

## Impact of Implementing Early Warning System to Improve Tuberculosis Medicines Procurement in Ethiopia

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Received: July 16, 2019; Published: November 01, 2019

### Abstract

**Background:** TB has existed for millennia and remains a major global health problem. It causes ill-health for approximately 10 million people each year and is one of the top ten causes of death worldwide. For the past 5 years, it has been the leading cause of death from a single infectious agent, ranking above HIV/AIDS.

Ethiopia is one of the global high burden countries for TB, TB/HIV and MDR-TB according to the latest WHO classification. However, MDR-TB case detection remains lower than projected in the current National TB Strategic Plan despite of high government commitment to support the TB program. This has contributed to over estimation and inaccurate procurement of second-line TB medicines in the past two years which were based on the NSP targets.

**Intervention:** In 2015 the country was trained on the use of QuanTB tool for quantification of TB medicines. The tool was later institutionalized as the TB medicines quantification and early warning system, and in addition to forecasting it has been useful in quarterly monitoring of TB medicines stock status and cases enrollment. It has also helped to guide the development of rational procurement plans through regular adjustment of SLDs delivery schedules based on the actual number of patients enrolled and planned to be enrolled on treatments.

**Results:** Using QuanTB data the country managed to postpone procurement of USD 751,041 worth of SLDs while closely monitoring their consumption trends. Wastage of additional USD 954, 509,99 was avoided by successfully relocating excess stocks to other countries with support from Global Drug Facility. Shipments of second line drugs which were already produced but were likely to be overstocked if delivered as planned were delayed and further staggered to minimize the risk.

**Conclusion:** Frequent review of quantification and TB medicines stock status is vital to ensure early detection of potential stock outs or overstocks. However, this can only be successful if actual patient enrolment and TB medicines pipeline data are regularly used to analyze stock levels and appropriate actions are timely taken to address the identified stocks imbalances.

**Keywords:** Ethiopia; MDR-TB; QuanTB; SLDs; EWS; NSP; NTP

### Abbreviation

AIDS: Acquired Immune Deficiency Syndrome; EWS: Early Warning System; HIV: Human Immunodeficiency Virus; MDR-TB: Multi Drug Resistant TB; NSP: National Strategic Plan; NTP: National TB Program; SLDs: Second Line Drugs; TB: Tuberculosis

### Introduction

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can also affect other sites (extrapulmonary TB). The disease is spread when people who are sick with pulmonary TB expel bacteria into the air. Overall, a relatively small proportion (5 - 15%) of the estimated 1.7 billion people infected with *M. tuberculosis* will

develop TB disease during their lifetime. However, the probability of developing TB disease is much higher among people infected with human immunodeficiency virus (HIV), and also higher among people affected by risk factors such as under-nutrition, diabetes, smoking and alcohol consumption [1].

TB has existed for millennia and remains a major global health problem. It causes ill-health for approximately 10 million people each year and is one of the top ten causes of death worldwide. For the past 5 years, it has been the leading cause of death from a single infectious agent, ranking above HIV/AIDS [1].

Without treatment, the mortality rate from TB is high. Studies of the natural history of TB disease in the absence of treatment with anti-TB drugs (conducted before drug treatments became available) found that about 70% of individuals with sputum smear-positive pulmonary TB died within 10 years of being diagnosed, as did about 20% of people with culture-positive (but smear-negative) pulmonary TB [2].

Ethiopia is one of the thirty global high burden countries for TB, TB/HIV and multi drug resistant TB (MDR-TB) according to the latest World Health Organization (WHO) classification. However, MDR-TB case detection remains lower than projected in the current National TB Strategic Plan (NSP) despite of high government commitment to support the national TB program (NTP). This has contributed to over estimation and inaccurate procurement of second-line TB drugs (SLDs) in the past two years which were based on the NSP targets [3].

Ensuring that patients have continuous access to TB treatment requires complex projections and calculations by NTP staff. Making these predictions is becoming more challenging as new diagnostic devices rapidly increase the number of individuals diagnosed and the quantity of medicines needed. Additionally, when treatment regimens change because new medicines or guidelines are introduced, NTP must plan carefully on how to phase medicines in and out to avoid stock-outs or wastage. Frequent forecasting and quantification, along with vigilant stock management, are vital to ensuring that appropriate types and quantities of medicines are available to meet the evolving needs of NTP as they scale up treatment.

### Intervention

Proper forecasting, supply planning, and stock monitoring are key to ensuring an uninterrupted supply of TB commodities to meet the evolving needs of NTP as treatment is scaled up and treatment regimens change. Previously, quantification of TB medicines was conducted using an Excel spreadsheet and the process was time consuming, cumbersome and inefficient because TB medicines were quantified one by one.

In 2015 the country was trained on the use of QuanTB tool for quantification of TB medicines. QuanTB is an electronic forecasting, quantification, and early warning tool designed to improve procurement processes, ordering, and planning for TB treatment. When used on a regular basis, QuanTB serves as an early warning system (EWS), providing information on actual versus planned consumption, impending expiries, and stock-outs of medicines.

The tool was later institutionalized as the TB medicines quantification and EWS and in addition to forecasting it has been useful in quarterly monitoring of TB medicines stock status and cases enrollment. Previously, there were no periodic reviews of quantification that could take into account the current patient numbers and stock levels by expiry. Using QuanTB the country managed to update the QuanTB files regularly every quarter using actual patient enrollment and actual stock status at the end of the quarter (including both stock on hand and order). Future patient enrollment plans were also being adjusted considering the patient enrollment trend in the past.

### Results and Discussion

The significance of using QuanTB is vastly demonstrated on management of SLDs. Treatment of MDR-TB is more complex than drug susceptible TB, this is mainly because of increased number of medicines, different regimens per individual considerations used for treatment and yet the small number of patients as compared to drug susceptible TB. QuanTB enable the country to conduct quantification of SLDs based on standard regimens for treatment of MDR-TB and individualized regimens proposed by experts reflecting the actual

practice at treatment initiating centers. The tool guides the development of rational procurement plans through regular adjustment of SLDs delivery schedules based on the actual number of patients enrolled and planned to be enrolled on treatments considering the trend of enrollment for the past couple of years rather than the target in the NSP.

Using QuanTB the country managed to postpone procurement of USD 751,041 worth of SLDs while closely monitoring their consumption trends. Wastage of additional USD 954, 509,99 was avoided by successfully relocating excess stocks to other countries with support from Global Drug Facility (GDF). Shipments of SLDs which were already produced but were likely to be overstocked if delivered as planned were delayed and further staggered to minimize the risk.

The savings above were utilized for procurement of new child friendly pediatric formulation and SLDs for introduction of short treatment regimen (STR) for treatment of MDR-TB.

### Conclusion

Ensuring the continuous and uninterrupted availability of TB medicines is the main responsibility of the NTP. Frequent review of quantification and TB medicines stock status is vital to ensure early detection of potential stock outs or overstocks. However, this can only be successful if actual patient enrolment data of the right quality and the future enrollment plan with actual trend analysis is adjusted to avoid over estimation. In addition, stock status of medicines at all level (central, regional and health facility level) and TB medicines pipeline data shall be regularly collected and used to analyze stock levels and appropriate actions are timely taken to address the identified stocks imbalances.

### Conflict of Interest

I certify that I have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue.

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**Volume 8 Issue 12 December 2019**

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