# Plan to Initiate and Expand Drug Resistant TB Management in Ghana

National TB Programme

2011

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## Introduction

Multidrug-resistant TB and extensively drug-resistant TB (MDR-TB and XDR-TB) are major threats to TB control globally. MDR-TB is defined as resistance to isoniazid and rifampicin, the two most important first-line drugs used in the treatment of TB. XDR-TB is defined as MDR-TB plus resistance to additional drugs - a fluoroquinolone and, at least, one second-line injectable drug.[1]

WHO estimates that globally, there were 440,000 incident cases of MDR-TB in 2008 and 150,000 deaths caused by the disease.[2] For Ghana, WHO (2010) estimates that 0.9% of all new TB cases and 14% of retreatment cases are MDR-TB.[3] These estimates are informed by a national drug resistance survey conducted by the National TB Programme in 2006 and 2007 in collaboration with the National Public Health and Reference Laboratory (NPHRL) and Noguchi Memorial Institute for Medical Research (NMIMR), and routine surveillance data available at country level.

The National TB Control Programme (NTP) has over the years focused on ensuring an effective DOTS Programme as a strategy to prevent the development of drug resistant TB. This worked to a large extent as failure rates for new smear positive TB cases within the Programme has remained consistently below 2% since 2007. While poor quality anti-TB drug prescriptions has also virtually been eliminated in Ghana, some incidents of poor case management remain which may partly explain the emergence of drug resistance TB.

In order to initiate programmatic management of drug resistant TB (PMDT), the NTP in 2009, submitted a proposal to the Green Light Committee for approval to purchase concessionally priced second line TB drugs (SLD). Working with the GLC to address initial challenges, the application was approved in 2011. The NTP is currently receiving technical support from international partners – WHO (GLC, GLI) and Partners in Health, Lesotho[4] (PIH) to implement PMDT.

Since 2010, the National TB Reference Laboratory Network (NRL) made up of National Public Health and Reference Laboratory (NPHRL), Noguchi Memorial Institute for Medical Research (NMIMR) and the Chest Clinic Laboratory in Korle Bu Teaching Hospital (KBTH) all in Accra, have all been working to actively identify MDR-TB cases among re-treatment and failed TB treatment cases. Using first line drug sensitivity testing (DST) over 200 patients have had sputum specimens tested for drug resistance. As part of quality assurance 10 samples were sent to Medical Research Council, South Africa with support from WHO AFRO where 4 were confirmed MDR-TB in 2010. Through the support of WHO, Forschungszentrum Borstel, the National Reference Centre for Mycobacteria in Borstel, Germany is currently providing supra-national reference laboratory support to the National TB Reference Laboratory Network in Ghana.

[1] WHO 2009. Management of MDR-TB : a field guide : a companion document to guidelines for programmatic management of drug-resistant tuberculosis : integrated management of adolescent and adult illness (IMAI). *WHO/HTM/TB/2008.402a*

[2] WHO 2010. The Global Plan to Stop TB 2011–2015: Transforming the Fight towards Elimination. w*ww.stoptb.org*

[3] WHO 2011. Tuberculosis country profiles: Ghana. *www.who.int/tb/data*

[4] PIH Lesotho has a Memorandum of Understanding with the NTP to support PMDT in Ghana, which is already ongoing.

With the support of PIH, Lesotho 2 MDR-TB cases were initiated on treatment in 2010 and 2 more initiated in 2011. Under the Global Fund Round 10 grant, more patients would be initiated on treatment beginning in 2012 as an order place for second-lines medicines in 2011 is expected to be delivered in March 2012.

Ghana has crossed some important hurdles for the start of PMDT. A funding gap still persists for PMDT in spite of some areas being covered under the approved Global Fund Round 10 grant. The National TB Programme is in discussions with other partners including government to address these.

This document details out the PMDT Plan for Ghana from 2011 to 2015. The strategies and interventions proposed in this document are in line with the six major objectives for drug resistant TB (DR-TB) outlined in the Global Plan to Stop TB, 2011–2015 and the DR-TB component of the National Tuberculosis Health Sector Strategic Plan for Ghana, 2009-13.

The aims of this plan are to:

1. Integrate the management of drug-resistant TB and drug resistance surveillance as part of routine TB control in Ghana

2. Prevent deaths and continued transmission of drug-resistant strains and creation of XDR-TB

The objectives for achieving the aims outlined above are to:

1. Scale up access to testing for resistance to first-line anti-TB drugs among TB patients.

2. Scale up access to testing of susceptibility to second-line anti-TB drugs, as well as HIV testing among confirmed cases of MDR-TB.

3. Scale up access to effective treatment for drug-resistant TB.

4. Scale up TB infection control in MDR-TB hospital wards and outpatient clinics.

5. Strengthen surveillance, including recording and reporting, of drug-resistant TB

6. Improve capacity in-country to manage drug-resistant TB and advocate for local and international commitment to fight drug resistant TB

**Objective 1: Scale up access to testing for resistance to first-line anti-TB drugs among TB patients.**

**Situational Analysis**

National TB Programme guidelines recommend culture and drug sensitivity testing (DST) for all treatment failures, re-treatment cases, HIV co-infected patients, health workers with TB and contacts of DR-TB patients. In 2010, the Ghana National TB Reference Laboratory Network investigated 97 TB patients for resistance to first-line TB medicines. This number increased in 2011 as part of the PMDT scale up plan. Currently, TB culture and DST services are available in six medical laboratories across the country. Operational challenges however resulted in these labs not being able to achieve full scale in culture and DST services in 2011 as estimated. To improve access to culture and DST services around the country, these operational challenges are being addressed to ensure full services in under the GF Round 10 grant. It is expected that there would be at least one TB culture facility provided in each of the 10 administrative regions with qualified staff trained to perform culture and DST.

The National Public Health and Reference Laboratory and the Tamale Teaching Hospital Laboratory will be upgraded to BSL-3 status to provide the full range of TB diagnostic services including culture, drug susceptibility testing for first and second-line TB medicines and molecular technologies. The National Public Health and Reference Laboratory will serve the southern part of the country while the Tamale Teaching Hospital Laboratory serves the northern sector. All TB culture centres and facilities will be linked to the reference laboratories through a reliable specimen transportation network.

The NTP, through various forums has disseminated information on culture and DST services for TB patients. However, the information has been slow in reaching frontline staff who manage patients. The NTP in 2011 revised all manuals on TB Microscopy, incorporating information on all new laboratory tools the Programme has introduced since the last revision and newer molecular technologies. The protocol for diagnostic algorithm has also been revised for MDR-TB and TB/HIV co-infection.

**Key Activities**

1. Train a critical number of laboratory staff on TB culture and drug sensitivity testing, and molecular technologies.
2. Ensure all TB culture and DST centres have a minimum of two dedicated trained staff providing services.
3. Train clinicians and DOTS centre nurses on the guidelines on resistance testing to first and second-line anti-TB drugs among TB patients including children.
4. Print and disseminate new TB testing algorithm to all health staff.
5. Print and disseminate revised TB Microscopy Manual to laboratory staff.
6. Establish a sputum transportation system that links service delivery points to TB culture and DST centres across the country
7. Maintain supply of laboratory consumables through appropriate quantification, timely procurement and routine monitoring of stocks.
8. Strengthen internal and external quality assurance systems for TB culture and drug sensitivity testing.
9. Improve the efficient working of the National TB Reference laboratory Network.

10. Upgrade the National Public Health and Reference Laboratory and the Tamale Teaching Hospitals Laboratory to BSL-3 status and to provide susceptibility testing for first and second-line TB medicines.
11. Equip all regional hospital laboratories to provide TB culture services
12. Establish a servicing plan for TB laboratory equipment and collaborate with the Clinical Engineering Unit of Ghana Health Service to provide technical support
13. Obtain technical support from supranational reference laboratory, Global Laboratory Initiative, Centre for Disease Control & Prevention, WHO and other partners.

**Objective 2: Scale up access to testing of susceptibility to second-line anti-TB drugs, as well as HIV testing among confirmed cases of MDR-TB.**

**Situational Analysis**

Currently, the only institution conducting some susceptibility testing for second-line anti-TB drugs is the Noguchi Memorial Institute for Medical Research. The National TB Reference Laboratory Network has been linked to Forschungszentrum Borstel, the National Reference Centre for Mycobacteria in Borstel, Germany to be a Supranational Reference Laboratory for TB culture services. A technical support mission from Forschungszentrum Borstel was conducted in September 2011 to assess the National TB Reference Laboratory Network (NRL) along side other peripheral laboratories in preparation for external quality assurance for TB culture and DST services. The mission report recommends that due to limited capacity to carry-out drug sensitivity testing, the NRL should focus on building capacity for first-line anti-TB drug susceptibility testing before venturing into second-line testing. In the interim, samples will be sent to the supranational laboratory in Borstel, Germany for external quality assurance and second-line TB drug susceptibility testing. The NTP however is eager to support the laboratory network become sufficient in conducting DST for first and second-line anti-TB drugs, and would collaborate with the supranational reference laboratory to achieve this in the shortest possible time.

Ghana has adopted the policy of provider-initiated HIV testing and counselling and this applies to all TB patients including DR-TB. Currently about 75% of all notified TB cases have had an HIV test done and the result declared.

**Key Activities**

1. Train a minimum of 2 laboratory staff in each BSL-3 laboratory to conduct susceptibility testing for second-line anti-TB drugs in 2012 and conduct refresher training yearly
2. Incorporate susceptibility testing to second-line anti-TB drugs into patient management protocols for MDR-TB
3. Incorporate routine HIV testing into patient management protocols for MDR-TB
4. Provide laboratory reagents and consumables for susceptibility testing to second-line anti-TB drugs

**Objective 3: Scale up access to effective treatment for drug-resistant TB.**

**Situational analysis**

Preparations to commence PMDT in Ghana started as far back as 2008. Focal Points from Korle Bu and Komfo Anokye Teaching Hospitals were trained on management of MDR-TB in 2009. In 2011 WHO and PIH collaborated to support a Clinical Management Team from the Korle Bu Teaching Hospital (KBTH) and Programme Staff to undergo PMDT training in Lesotho. Health staff trained includes medical doctors, nurses, pharmacists and programme management staff. Guidelines for Programmatic Management of DR-TB have been developed with technical support from WHO and Partners in Health, Lesotho.

The Chest Department of the Korle Bu Teaching Hospital (KBTH), with support from Partners in Health, Lesotho, has initiated 4 MDR-TB patients on treatment – 2 in 2010 and 2 in 2011 on a pilot basis. Initial lessons from this pilot implementation will feed into the nationwide scale-up of PMDT. Initial experiences gained from this pilot points to the importance of providing aggressive in-patient care during the injectable phase of treatment when patients develop severe drug side effects and strong patient support systems are needed throughout treatment.

Under the Round 10 grant, TB wards would be upgraded to meet the minimum infection control standards for MDR-TB admission. Wards in Korle Bu (Accra), Komfo Anokye (Kumasi) and Tamale Teaching Hospitals (Tamale) and Effia-Nkwanta Regional Hospital (Sekondi) will be renovated to serve as MDR-TB wards. Patients who need in-patient care would be admitted into these wards in the respective hospitals where MDR-TB treatment would be done to geographically cover the country.

Ghana has a strong community-based TB care approach to TB case management. All TB patients have community volunteers and/or community health nurses who support them to go through treatment successfully. For MDR-TB, a similar approach will be used in managing patients at the community level while ensuring that community workers are well trained to monitor treatment and protect themselves and the community from the spread of drug resistant TB.

Second line TB medicines will be procured from the Global Drug Facility of WHO. An initial order covering 20 patients for the first year of PMDT in Ghana has been placed and is expected in-country in the second quarter of 2012. Second Line Medicines will be stored at the Pharmacy Stores of the Chest Clinic of KBTH and managed by a senior pharmacist trained in DR-TB drug management. A Green Light Committee Mission to assess the country preparedness for PMDT found storage conditions in the Pharmacy of the Chest Clinic to be appropriate.

Request for stocks of DR-TB medicines from MDR-TB treatment centres will be submitted directly to the multi-disciplinary Central MDR-TB Coordinating Team in the Chest Clinic in KBTH. The team will review each request and approve 2 months drug supply per patient on treatment. Medicines will be issued directly to the facility managing the patient. Maximum and minimum stock levels for DR-TB medicines in treatment facilities will be 2 and 1 month respective and refill period monthly. As capacity for DR-TB management is created at Komfo Anokye and Tamale Teaching Hospitals and Effia Nkwanta Regional Hospital, these hospitals would also establish their own DR-TB Management Teams to initiate treatment and support other hospitals within their catchment area to manage patients. The Central MDR-TB Team in KBTH however would supervise all these teams.

**Key Activities**

1. Print and disseminate DR-TB Management Guidelines

2. Train all categories of health staff involved in the management of DR-TB patients, including community workers.
3. Ensure DOT for DR-TB management throughout treatment. Community health nurses will supervise treatment at community level.
4. Ensure appropriate management of all DR-TB patients in accordance with Programme guidelines including clinical and laboratory monitoring, and management of adverse events.
5. Provide enablers' package to MDR-TB patients.
6. Ensure appropriate quantification, timely procurement and supplies, and effective management of second-line medicines
7. Register all MDR-TB patients under the National Health Insurance Scheme
8. Ensure wards with appropriate infection controls are available for DR-TB management
9. Provide tools for recording and reporting on DR-TB and train staff on tools
10. Conduct monitoring and supervision, including clinical supervision to PMDT sites and provide technical assistance to front-line implementers.

**Objective 4: Scale up TB infection control in MDR-TB hospital wards and outpatient clinics.**

**Situational Analysis**

Infection control is critical for the prevention of TB bacilli spread from person to person. The NTP in collaboration with the Institutional Care Department of Ghana Health Service has developed a policy document on Infection Control for Ghana, which is use in all health institutions across the country. The NTP has also developed a Standard Operating Procedure Manual for TB and Airborne infection control with technical support from CDC and TBCAP. This document focuses on TB infection control at OPDs, DOTS centres, ART centres, DR-TB wards and all congregate settings were the risk of TB spread is increased.

A Focal Point for infection control exists within the NTP to coordinate all TB infection control activities in collaboration with the National Infection Prevention and Control Focal person in the Institutional Care Division of Ghana Health Service. Acknowledging the role that buildings play in infection control, the NTP has built capacity within the Estate Management Department of Ghana Health Service in TB infection control. This is to ensure that hospitals and other medical infrastructure design and development meet the basic standards of TB and airborne infection control.

As part of GF Round 10 implementation, the NTP in collaboration with the Estate Management Department will conduct a nation-wide assessment of infection control standards in DOTS centres, ART clinics, OPDs, wards and laboratories in public and private health facilities across the country. This assessment would enable the NTP to focus limited resources where it is needed most. It would most importantly inform health managers at various levels in the health care system of the state of infrastructure at their level and implications for infection control to inform decision-making. It would also serve as an advocacy tool for resource mobilization from government and donor partners.

**Key Activities**

1. Renovate DR-TB wards to meet TB and airborne infection control standards
2. Implement infection control package recommended in the Guidelines for DR-TB Management for centres managing DR-TB and the community level
3. Conduct routine monitoring of infection control standards at centres managing DR-TB
4. Provide appropriate protection devices for health staff and community volunteers in contact with DR-TB patients
5. Monitor TB and MDR-TB incidence among general health staff

**Objective 5: Strengthen surveillance, including recording and reporting, of drug-resistant TB.**

**Situational Analysis**

Ghana currently has drug susceptibility testing facilities for first-line TB medicines. The main challenges are the unawareness of front-line clinical staff of the availability of these services, the frequent interruptions in service delivery, long turnaround time for laboratory results and poor management of surveillance data.

The NTP has already started addressing these challenges by providing skills training for laboratory staff in basic lab practices and newer technologies; local engineers to perform routine servicing of biosafety cabinets and other laboratory equipment; and collaborating with the supranational reference laboratory to quality assure laboratory operations, recording and reporting and strengthen internal and external controls.

The national TB laboratory manuals have been revised to incorporate DR-TB testing and newer technologies including molecular. Guidelines for programmatic management of drug-resistant TB have also been developed. These documents will be printed and disseminated with training of frontline health staff to improve their skills in suspecting, diagnosis, and management of DR-TB.

The NTP also plans to undertake periodic resistance surveys for first and second-line TB medicines to monitor trends.

**Key Activities**

1. Generate demand for susceptibility testing for TB medicines through sensitization and training of front-line staff
2. Establish an electronic case-based database for MDR-TB patients on treatment at national level
3. Implement technical missions recommendations on laboratory improvements including streamlining laboratory operations, recording and reporting
4. Create capacity for laboratory personnel to manage and make use of routine surveillance data generated to inform programme implementation
5. Strengthen internal and external quality controls in all laboratories conducting DR-TB surveillance
6. Conduct first and second-line TB drug resistance surveys

**Objective 6: Improve capacity in country to manage drug-resistant TB and advocate for local and international commitment to fight drug resistant TB**

**Situational Analysis**

The NTP is in the very early stages of implementing PMDT in Ghana. There is very little experience within the health service in managing 'superbugs' in Ghana and there is almost no infrastructure available that is appropriate for case management. Much resource therefore is needed to provide infrastructure and capacity building for health staff to diagnose and manage cases to curb the spread of DR-TB.

The NTP attaches a lot of importance to DR-TB and has a committee on DR-TB which is a sub-committee under the National TB Advisory Committee, the national body that advices the NTP on programme implementation bringing diverse views from academia, research, community, health policy, programme management, general health services, private sector etc. The NTP also has a designated focal point at the Programme to coordinate the implementation of PMDT.

The NTP has a long experience in collaborating with civil society and community actors in controlling TB. These approaches will continue to be used and strengthen to create community awareness on TB and DR-TB, create demand for screening for TB and provide patient support services.

**Key Activities**

1. Designate and renovate centres to manage DR-TB
2. Create capacity for health staff to diagnose and manage DR-TB
3. Develop and disseminate education materials on DR-TB targeted at the community
4. Collaborate with civil society organizations to educate the community on TB and DR-TB, fight stigma and support individual patients through treatment.
5. Strengthen operational research capacity for better use of DR-TB surveillance data and to measure impact of new laboratory tools for diagnosing DR-TB.
6. Organize DR-TB sub-committee meeting biannually to review implementation of PMDT and advice NTP according.
7. To continue to obtain technical assistance from partners on PMDT to support implementation.
8. Advocate with government and international donor agencies to support PMDT in Ghana

**Annex 1: Drug Resistant TB Expansion Plan 2011-2015**

| **Aims** | **Major Activities** | **Indicators** | **Baseline (2010)** | **Target for 2015** |
|---|---|---|---|---|
| Integrate the management of drug-resistant TB and drug resistance surveillance as part of routine TB control in Ghana. | PMDT programme implemented and running in identified treatment centres | Incidence of MDR-TB | 2% | Declining |
| | | Facilities implementing MDR-TB treatment | 1 | 10 |
| Prevent deaths and continued transmission of drug-resistant strains and creation of XDR-TB | Early initiation of patients on PMDT | Treatment success rate of MDR-TB | 0% | 65% |
| | | Treatment failure rate for MDR-TB | 0% | 10% |
| | | Death Rate for MDR-TB | - | 25% |
| **Objectives** | **Major Activities** | **Indicators** | **Baseline (2010)** | **Target for 2015** |
| **Objective 1:** Scale up access to testing for resistance to first-line anti-TB drugs among TB patients. | Testing for MDR-TB using culture and DST and molecular technologies | Percentage of new bacteriologically-positive TB patients tested for resistance to first-line drugs | n/a | 10% |
| | | Percentage of previously treated TB patients tested for resistance to first-line drugs | 10% | 100% |
| **Objective 2:** Scale up access to testing of susceptibility to second-line anti-TB drugs, as well as HIV testing among confirmed cases of MDR-TB | Testing for susceptibility to second-line drugs using culture and DST; Testing for HIV | Percentage of confirmed MDR-TB patients who required a second-line DST | n/a | 20% |
| | | Percentage of confirmed MDR-TB patients who had an HIV test result recorded | n/a | 100% |
| **Objective 3:** Scale up access to effective treatment for drug-resistant TB. | Procurement and supply of second-line TB drugs;<br>Train health workers to manage DR-TB;<br>Manage DR-TB patients in accordance to Programme guidelines;<br>Management of adverse events;<br>Provide enablers' package to patients & enrol patients under NHIS;<br>Programme management and supervision;<br>Data management;<br>Provide technical assistance. | Percentage of cases with confirmed MDR-TB started on treatment according to national protocols | 75% | 100% |
| | | Treatment success rate among patients with confirmed MDR-TB | n/a | 65% |
| | | Stock out of SLD for MDR-TB management | n/a | 0% |

| Goals and Objectives | Major Activities | Indicators | Baseline (2010) | Target for 2015 |
|---|---|---|---|---|
| **Objective 4:** Scale up TB infection control in MDR-TB hospital wards and outpatient clinics | Training of health staff and community workers on infection control;<br>Implementation of infection control packages at centres managing MDR-TB;<br>Routine monitoring of infection control standards at OPDs, laboratories and MDR-TB centres using standardized assessment tools;<br>Monitor TB notification among health workers | Number of health workers & community workers trained in infection control | | |
| | | Percentage of MDR-TB facilities maintaining appropriate TB infection control standards | n/a | 100% |
| | | Ratio of TB notification rate among health care workers to notification rate among general population | n/a | ~ 1 |
| **Objective 5:** Strengthen surveillance, including recording and reporting, of drug-resistant TB. | Conduct surveillance of drug resistance among TB cases through routine testing of patients and conduct periodic surveys;<br>Establish an electronic case-based database for MDR-TB patients on treatment; obtain technical assistance for DRS and implement recommendations; streamline recording and reporting systems; strengthen internal and external quality controls in laboratories. | Functional case-based electronic medical records system for MDR-TB patients on treatment at national level | Non-existent | Electronic medical records in place. |
| | | Percentage of confirmed cases of MDR-TB with treatment outcomes evaluated | 0 | 100% |
| **Objective 6:** Improve capacity in-country to manage drug-resistant TB and advocate for local and international commitment to fight drug resistant TB | Renovate designated centres to manage DR-TB;<br>Create capacity for health staff to manage DR-TB; collaborate with civil society organizations to educate the community on TB and DR-TB, fight stigma and support individual patients through treatment; conduct operational research | Number of designated MDR-TB centres with adequate capacity to manage MDR-TB | 1 | 4 |
| | | | | |

**Annex 2: Treatment and Enrolment Plan**

| **Enrolment** | **Number of patients** |
|---|---|
| No of patients currently on treatment[5] | 4 |
| Planned enrolment, 2011 | 20 |
| Planned enrolment, 2012 | 50 |
| Planned enrolment, 2013 | 100 |

| **Standardized Treatment[6]** | **Duration (months)** |
|---|---|
| **Intensive Phase:** Z-Km (Cm)-Lfx-Pto-Cs-PAS | 8 - 10 |
| **Continuation Phase:** Z-Lfx-Pto-Cs-PAS | 12 - 14 |

[5] Patient enrolled with support from Partners in Health, Lesotho

[6] Refer to the National Guidelines for Programme Management of DR-TB for information on daily dose recommendations by weight and individualized regimen combinations

**Annex 3: List of Second-Line TB Medicines Procurement 2011 – 2013**[7]

| Product | Strength | Estimated unit cost (US$) | Year 1 Estimated Quantity | Year 1 Total cost (US$) | Year 2 Estimated quantity | Year 2 Total cost (US$) | Year 3 Estimated quantity | Year 3 Total cost (US$) |
|---|---|---|---|---|---|---|---|---|
| Prothionamide Tablet | 250mg | 0.1548 per Tab | 53,760 | 8,322.05 | 134,400 | 20,805.12 | 268,800 | 41,610.24 |
| Cycloserine Tablet | 250mg | 0.5929 per Tab | 53,760 | 31,874.30 | 134,400 | 79,685.76 | 268,800 | 159,371.52 |
| Pyrazinamide Tablet | 500mg | 0.0177 per Tab | 53,760 | 951.55 | 134,400 | 2,378.88 | 268,800 | 4,757.76 |
| Kanamycin Injection | 1g | 2.580 per vial | 4,200 | 10,838 | 11,200 | 28,896 | 22,400 | 57,792.00 |
| Capreomycin Injection | 1g | 8.0 per vial | 1,400 | 11,200.00 | 2,800 | 22,400.00 | 5,600 | 44,800.00 |
| Levofloxacin Tablet | 500mg | 0.0785 per Tab | 20,160 | 1,582.56 | 50,400 | 3,956.40 | 100,800 | 7,912.80 |
| Levofloxacin Tablet | 250mg | 0.0500 per Tab | 13,440 | 672.00 | 33,600 | 1,680.00 | 67,200 | 3,360.00 |
| P-aminosalicylate sodium 60% (PAS) | 100g | 24.00 per Jar | 618 | 14,837.76 | 1,236 | 29,675.52 | 2,473 | 59,351.04 |
| Ethambutol Tablet | 400mg | 0.0356 per Tab | 13,440 | 478.46 | 26,880 | 956.93 | 53,760 | 1,913.86 |
| | | | **TOTAL→** | **80,756.68** | **TOTAL→** | **190,434.61** | **TOTAL→** | **380,869.22** |

**Annex 4: Detailed Cost of MDR-TB Scale Up Plan (USD)**

| | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Estimated number of detected MDR-TB cases in the region | 1,851.90 | 1,955.23 | 2,027.16 | 2,075.72 | 2,108.80 |
| Percentage of detected MDR-TB cases on DOTS-Plus treatment (%) | 0.63 | 0.72 | 0.82 | 0.91 | 1.00 |
| Estimated proportion of regional MDR-TB cases accounted for by the country | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Estimated number of MDR-TB cases to treat on DOTS-Plus | 149.36 | 180.68 | 211.16 | 240.63 | 269.26 |
| | | | | | |
| **Unit cost per MDR-TB patient treated** | | | | | |
| TB Drugs, second-line | 2,575.00 | 2,575.00 | 2,575.00 | 2,575.00 | 2,575.00 |
| Hospitalization, MDR-TB | 18.98 | 18.98 | 18.98 | 18.98 | 18.98 |
| DOT visits | 20.56 | 20.56 | 20.56 | 20.56 | 20.56 |
| Sputum smears, cultures, DST and X-rays | 37.33 | 37.33 | 37.33 | 37.33 | 37.33 |
| Training, MDR-TB | 45.55 | 45.55 | 45.55 | 45.55 | 45.55 |
| MDR-TB programme and data management | 125.91 | 125.91 | 125.91 | 125.91 | 125.91 |
| Adverse events | 30.37 | 30.37 | 30.37 | 30.37 | 30.37 |
| Other, MDR-TB | 39.23 | 39.23 | 39.23 | 39.23 | 39.23 |
| **Total cost per MDR-TB patient to treat** | **2,892.94** | **2,892.94** | **2,892.94** | **2,892.94** | **2,892.94** |
| | | | | | |
| **Total cost to treat MDR-TB patients** | **432,090.07** | **522,704.10** | **610,883.52** | **696,117.76** | **778,938.48** |
| | | | | | |
| **Summary of costs** | | | | | |
| Total cost to treat MDR-TB patients | 432,090.07 | 522,704.10 | 610,883.52 | 696,117.76 | 778,938.48 |
| Procurement costs for second-line drugs | 75,615.76 | 91,473.22 | 106,904.62 | 121,820.61 | 136,314.23 |
| Total cost of data and programme management, supervisions activities and training for MDR-TB | 99,600.00 | 99,600.00 | - | - | - |
| Total cost for default and contact tracing | 4,000.00 | 9,500.00 | 5,000.00 | 5,000.00 | 5,000.00 |
| Total cost of drugs for adverse events | 149,360.41 | 180,682.93 | 211,163.88 | 240,626.77 | 269,255.38 |
| Total cost of infection control | 1,138,000.00 | 232,000.00 | 202,000.00 | 232,000.00 | 202,000.00 |
| | | | | | |
| **Total cost to treat MDR-TB patients** | **1,466,576.18** | **613,256.15** | **525,068.50** | **599,447.38** | **612,569.61** |