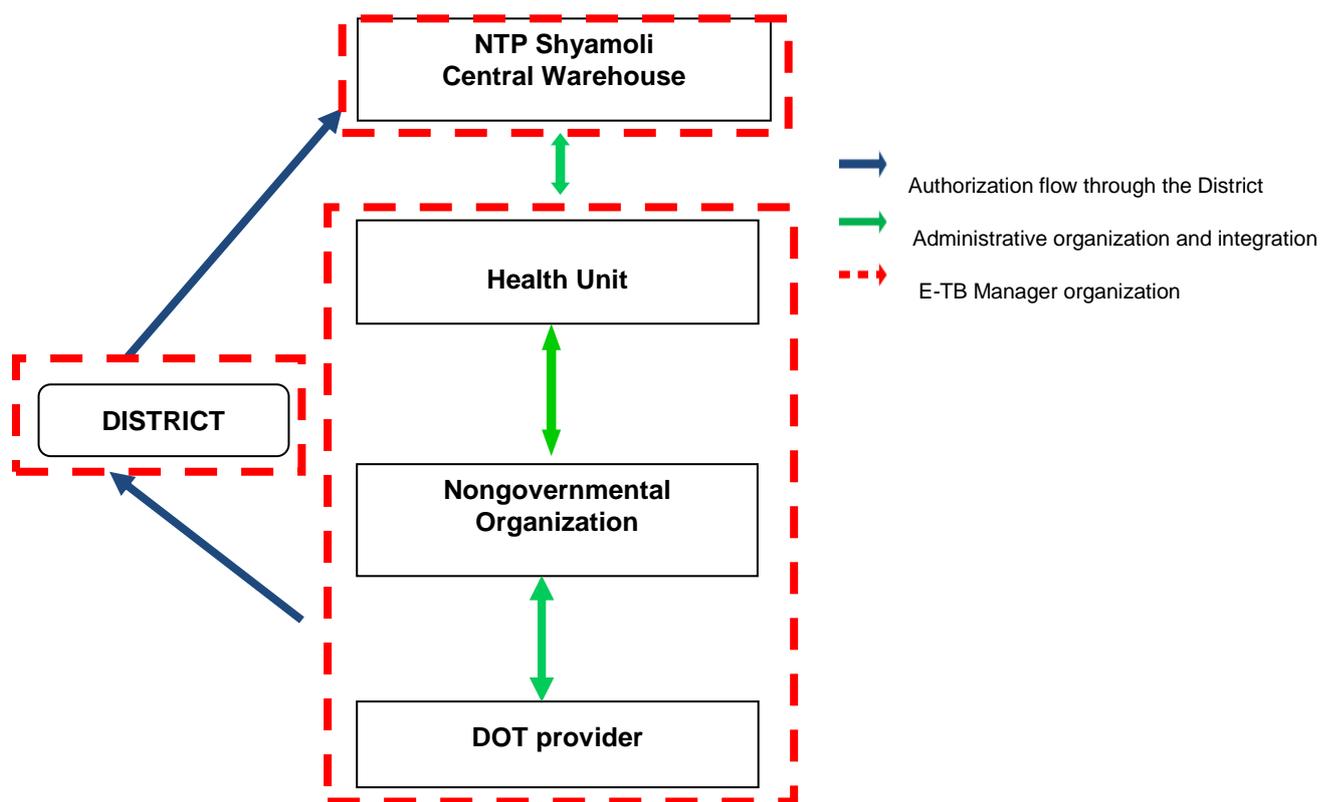
E-TB manager<sup>1</sup>—a system-strengthening electronic web-based tool that addresses all management information needs of TB control programs—is being developed and implemented in Bangladesh by SIAPS. It offers great potential for significantly improving management of TB and drug-resistant TB cases, first- and second-line medicines used for treatment, and any TB commodity.

E-TB manager can capture data and generate reports for the following areas—

- Treatment and case management: uses online notification and follow-up, records clinical and laboratory results, tracks patients' transfers in and out of facilities, and provides data for treatment adherence and patient contact evaluation

<sup>1</sup> E-TB manager is developed under USAID/ Strengthening Pharmaceutical Systems (SPS) program

- First- and second-line medicines management: provides data for medicine consumption, forecasting, ordering, distribution, and dispensing; records stock movements and tracks medicine batch numbers at all levels
- Information and surveillance management: maps TB, multidrug-resistant (MDR)-TB, and extensively drug-resistant TB case patterns, epidemiological indicators, resistance patterns, co-morbidities, previous treatment history, and treatment cohort results; provides surveillance reports and updated information with ready access online at central and peripheral levels
- Operational and clinical research: provides easy methods for analyzing collected data, evaluating treatment costs, and exporting data to other statistical programs



**Figure 2. Medicine and information flow for TB medicines**

As of now, NTP forecasts medicine quantity and laboratory consumables using Global Drug Facility (GDF) spreadsheet. Quantities are based on the estimated number of patients treated during the previous year and the number of patients forecast in the performance framework. However, SIAPS took the opportunity to forecast the TB medicines including lab items using available tools (Quantimed<sup>2</sup> and GDF tool) and develop a supply plan using the Pipeline<sup>3</sup> computer program.

<sup>2</sup> Quantimed: Pharmaceutical Quantification And Cost Estimation Tool, Center for Pharmaceutical Management, Arlington, VA

<sup>3</sup> USAID | DELIVER PROJECT, Task Order 1. 2010. *PipeLine 5: An Addendum to the PipeLine 4 User's Guide*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.

This activity is to set up a medium term five year forecast for NTP with two year supply plan that will provide evidence-based procurement decisions. These decisions should guide future procurement actions and ensure sustainable availability of commodities for the programs. The goal is to developed a data driven quantification and procurement system, prevent stock-outs and minimize losses due to over-stocks at all levels in the supply chain.

This quantification exercise will provide the Government of Bangladesh policy makers and donors with a framework for computing the requirements for anti-TB medicines and selected laboratory supplies for TB diagnosis. This will help NTP to plan for long-term procurements and to mobilize necessary funds.

### **Scope of Quantification**

The scope of the forecast was national, covering first-line anti-TB medicines, MDR-TB medicines, and laboratory reagents and supplies for smear tests. The forecast was made for the period January 2012 to December 2016 and the supply plan covered two years.

### **Objectives of Quantification**

- Develop an evidence-based forecast of requirements to support the NTP for 2012–2016
- Develop 24-month procurement and supply plans for both programs taking the forecasts, service capacity, and available funds; and stock on hand, stock on order, and buffer stock into consideration.
- Identify any supply gaps and under-funded categories and forward recommendations to NTP
- Identify constraints in data management to support regular forecasting and supply planning
- Develop recommendations for institutionalization of formal data collection, forecasting, supply planning, and monitoring systems for TB commodities.
- Provide technical assistance and technical know-how to NTP staff in forecasting and supply planning exercises

### **Quantification Process**

Consultants met on March 4, 2012, to agree on the scope of work, what methodologies to use, the list of participants for the trainings and the workshops, and the schedule of the activities. The scope of work was modified slightly based on the existing situations at the time in terms of availability of data, availability of participants for the workshops, and the trainings. A meeting was held with the country director of SIAPS/Bangladesh. During the meetings, consensus was reached on the scope of work for the short-term technical assistance; the program areas to be quantified were clearly defined and coordination matters were clarified.

In addition, the progress concerning about setting up the meetings with the different governmental partners was discussed and confirmed.

Subsequently, separate meetings and discussions were held with different government officials, department heads, and nongovernmental organization partners. The list of experts and respective institutions contacted to get more data and information on TB program are listed in annex B.

As a result of the discussions, more data and information were obtained on the following—

- Policy documents, fact sheets, annual program progress reports, and strategic plan for national tuberculosis control program were collected and reviewed.
- Data collection tools were drafted based on the document reviews and existing data collection system.
- A meeting was arranged with government and development partners to validate the different assumptions for forecasting and supply plan consistence with country activities.
- The role of collaborating partners in the logistics management of TB commodities and how they connected with the program was discussed.
- What the partners' roles in the logistics management of TB commodities for Bangladesh are and their links with each other.
- Also reviewed what program areas are covered, the current quantification methodology, availability of data for the quantification of the commodities, and challenges of the existing logistics systems.

## **Quantification Methodology**

The following are the major documents collected and reviewed for the exercises:

- Revised Strategic Plan For National Tuberculosis Control Program, 2012–2016 (draft)
- National guidelines and operational manual for tuberculosis control, 4th edition
- Operational manual for the management of MDR-TB, 1st edition, 2009
- Procurement and supply management plan, 2012
- Tuberculosis Control in Bangladesh, Annual Reports (2009, 2010, 2011)
- WHO Global and regional TB control reports (2011, 2012)

Based on documents review, the available data and consensus of participants during national quantification workshop, the morbidity method was applied to this quantification. The morbidity method is related to disease patterns. It is useful when reliable laboratory data on workload and consumption are not available. To forecast commodity requirements for the TB

program due to unavailability of good consumptions data and the fact that the programs have specific targets in terms of number of cases to be treated.

Five-year (2012 -2016) forecast of the TB commodities were undertaken with two years supply plans. TB commodity groups quantified include anti-TB drugs for first line TB, anti – TB drugs for MDR TB and laboratory reagents and supplies for the diagnosis of first line TB. The specific forecasting methodologies, key assumptions and forecasting results for each commodity category are included in the corresponding subsections presented in the quantification results.

For anti-TB medicines, Quantimed and GDF tools were applied and results were compared. For the lab commodities in the TB program were provided on an Excel spreadsheet. Requirements for wastages were also added to get the total quantity of each forecasted commodity.

Pipeline was used for the supply planning of the major commodities. Prices of commodities used for valuation of TB commodities were obtained from NTP.

The freight costs used in the quantification of requirements are based on an indicative percentage of 17 percent of the product costs.

### **Input Data and Assumptions**

The following assumptions were adopted based on the decision by the participants of the consultative quantification workshop and subsequent discussions with specific technical staffs of NTP.

- Forecast period is January 2012 to December 2016.
- Morbidity method was adopted for the forecast.
- NTP provided population projections for basing calculations for new TB cases for the forecast period (table1).
- The TB incidence was calculated based on actual TB cases reported in 2011 by NTP and on an assumption that only 50 percent of all the TB cases are being notified at clinics and treated in Bangladesh (case detection rate = 50 percent). Accordingly, incidence rates were calculated to be 224 cases per 100,000 populations. This incidence rate and the projected population were used to calculate the number of new TB cases for the forecast period.
- Accordingly, incidence rates were calculated to be 224 cases per 100,000 populations. This incidence rate and the projected population were used to calculate the number of new TB cases for the forecast period.

**Table 1. Projected Number of Population, Expected TB Incidence Rate, Expected Number of TB Cases to be Detected and Treated**

Year	2012	2013	2014	2015	2016
Population (in millions)	155.0	157.6	160.2	162.3	165.6
TB incidence per 100,000 population (all TB cases except MDR-TB)	224	224	224	224	224
Total number of TB cases per year (untreated and treated)	347,237	352,978	358,841	364,829	370,946
Percentage of cases with access to modern treatment (notified and treated at health facilities)	50%	50%	50%	50%	50%
Number of all TB cases to be treated	173,618	176,489	179,421	182,415	185,473
Adult TB cases (all first-line) 95%	164,938	167,665	170,450	173,294	176,199
Pediatric TB cases (all first-line) 5%	8,681	8,824	8,971	9,121	9,274

The proportions of the different TB cases as reported in the annual NTP report for the year 2011 were used to calculate the number of category I and II adult TB cases. These proportions were applied to the total number of adult first-line TB cases to calculate the number of category I and category II cases. In Bangladesh, TB treatment is provided through different categories named I, II, III, and IV.

The category I includes smear positive, smear negative and extra pulmonary cases severely ill; category II considered re-treatment cases; category III includes pulmonary negative, extra pulmonary case and not severely ill; and category IV includes MDR-TB phase.

**Table 2. Proportion of Category I and Category II Adult First-Line TB Cases**

Treatment Category	TB cases	2011 NTP Report	Proportions, %
<b>Category I</b>	New smear positive	98,948	63.61
	New smear negative	21,921	14.09
	New extra pulmonary	27,329	17.57
<b>Category II</b>	Relapse	2,701	1.74
	Treatment after failure	886	0.57
	Treatment after default	320	0.20
	Others	3,459	2.22
	<b>Total</b>	155,564	100.00

- All pediatric TB cases were assumed to be TB category I.
- NTP provided the MDR-TB target number of cases to be treated, based mainly on the capacity of the program to reach, diagnose, and treat these TB cases. All the MDR-TB cases were assumed adult cases.

**Table 3. Number of Cases for the Treatment of MDR-TB**

Year	2012	2013	2014	2015	2016
MDR-TB cases	600	750	1,000	1,200	1,500

- Of the total number of TB cases, the proportion of pediatric cases to be treated was assumed to be 5 percent based on the average of the proportions in the NTP strategic document for the forecast period.
- Table 4 shows the regimens and formulations used for adult patients, and table 5 shows those used for pediatric TB patients according to the national standard treatment guidelines for adult TB for first-line medicines and the interim fixed-dose combinations (FDCs) dosing instructions and recommendations by WHO and GDF for pediatric TB.

**Table 4. Regimens and Formulations by Category for Adult First-Line TB**

	<b>Regimen</b>	<b>Drugs and Formulations</b>
Adult TB Category I	2 (RHZE)/4 (RH)	4-FDC (HRZE) 2-FDC (HR)
Adult TB Category II	2 S (RHZE): 1 (RHZE)/ 5 (RH)E	4-FDC (HRZE) Streptomycin (S) 2-FDC (HR) Ethambutol (E)

**Table 5. Regimens and Formulations by Category for Pediatric First-Line TB**

	<b>Treatment Phase</b>	<b>Regimen</b>	<b>Drugs and Formulations</b>
Pediatric TB Category I	Intensive	2 (RHZ)	RHZ 60/30/150
	Continuation	4 (RH)	RH 60/30

- For adult MDR-TB cases, the following regimens and formulations were assumed to be used according to the 2009 operational manual for the management of MDR-TB.

**Table 6. Regimens and Formulations for Adult MDR-TB**

	<b>Regimen</b>
Intensive Phase (10 Months)	Kanamycin (KM)
	Pyrazinamide (Z)
	Ofloxacin (Ofx)
	Ethionamide (Eto)
	Cycloserine (Cs)
Continuation Phase (14 Months)	Pyrazinamide (Z)
	Ofloxacin (Ofx)
	Ethionamide (Eto)
	Cycloserine (Cs)

- Average weight of adult TB patients taking first-line TB medicines was assumed to be 40-54 kilograms (kg) and that of patients with MDR-TB 33–50 kg. For pediatric TB

patients, average weight was 15–20 kg. These weight ranges were used to calculate dosages.

- Only FDCs were assumed to be used during the forecast period for first-line TB cases and not the single drug formulations.
- According to the laboratory manual, the following usage rates per a slide test were used to calculate the requirements of laboratory reagents.

**Table 7. Usage Rate per Slide Test for TB laboratory Reagents and Supplies**

Item	Usage rate per slide test
Strong carbol fuchsin	5 ml
Methylene blue (3 g/l)	5 ml
Acid alcohol 3% v/v	7 ml
Industrialized methylated spirit	5 ml
Immersion oil 20 ml/ bottle	0.1 ml
Lysol 5% solution (Phenol disinfectant)	5 ml
Slides	1
Filter paper	0.1
Lens cleaning tissue	0.2
Waterproof marker pens	1 for 500
Gloves, examination, medium size, pair	0.15
Instruction book	1 for 1000
Material safety data sheet	1 for 1000
Inventory list	1 for 500

**Table 8. Number of Suspects and Slide Tests per One Smear Positive Case**

	2012–2016
Number of suspects examined to get 1 smear-positive case	10
Number of slide tests per suspect	3
Number of slide tests for follow up with each smear-positive patient	3
Total number of slide tests per 1 smear positive patient	33

- Estimated number of slide positive cases were calculated based on the estimated number of new TB smear positive cases (see table 2 for details on the proportions) for the forecast period (table 9).

**Table 9. Estimated Number of New Smear Positive Cases**

Year	2012	2013	2014	2015	2016
Number of new smear positive cases	104,917	106,652	108,423	110,232	112,080

- A wastage rate of 5 percent was applied for calculating TB medicine requirements and 15 percent was applied for wastage rate, quality control, and training in calculating laboratory reagents and supplies requirements.
- Seventeen percent of the total price was included to cover freight and logistics expenses.
- It was assumed that for the forecasting period, the following minimum, maximum, and desired stock levels will be maintained at the different distribution and storage levels in Bangladesh.

**Table 10. Minimum and Maximum Stock Levels for the Program**

<b>Minimum and maximum levels</b>	<b>Minimum months of stock</b>	<b>Maximum months of stock</b>
Central	3	6
Upazila	3	6
Total ( Country/Program)	6	12

- Shipment interval was assumed to be 3 months and therefore the desired stock level for the program calculated to be 11.5~ 12 months using the following formula.

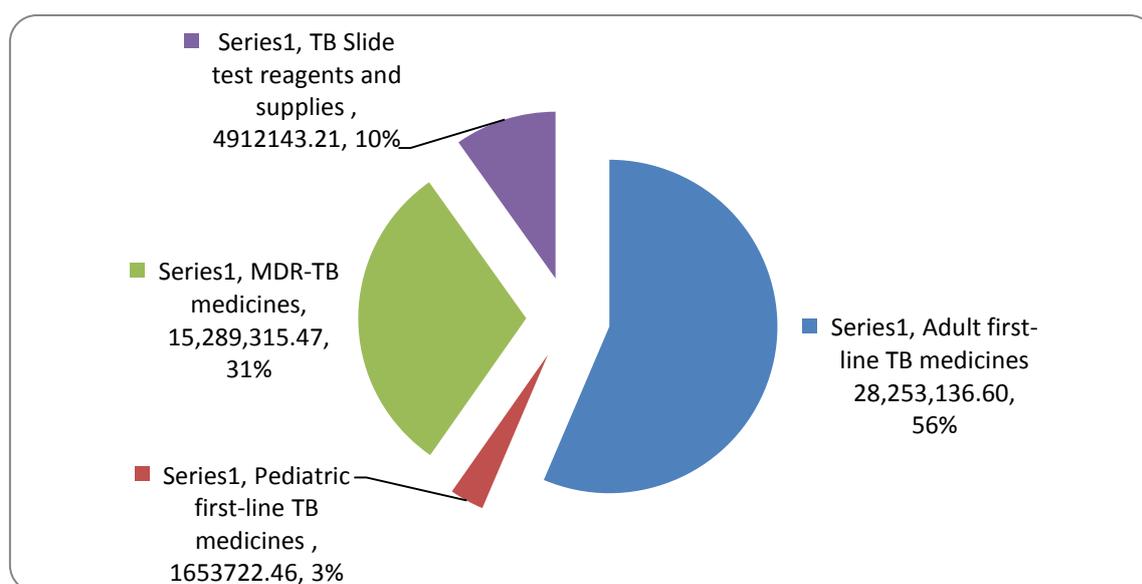
$$***Desired MOS = (Min MOS + Max MOS + Shipment interval)/2***$$

## QUANTIFICATION RESULTS

Using available data and assumptions adopted during the national quantification workshop, further expert discussion, applying Quantimed and GDF tools for TB commodities the total value of forecasted medicines and supplies required for the Bangladesh NTP public sector for the period January 2012 to December 2016 amounts to a total of 50,108,320 US dollars (USD). Table 11 below provides a summary of the values of the various TB pharmaceuticals required. The forecast is for absolute requirements, wastage, and 17 percent freight and logistics costs. The current inventory position is not reflected in the figures. These parameters are used to develop the supply plans and will be used to calculate the final quantity and cost requirements.

**Table 11. Summary of Estimated Cost (in USD) of the Requirements by Category and Year**

Product Category	2012, \$	2013, \$	2014, \$	2015, \$	2016, \$	Total
Adult first-line TB medicines	4,671,809	4,748,997	4,827,904	4,908,482	4,990,788	24,147,980
Pediatric first-line TB medicines	273,452	277,956	282,587	287,312	292,131	1,413,438
MDR-TB medicines	1,552,607	1,940,775	2,587,678	3,105,214	3,881,517	13,067,791
TB slide test reagents and supplies	812,247	825,676	839,391	853,397	867,702	4,198,413
Total	7,310,115	7,793,405	8,537,561	9,154,405	10,032,139	42,827,625
17% freight and logistics	1,242,720	1,324,879	1,451,385	1,556,249	1,705,464	7,280,697
	8,552,835	9,118,283	9,988,946	10,710,653	11,737,603	50,108,320



**Figure 3. Comparison of commodity groups by value for the years 2012–2016**

## Forecasted TB Commodities Requirements

Table 12 shows the projected requirements of TR commodities under different assumptions. The projected commodities of 18,892 tablets of ethambutol 400 mg, 485,239 packs of rifampicine + isoniazide 150 mg + 75 mg tablets, 245,460 pack of rifampicine + isoniazide + pyrazinamide + ethambutol, 25,459 packs of streptomycin sulfate 1 g/vial and 127,292 10 ml vials or water for (streptomycin) injection and 25,459 AD 2-stroke syringes for injections are required during the 2012-2016.

**Table 12. Total Commodity Requirements by Pack Quantity, Adult First-Line TB**

Product	Pack size	2012	2013	2014	2015	2016	Total
Ethambutol 400 mg/tab	672	3,665	3,725	3,787	3,850	3,915	18,942
Rifampicine + isoniazid 150 mg + 75 mg/tab	672	93,877	95,429	97,014	98,633	100,286	485,239
Rifampicine + isoniazid + pyrazinamide + ethambutol 150 mg + 75 mg + 400 mg + 275 mg/tab	672	47,488	48,273	49,075	49,894	50,730	245,460
Streptomycin sulfate 1 g/vial	100	4,925	5,007	5,090	5,175	5,262	25,459
Water for (streptomycin) injection, 10 ml vial	20	24,627	25,033	25,449	25,874	26,309	127,292
AD 2-Stroke syringes for (streptomycin) injection, 100 syringes	100	4,925	5,007	5,090	5,175	5,262	25,459

## Commodities Required for Pediatric First-Line

Table 13 shows that the first-line TB commodities required for pediatric. A total of 201,921 packs of rifampicin + isoniazid 60 mg +30 mg/tab and 100,960 packs of rifampicin + isoniazid + pyrazinamide 60 mg + 30 mg + 150 mg/tablet required for the forecasting period.

**Table 13. Total Commodity Requirements by Pack Quantity, Pediatric First-Line TB**

Product	Pack size	2012	2013	2014	2015	2016	Total
Rifampicin + isoniazid 60 mg + 30 mg/tab	84	39,065	39,708	40,370	41,045	41,733	201,921
Rifampicin + isoniazid + pyrazinamide 60 mg + 30 mg + 150 mg/tab	84	19,532	19,854	20,185	20,522	20,867	100,960

The required commodities for multidrug-resistant TB (MDR-TB) cases are given in table 14. A total of 114,534 packs of cycloserine 250 mg/tab and ethionamide 250 mg/tab each, 159,075 vials of kanamycin sulfate at 1 g/vial, 152,712 packs of ofloxacin 200 mg/tab, 17,044 packs of pyrazinamide 500 mg/tab 15,908 packs of syringe with needle 5 ml, and water for injection, 5 ml each.

**Table 14. Total Commodity Requirements by Pack Quantity, MDR-TB**

<b>Product</b>	<b>Pack size</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Total</b>
Cycloserine 250 mg/tab	100	13,608	17,010	22,680	27,216	34,020	114,534
Ethionamide 250 mg/tab	100	13,608	17,010	22,680	27,216	34,020	114,534
Kanamycin sulfate 1 g/vial	1	189,000	236,256	315,000	378,000	472,500	1,590,756
Ofloxacin 200 mg/tab	100	18,144	22,680	30,240	36,288	45,360	152,712
Pyrazinamide 500 mg/tab	672	2,025	2,531	3,375	4,050	5,063	17,044
Syringe with needle, 5 ml	100	1,890	2,363	3,150	3,780	4,725	15,908
Water for injection, 5 ml	100	1,890	2,363	3,150	3,780	4,725	15,908

### Required TB Kits

The estimated number of lab kit (1 kit for 1,000 slides test) required for the forecasted periods are 17,897 kits (table 15).

**Table 15. Total Commodity Requirements by Kit Quantity, TB Laboratory Reagents, and Supplies**

<b>Year</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Total</b>
Estimated number of TB lab reagents and supplies kits required (1 kit for 1,000 slide tests)	3,462	3,520	3,578	3,638	3,699	17,897

### Cost of the Total Commodities

The total cost of the commodities is estimated by taking the current per unit price of each commodity. Generally, the total estimated cost during the years 2012–2106 for the adult first-line TB is USD 4,990,788 (table 16). The total costs of the pediatric first-line TB cases are USD 292,131 (table 17).

**Table 16. Cost of Commodity Requirements for Adult First-Line TB**

<b>Product</b>	<b>Unit cost/ pack,\$</b>	<b>2012, \$</b>	<b>2013, \$</b>	<b>2014, \$</b>	<b>2015, \$</b>	<b>2016, \$</b>
Ethambutol 400 mg/tab	23.29	85,351	86,759	88,200	89,674	91,180
Rifampicine + isoniazid 150 mg + 75 mg/tab	20.10	1,886,928	1,918,114	1,949,986	1,982,523	2,015,758
Rifampicine + isoniazid + pyrazinamide + ethambutol 150 mg + 75 mg + 400 mg + 275 mg/tab	43.70	2,075,236	2,109,532	2,144,585	2,180,369	2,216,922
Streptomycin sulfate 1 g/vial	68.00	334,927	340,452	346,106	351,892	357,800
Water for streptomycin injection, 10 ml /vial,	10.60	261,046	265,352	269,759	274,269	278,873
AD 2-Stroke syringes for streptomycin injection, 100 syringes	5.75	28,321	28,788	29,266	29,756	30,255
		4,671,809	4,748,997	4,827,904	4,908,482	4,990,788

**Table 17. Cost of Commodity Requirements, Pediatric First-Line TB**

<b>Product</b>	<b>Unit Cost/ Pack, \$</b>	<b>2012, \$</b>	<b>2013, \$</b>	<b>2014, \$</b>	<b>2015, \$</b>	<b>2016, \$</b>
Rifampicin+ isoniazid 60 mg + 30 mg/tab	4.00	156,258	158,832	161,478	164,178	166,932
Rifampicin + isoniazid + pyrazinamide 60 mg + 30 mg + 150 mg/tab	6.00	117,194	119,124	121,109	123,134	125,199
		273,452	277,956	282,587	287,312	292,131

**Table 18. Cost of Commodity Requirements, MDR-TB**

<b>Product</b>	<b>Unit Cost/ pack, \$</b>	<b>2012, \$</b>	<b>2013, \$</b>	<b>2014, \$</b>	<b>2015, \$</b>	<b>2016, \$</b>
Cycloserine 250 mg/tab	59.09	804,097	1,005,121	1,340,161	1,608,193	2,010,242
Ethionamide 250 mg/tab	7.25	98,658	123,323	164,430	197,316	246,645
Kanamycin sulfate 1g/vial	2.58	487,620	609,540	812,700	975,240	1,219,050
Ofloxacin 200 mg/tab	5.50	99,792	124,740	166,320	199,584	249,480
Pyrazinamide 500 mg/tab	11.86	24,017	30,021	40,028	48,033	60,041
Water for injection, 5 ml	16.30	30,807	38,510	51,345	61,614	77,018
Syringe with needle, 5 ml	4.03	7,617	9,521	12,695	15,233	19,042
		1,552,607	1,940,775	2,587,678	3,105,214	3,881,517

**Table 19. Commodity Requirements by Value, TB Laboratory Reagents and Supplies**

<b>Year</b>	<b>Unit Cost/kit, \$</b>	<b>2012, \$</b>	<b>2013, \$</b>	<b>2014, \$</b>	<b>2015, \$</b>	<b>2016, \$</b>
TB lab reagents and supplies kits required	204.00	812,247	825,676	839,391	853,397	867,702

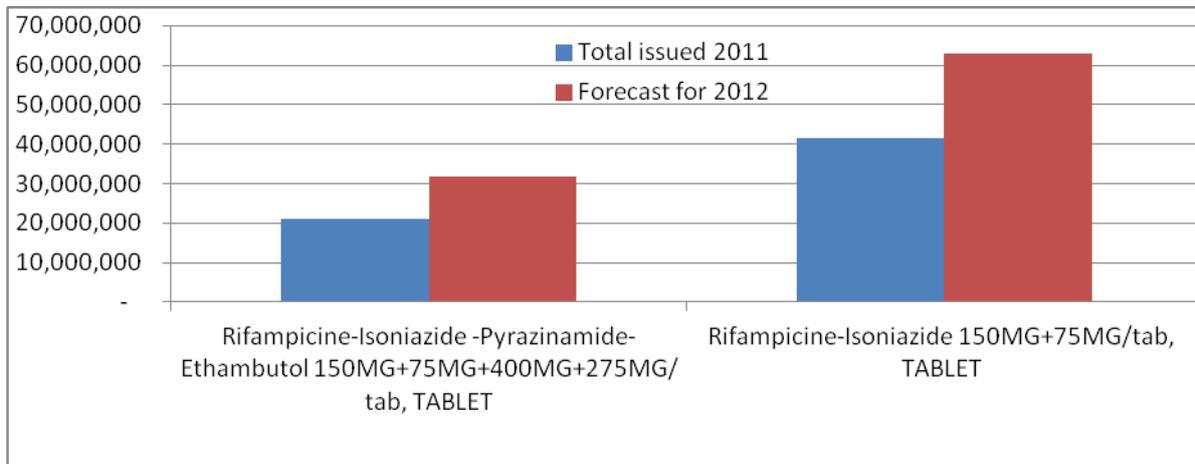
Of the total of about USD 50.1 million requirement for the period 2012–2016, adult first line TB drugs account for most of the requirements taking around 56 percent of the total requirements, followed by MDR-TB drugs which account for 31 percent. The pediatric first-line TB drugs and lab reagents and supplies account for 10 percent and 3 percent of the total requirements for the forecast period. Table 20 below provides the comparison by value of the requirements for the four product categories.

**Table 20. Total Commodity Requirements by Category and Value for 2012–2016**

	<b>Total Product Cost, \$</b>	<b>Total Cost including 17% F&amp;L, \$</b>
Adult First-Line TB drugs	24,147,981	28,253,137
Pediatric First-Line TB drugs	1,413,439	1,653,723
MDR-TB drugs	13,067,792	15,289,316
TB Slide test reagents and supplies	4,198,413	4,912,143
	42,827,624	50,108,320

- The requirements for the MDR-TB keep on increasing significantly during the forecast period. This is due to the assumption that capacity of MDR-TB diagnosis will increase significantly year by year.

- Figure 4 below compares the quantities issued from the Central Medicines Stores Depot in 2011 with the quantities forecasted for 2012.



**Figure 4. Comparison by quantity 2011 issue data versus 2012 forecast**

Generally, the comparison shows that forecasted quantities for 2012 consumption are larger than the issue data from 2011, which is expected; however, the differences for some medicines are huge. Of the adult first-line TB medicines compared here, the smallest difference between the two figures is for ethambutol 400 mg tablets (3 percent) while the largest difference is for streptomycin, which is around 37 percent. For the pediatric first-line TB medicines, the difference is very large (65–80 percent) for the two products compared. The issue quantity for the MDR-TB medicines compared here is around 12–16 percent of the quantities estimated for 2012; this is in line with the difference between the reported number of MDR-TB cases treated in 2011 (75) and that estimated for 2012 (600).

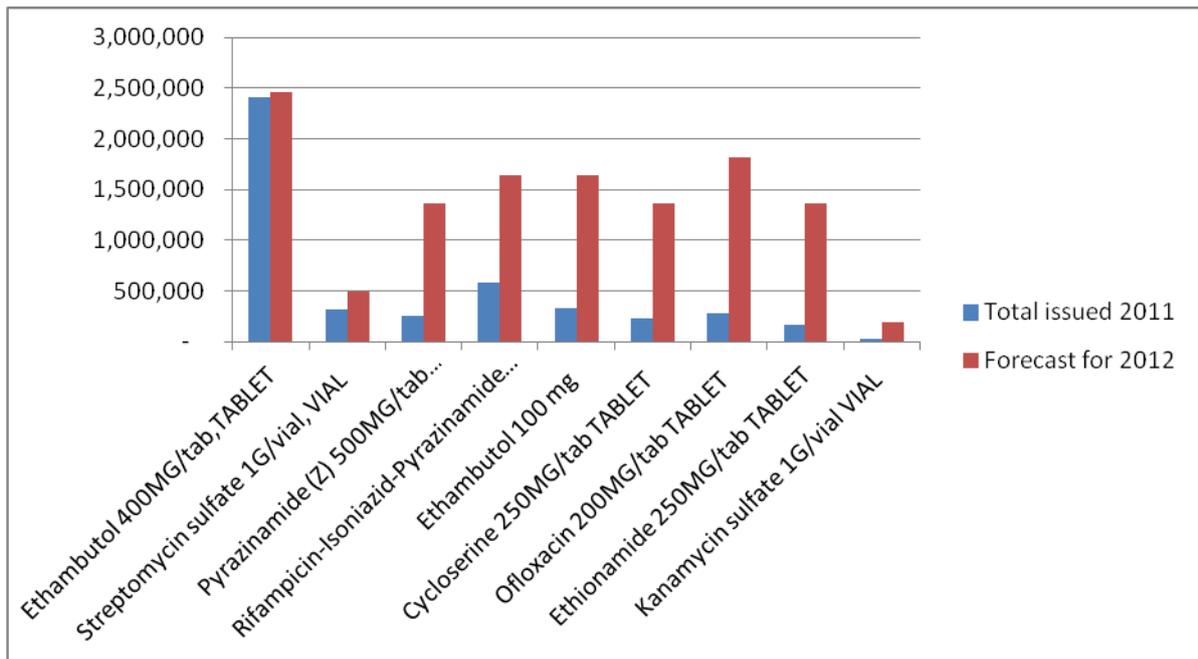


Figure 5. Comparison of commodity by 2011 issue data versus 2012 forecast

## CHALLENGES

- Getting reliable actual historical consumption data of TB commodities was not possible.
- Getting reliable morbidity data was also a challenge as there were inconsistencies observed in the reports for the morbidity data (incidence rates and prevalence rates).
- Determining the case detection rate of all TB cases was difficult as was deciding on the incidence rate for all the TB cases. However, the incidence rate calculated from the assumption of 50 percent case detection rate for all the TB cases was very close to the one reported by WHO.
- Quantification capacity at the country level and at the program level is limited.
- No information was available on pediatric MDR-TB cases and pediatric category II first-line TB cases.

## RECOMMENDATIONS

- Ensure reliable consumption data. This can be done by introducing web-based LMIS to capture most accurate data possible on consumption, stock level, transfers, losses, and days out of stock from health facilities.
- Train program managers and their office staff on the principles and tools of quantification (especially use of Quantimed and Pipeline 5.1 software for both forecasting and supply planning) so that they can develop adequate knowledge and skills on quantification as well as successful implement TB program
- Integrate supply planning into routine supply chain management—supply planning is on-going process, not a one-time activity.
- Undertake forecasting of the commodities at least once a year and then review semi-annually.
- Begin to sensitize physicians and health workers on the TB treatment protocols.
- Establish a centrally coordinating mechanism involving government, NGOs, donors, and WHO to review the quantification exercise annually and conduct quarterly updates of 24-month supply plan.
- Update SOPs and guidelines according to the latest recommendations by WHO.
- Train technicians to ensure the appropriate use of medicines and application of the guidelines.
- Use the Pipeline tool for the supply planning and monitoring of the anti-TB medicines, reagents, and supplies.

**ANNEX A. LIST OF PARTICIPANTS: CONSULTATIVE TB COMMODITIES  
QUANTIFICATION WORKSHOP, MARCH 2012**

<b>Name</b>	<b>Designation</b>
Dr. Md. Ashaque Hussain	Director MBDC and Line Director, TB & leprosy
Dr. Md. Nuruzzaman Haque	Deputy Director and PM-TB
Dr. Mirza Nizam Uddin	Deputy Program Manager, NTP
Dr. Md. Kamar Rezwan	National Professional Officer (TB Control), WHO
Dr. Kamal Hossain	Medical Coordinator, Damien Foundation
Dr. Zubayer Hussain	Country Director, SIAPS Program
Dr. Md. Mojibur Rahman	NPC-NTP
Dr. Shamim Sultana	DPM, Coordination NTP, DUHS
Dr. Rawshan Jahan	Sr. Sector Specialist, BRAC
Dr. A. T. M. Samsul Basher	Program Specialist, M&E, TB CARE II Project URC
Dr. K. M. Alamgir	DPM (training), NTP
Dr. S.M. Abu Zahid	DPM, NTP
Dr. Md. Abdul Hamid	DPM (P&L), NTP
Dr. Sabera Sultana	NPO, WHO
A. Oumer	Consultant, SIAPS Program
Golam Kibria	Senior Technical Advisor, SIAPS Program
Dr. Md Sheikh Giash Uddin	Consultant, SIAPS Program

## **ANNEX B. PERSONS INTERVIEWED**

Dr. Md Ashaque Hossain, Director MBDC and Line Director, NTP

Dr. Md Kamar Rezwana, NPO-TB, WHO

Dr. Md Mojibur Rahman, NPC, NTP

Dr. ATM Sanaul Bashar, Program Specialist-M&E, URC

Dr. S.M Abu Zahid, DPM, NTP

Dr. S. M. Mostofa Kamal, Associate Professor, NTRL, NIDCH

## ANNEX C. LIST OF BOOKS AND REPORTS REVIEWED

1. Revised Strategic Plan for National Tuberculosis Control Program, 2012-2016 (Draft)
2. National guidelines and operational manual for Tuberculosis control, 4th edition
3. Operational manual for the management of MDR-TB, 1st edition, Jan 2009
4. Procurement and supply management plan, Feb 2012
5. Tuberculosis Control in Bangladesh, Annual Reports (2009, 2010, 2011)
6. WHO Global and regional TB control reports (2011, 2012)
7. National Institute of Population Research and Training.. 2009. *Bangladesh Demographic and Health Survey 2007*. Dhaka, Bangladesh; and Calverton, Maryland, USA: Mitra and Associates, and Macro International.
8. Bangladesh Bureau of Statistics. 2003. *Bangladesh Population Census, 2001*. Analytical Report. Dhaka: Bangladesh Bureau of Statistics. Planning Division. Ministry of Planning.
9. Bangladesh Bureau of Statistics. 2009. Sample Vital Registration System: Planning Division, Ministry of Planning.

## ANNEX D. SHIPMENT SUMMARY BY SUPPLIER PIPELINE 5.0

Run Date:

29-Aug-12

Report Period: Jan 2012 - Dec 2014 BangladeshBD TB 2012-2013

Time:

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Category: TB drugs  
 Supplier: NTP00  
 Status: Planned, Ordered, Shipped, Arrived, Received

Supplier							-----Costs-----		
Type	Product	Funding Source	Receipt Date	Quantity	Status	ID	Product	Freight	Total
<b>NTP</b>	First line Adult-TB								
	Ethambutol 400mg, 28BLx24 Tabs								
		Not Selected	31-Aug-12	1,180	Ordered	39	27,482	4,672	32,154
		Not Selected	31-Dec-13	1,772	Planned	86	41,270	7,016	48,286
	Rif/INH/Pyr/Eth 150/75/400/275mg, 28BLx24 Tabs								
		Not Selected	31-Aug-12	22,455	Ordered	4	981,284	166,818	1,148,102
		Not Selected	31-Oct-12	30,275	Planned	102	1,323,018	224,913	1,547,930
		Not Selected	31-Mar-13	20,832	Planned	103	910,358	154,761	1,065,119
		Not Selected	31-Aug-13	20,115	Planned	130	879,026	149,434	1,028,460
		Not Selected	31-Dec-13	16,050	Planned	131	701,385	119,235	820,620
	Rifampicin/INH 150/75mg, 28BLx24 Tabs								
		Not Selected	31-Aug-12	24,785	Ordered	3	498,179	84,690	582,869
		Not Selected	31-Oct-12	95,264	Planned	105	1,914,806	325,517	2,240,323
		Not Selected	31-Mar-13	41,180	Planned	132	827,718	140,712	968,430
		Not Selected	31-Aug-13	39,760	Planned	133	799,176	135,860	935,036
		Not Selected	31-Dec-13	31,878	Planned	134	640,748	108,927	749,675
	Streptomycin (as sulfate), PFI, 1g x 50 Vials								
		Not Selected	31-Aug-12	2,543	Ordered	77	86,445	14,696	101,141
		Not Selected	31-Oct-12	10,581	Planned	111	359,754	61,158	420,912
		Not Selected	31-Mar-13	4,324	Planned	112	147,016	24,993	172,009
		Not Selected	31-Aug-13	4,170	Planned	136	141,780	24,103	165,883
		Not Selected	31-Dec-13	3,420	Planned	137	116,280	19,768	136,048

**Shipment Summary by Supplier** PipeLine 5.0  
 Report Period: Jan 2012 - Dec 2014 Bangladesh TB 2012-2013  
 2 of 4

Run Date: 29-Aug-12

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Time:

**Supplier**

Type

Product

						-----Costs-----		
Product	Funding Source	Receipt Date	Quantity	Status	ID	Product	Freight	Total
Water for injection , 10 ml vial , 20 vials								
	Not Selected	31-Aug-12	1,085	Ordered	80	11,501	1,955	13,456
	Not Selected	31-Oct-12	12,478	Planned	114	132,267	22,485	154,752
	Not Selected	31-Mar-13	10,794	Planned	115	114,416	19,451	133,867
	Not Selected	31-Aug-13	10,430	Planned	138	110,558	18,795	129,353
	Not Selected	31-Dec-13	8,358	Planned	139	88,595	15,061	103,656
First line Adult-TB Total						10,853,061	1,845,020	12,698,081
First line Ped -TB								
Rifampicin/INH 60/30mg, dispersible, BL 84 Tabs								
	Not Selected	30-Sep-12	45,570	Planned	152	182,280	30,988	213,268
	Not Selected	28-Feb-13	17,090	Planned	153	68,360	11,621	79,981
	Not Selected	31-Jul-13	16,545	Planned	154	66,180	11,251	77,431
	Not Selected	31-Dec-13	16,545	Planned	155	66,180	11,251	77,431
Rifampicin/INH/Pyraz 60/30/150mg, BL 84 Tabs								
	Not Selected	31-Aug-12	22,792	Planned	108	136,752	23,248	160,000
	Not Selected	31-Jan-13	8,500	Planned	109	51,000	8,670	59,670
	Not Selected	31-Jul-13	9,924	Planned	110	59,544	10,122	69,666
	Not Selected	31-Dec-13	8,354	Planned	135	50,124	8,521	58,645
First line Ped -TB Total						680,420	115,671	796,091

**National Anti-TB Drugs and Laboratory Reagents and Supplies Quantification Bangladesh  
2012-2016**

**Shipment Summary by Supplier** PipeLine 5.0  
Report Period: Jan 2012 - Dec 2014 Bangladesh BD TB 2012-2013  
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Run Date: 29-Aug-12  
Page: Run  
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**Supplier**

Type

Product

MDR TB

Cycloserine 250mg, BL 100 caps

Not Selected

31-Aug-12

450

Ordered

5

26,591

4,520

31,111

Not Selected

30-Sep-12

13,666

Planned

117

807,524

137,279

944,803

Not Selected

31-Jan-13

8,512

Planned

118

502,974

85,506

588,480

Not Selected

30-Jun-13

7,090

Planned

119

418,948

71,221

490,169

Not Selected

30-Nov-13

7,051

Planned

120

416,644

70,829

487,473

Ethionamide 250mg, BL 100 Tabs

Not Selected

31-Aug-12

450

Ordered

6

3,263

555

3,817

Not Selected

31-Oct-12

14,930

Planned

87

108,243

18,401

126,644

Not Selected

28-Feb-13

8,796

Planned

88

63,771

10,841

74,612

Not Selected

31-Jul-13

7,090

Planned

89

51,403

8,738

60,141

Not Selected

31-Dec-13

7,006

Planned

90

50,794

8,635

59,428

Kanamycin 1g, PFI, 50 Vials

Not Selected

31-Aug-12

240

Ordered

71

30,960

5,263

36,223

Not Selected

30-Sep-12

4,410

Planned

124

568,890

96,711

665,601

Not Selected

31-Jan-13

2,366

Planned

125

305,214

51,886

357,100

Not Selected

31-Jul-13

2,364

Planned

126

304,956

51,843

356,799

Not Selected

31-Dec-13

1,928

Planned

127

248,712

42,281

290,993

Ofloxacin 200mg, BL 100 Tabs

Not Selected

31-Aug-12

540

Ordered

8

2,970

505

3,475

Not Selected

30-Sep-12

19,888

Planned

95

109,384

18,595

127,979

Not Selected

31-Jan-13

11,340

Planned

96

62,370

10,603

72,973

Not Selected

31-Jul-13

11,340

Planned

98

62,370

10,603

72,973

Not Selected

31-Dec-13

9,450

Planned

128

51,975

8,836

60,811

Pyrazinamide 500mg, 28BLx24 Tabs

Not Selected

31-Aug-12

80

Ordered

2

949

161

1,110

Not Selected

30-Sep-12

924

Planned

99

10,959

1,863

12,822

Not Selected

31-Jan-13

1,261

Planned

100

14,955

2,542

17,498

Not Selected

31-Jul-13

1,266

Planned

101

15,015

2,553

17,567

Not Selected

31-Dec-13

1,041

Planned

129

12,346

2,099

14,445

**Shipment Summary by Supplier** PipeLine 5.0  
 Report Period: Jan 2012 - Dec 2014 Bangladesh TB 2012-2013  
 4 of 4

Run Date: 29-Aug-12

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Time:

**Supplier**  
Type

Product	Funding Source	Receipt Date	Quantity	Status	ID	-----Costs-----		
						Product	Freight	Total
Syringe with needle, 5 ml, of 100	Not Selected	30-Sep-12	2,212	Planned	148	8,914	1,515	10,430
	Not Selected	31-Jan-13	1,172	Planned	149	4,723	803	5,526
	Not Selected	31-Jul-13	1,182	Planned	150	4,763	810	5,573
	Not Selected	31-Dec-13	971	Planned	151	3,913	665	4,578
Water for injection, 5 ml of 100 vilas	Not Selected	30-Sep-12	2,212	Planned	140	36,056	6,129	42,185
	Not Selected	31-Jan-13	1,172	Planned	141	19,104	3,248	22,351
	Not Selected	31-Jul-13	1,182	Planned	142	19,267	3,275	22,542
	Not Selected	31-Dec-13	971	Planned	143	15,827	2,691	18,518
					MDR TB Total	4,364,744	742,007	5,106,751
TB slide test								
TB slide test kits of 1000 tests	Not Selected	30-Sep-12	4,032	Planned	144	822,528	139,830	962,358
	Not Selected	28-Feb-13	1,521	Planned	145	310,284	52,748	363,032
	Not Selected	31-Jul-13	1,465	Planned	146	298,860	50,806	349,666
	Not Selected	31-Dec-13	1,521	Planned	147	310,284	52,748	363,032
					TB slide test Total	1,741,956	296,133	2,038,089
					NTP Total	17,640,181	2,998,831	20,639,012
					Grand Total	17,640,181	2,998,831	20,639,012