

The Economic Cost of Non-adherence to TB Medicines Resulting from Stock-outs and Loss to Follow-up in Kenya

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RESEARCH SUMMARY

A key element of successful tuberculosis (TB) control programs is adherence to treatment, which is a cornerstone of most international and national policies and guidelines. Non-adherence is often due to patient-related factors but can also be a result of provider issues, such as stock-outs of TB medicines. Non-adherence results in increased length and severity of illness, death, disease transmission, and drug resistance. This has economic consequences in terms of cost to both individuals and the health system as a whole as well as lost income for patients and their families.

Non-adherence is commonly due to treatment interruption, which may range from intermittent periods of a few days to longer periods of weeks or months and may even result in complete discontinuation of treatment. Interventions to prevent treatment interruption are aimed at both patients and providers. On the provider side, actions include ensuring proper prescribing practices, managing side effects, providing good quality medicines, and preventing stock-outs. On the patient side, actions include interventions to encourage patients to use medicines as directed and continue treatment even when they feel better, as well as to remove barriers to treatment, such as transport costs. These actions are believed to be a good investment, but the economic savings have not been clearly defined.

Kenya is among 22 countries considered to have a high burden of TB, including multidrug-resistant TB (MDR-TB). The Kenyan Ministry of Health (MOH) has an extensive TB program with directly observed treatment, short course (DOTS) for TB and programmatic management of drug-resistant TB for MDR-TB. In addition, the MOH has strategies and procedures in place to ensure and improve treatment adherence, including supervised treatment and supply chain management strengthening. This is not always easy, however, especially in a large, decentralized country where health care services are largely managed at the local level and where supply chain and loss to follow-up (LTFU) have been challenges.

In recent years, the National Tuberculosis, Leprosy, and Lung Disease Program (NTLDP) experienced challenges with supplies of TB medicines and with LTFU. Both problems can result in treatment interruption. At the request of the NTLDP and the United States Agency for International Development, a Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program technical team conducted a study to determine the health, mortality, and economic impact of stock-outs and LTFU to justify greater investment in addressing these challenges.

METHODOLOGY

The research team selected three case studies that were likely to have had the greatest economic impact: averted stock-outs of drug-sensitive TB (DS-TB) medicines, LTFU of DS-TB patients, and LTFU of MDR-TB patients.

Data were obtained from three sources: a global literature review; a review of NTLDP documents and records; and interviews with an expert panel of doctors, pharmacists, and NTLDP staff in Kenya. Based on the information received, algorithms were developed (figure 1) and modeled in a spreadsheet-based tool developed by SIAPS to analyze impact.

The models quantify the likely impact of the treatment interruption in terms of subsequent treatment or non-continuation of treatment, and in terms of provider costs, household out-of-pocket costs, and productivity losses. The models also show the additional health and cost outcomes of each specific type of treatment interruption, excluding the outcomes that would have been incurred if treatment had not been interrupted.

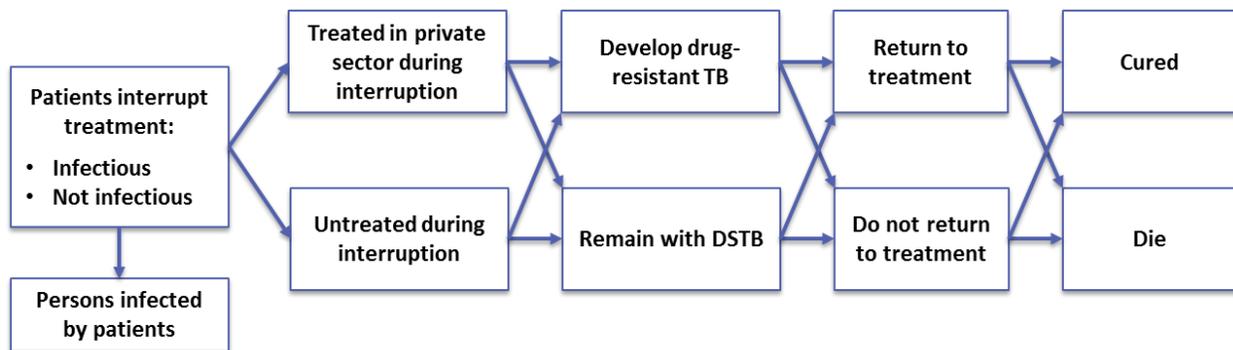


Figure 1. Conceptual framework for treatment interruption

RESULTS

Preventing DS-TB Medicine Stock-outs Saves Money

Under government devolution in 2013/14, the procurement of TB medicines became the responsibility of county governments. However, county governments had limited capacity to procure TB medicines due to technicalities involved in the procurement process. As a result, no adult first-line TB medicines were procured for two fiscal years and stock-outs became a serious concern. The NTLDP, with technical support from SIAPS and advocacy from other stakeholders, prepared a compelling, evidence-based case to the national government and key partners. As a result, emergency funding was obtained, thus averting the crisis.

These interventions are estimated to have saved more than 7,000 lives and prevented the development of more than 1,000 cases of drug-resistant TB and more than 400 new infections (table 1). The interventions also saved more than USD 113 million (USD 25 million in health service costs and USD 88 million in household and society costs) (table 2). These savings translate to more than USD 2,000 per patient.

DS-TB Patients LTFU Add to Health Service and Other Costs

Like many developing countries, Kenya has had challenges with LTFU. According to NTLDP data, the average LTFU in 2014 was 4%, with Samburu and Pokot counties having the highest rates (10% to 12%) (NTLDP Annual Report, 2015).

An estimated 3,317 DS-TB patients who were lost to follow-up in 2015 are likely to have resulted in 70 patients developing MDR-TB, 28 new persons being infected with MDR-TB, and more than 400 deaths. In addition, this LTFU is likely to have resulted in more than USD 7 million in additional costs (USD 1.6 million in health service costs and USD 5.5 million in household and society costs), translating to more than USD 2,000 per patient.

MDR-TB Patients LTFU Significantly Add to Costs

An estimated 52 MDR-TB patients LTFU in 2015 is likely to have resulted in five patients developing extensively drug-resistant TB (XDR-TB), three new persons being infected with MDR-TB, one new person with XDR-TB, and three deaths. In addition, this LTFU is likely to have resulted in approximately USD 380,000 million in additional costs (USD 325,000 in health service costs and USD 55,000 in household and society costs), translating to more than USD 7,000 per patient.

Table 1. Impact of Treatment Interruption on Morbidity and Mortality

	DS-TB stock-outs of 3 months ^a	DS-TB LTFU of 3 months	MDR-TB LTFU of 5 months
<i>Number of patients</i>	52,724	3,317	52
Number of patients who develop MDR-TB as a result of interruption	1,107	70	0
Number of patients who develop XDR-TB as a result of interruption	Not estimated	Not estimated	5
Number of additional persons who develop DS-TB as a result of interruption ¹	0	0	0
Number of additional persons who develop MDR-TB as a result of interruption	443	28	3
Number of additional persons who develop XDR-TB as a result of interruption	Not estimated	Not estimated	1
Number of patients who die as a result of interruption	7,319	460	3

^a Hypothetical example

¹ In both DS-TB case studies, the opinion of the expert panel was that none of the patients with DS-TB would be infectious at the time of treatment interruption and, therefore, no additional people would be infected as a result of the interruption. The research team did not take into account that some of the patients who interrupted or discontinued treatment could have become infectious again, due to lack of evidence with which to estimate such an impact.

Table 2. Estimated Economic Impact of Treatment Interruption (in USD)

	DS-TB stock-outs of 3 months ^a	DS-TB LTFU of 3 months	MDR-TB LTFU of 5 months
<i>Number of patients whose treatment was interrupted</i>	52,724	3,317	52
Total additional cost			
Provider cost	\$25.5 million	\$1.6 million	\$324,000
Household cost	\$88.3 million	\$5.5 million	\$55,000
Total	\$113.8 million	\$7.1 million	\$379,000
Additional cost per affected patient			
Provider cost	\$486	\$486	\$6,194
Household cost	\$1,674	\$1,674	\$1,054
Total	\$2,159	\$2,159	\$7,247

^a Hypothetical example

CONCLUSIONS

Investing in sustainable access is worthwhile

Results of these three case studies demonstrate that TB treatment interruption can have a significant impact on morbidity and mortality. TB treatment interruption results in many people developing MDR-TB and XDR-TB, which results in new infections and deaths. The economic impact on health services, families, and society in general is equally devastating, costing up to millions of US dollars.

These results are only approximate figures, as some of the assumptions were based on estimates provided by the expert panel in the absence of data. However, it is likely that the above figures are, in fact, underestimated, in part because the research team did not take into account that some patients who had become non-infectious prior to treatment interruption would have become infectious again later. The research team also did not consider that some of the people who would have developed MDR-TB would have also later developed XDR-TB.

A full report and further information can be obtained from the lead author – David Collins (dcollins@msh.org) or from fintools@msh.org.

The global literature review found that, apart from a previous SIAPS study conducted in the Philippines, little research has been conducted on the impact of treatment interruption. Therefore, more research would be highly beneficial.

The results of the analysis indicate that priority should be given to improving supply chain management to prevent stock-outs; reduce DS-TB patient LTFU through better education and case management, especially in regions where LTFU is high; and reduce MDR-TB LTFU through improved case management, including better management of medicines, as adverse side effects are a major reason for LTFU.

In addition, the case studies illustrate that the cost of treatment interruption in Kenya is significant and that investing additional resources to resolve these problems is likely to be extremely worthwhile.

FURTHER READING

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ABOUT SIAPS | The Systems for Improved Access to Pharmaceuticals and Services (SIAPS) program works to assure access to quality pharmaceutical products and effective pharmaceutical services through systems-strengthening approaches to achieve positive and lasting health outcomes. SIAPS is funded by the US Agency for International Development (USAID) and is implemented by Management Sciences for Health.

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