The Democratic People's Republic of Korea and the World Health Organization coordinated this first Joint Monitoring Mission (JMM) from 9-19 May 2014, to review the country's National Tuberculosis Control Programme (NTP). The review was undertaken jointly by the Ministry of Public Health, DPR Korea and the WHO with active participation of partners including UNICEF, Global Drug Facility; Green Light Committee, and technical experts.

The objectives of the Mission were to review the performance of the National TB Programme compared to the National Strategic Plan 2008-15 and achievements against the set targets, and to review technical policies, specially, of the new interventions initiated since implementation of the Global Fund grant.

The team reviewed documents and reports provided to them by the NTP, met with the NTP, national and international partners and visited health facilities implementing the national TB programme in the country at all levels. This report reflects the findings, outcomes of discussion, conclusions and recommendations of this JMM.
National Tuberculosis Control Programme: Democratic People’s Republic of Korea

Report of the Joint Monitoring Mission
9–19 May 2014
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Contents

Acknowledgements .................................................................................................................. vi
Acronyms ................................................................................................................................... vii
Executive summary .................................................................................................................. 1
1. Introduction .......................................................................................................................... 11
   1.1 Objectives ......................................................................................................................... 11
   1.2 Methodology ...................................................................................................................... 12
   1.3 Background ........................................................................................................................ 13
   1.4 Structure and organization of the health services and the National Tuberculosis Control Programme ................................................................. 14
2. Tuberculosis epidemiology ................................................................................................... 19
   2.1 Case notifications ............................................................................................................... 19
   2.2 TB mortality ....................................................................................................................... 24
   2.3 TB prevalence .................................................................................................................... 25
   2.4 Summary and recommendations ....................................................................................... 26
3. Programme financing, budgets and management ............................................................... 26
   3.1 Progress ............................................................................................................................ 26
   3.2 Challenges ........................................................................................................................ 28
   3.3 Recommendations ............................................................................................................ 28
4. Findings and recommendations on major TB control areas .............................................. 29
   4.1 Case-finding ...................................................................................................................... 29
4.2 Quality assured laboratory network.................................................. 33
4.3 Treatment (including patient support and DOT)................................. 41
4.4 Management of anti-TB medicines and supplies................................. 44
4.5 Programme supervision...................................................................... 49
4.6 Recording, reporting and surveillance................................................. 50
4.7 Partner collaboration and coordination.............................................. 53
4.8 TB-HIV.............................................................................................. 55
4.9 Programmatic management of drug-resistant TB (PMDT)............... 59
4.10 Involving all care providers.............................................................. 70
4.11 Contributing to health system strengthening (HSS).......................... 71
4.12 Infection control................................................................................ 74
4.13 Human resource development.......................................................... 77
4.14 Community engagement and health promotion.............................. 80
4.15 Operational research.......................................................................... 82

Annexes

1. List of reviewers..................................................................................... 85
2. Programme of the JMM.......................................................................... 87
3. List of people met.................................................................................... 91
4. Map of Democratic People’s Republic of Korea.................................... 96
Acknowledgements

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The leadership, gracious hospitality and cooperation afforded by the National Tuberculosis Control Programme (NTP) are also acknowledged. Field visits were meticulously coordinated and efficient, tireless and patient translators made conversation with implementing partners easier and afforded a friendly environment for the visitors. The directors and staff at all levels made time to meet with the visiting team. Although data was difficult to access and often available late, the mission acknowledges the support of implementing programme staff at all levels to share information.

The organization of the mission required months of planning and coordination and here the mission acknowledges the efforts of UNICEF and WHO. Although they are principally occupied with the implementation of GF grant to the country, the mission benefitted greatly from the leadership and the support of both these agencies.

Finally, the mission is grateful to the many patients and frontline staff – in hospitals, laboratories and in the community who generously met and interacted with the team.
## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACSM</td>
<td>advocacy, communication and social mobilization</td>
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<tr>
<td>ADR</td>
<td>adverse drug reactions</td>
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<tr>
<td>C/DST</td>
<td>culture/drug sensitivity testing</td>
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<tr>
<td>CFK</td>
<td>Christian Friends of Korea</td>
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<tr>
<td>CHAEI</td>
<td>Central Hygiene and Anti-Epidemic Institute</td>
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<td>CNR</td>
<td>case-notification rates</td>
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<td>CMW</td>
<td>Central Medical Warehouse</td>
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<td>cMW</td>
<td>county medical warehouse</td>
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<td>CN</td>
<td>concept note</td>
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<td>CP</td>
<td>continuation phase</td>
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<tr>
<td>CTPI</td>
<td>Central TB Preventive Institute, Pyongyang</td>
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<tr>
<td>cTPI</td>
<td>City TB Preventive Institute</td>
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<tr>
<td>DOT</td>
<td>directly-observed treatment</td>
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<td>DRS</td>
<td>drug resistance surveillance</td>
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<td>DR-TB</td>
<td>drug-resistant TB</td>
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<tr>
<td>DST</td>
<td>drug sensitivity testing</td>
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<td>EBF</td>
<td>Eugene Bell Foundation</td>
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<tr>
<td>EQA</td>
<td>external quality assurance</td>
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<tr>
<td>FEFO</td>
<td>first expiry first out</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>FL DST</td>
<td>first-line drug sensitivity testing</td>
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<td>GDF</td>
<td>Global Drug Facility</td>
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<td>GF</td>
<td>The Global Fund</td>
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<td>GLC</td>
<td>Green Light Committee</td>
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<tr>
<td>HEPA</td>
<td>high-efficiency particulate air</td>
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<td>HSS</td>
<td>health systems strengthening</td>
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<td>IC</td>
<td>infection control</td>
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<tr>
<td>IP</td>
<td>intensive phase</td>
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<td>IPC</td>
<td>interpersonal communication</td>
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<tr>
<td>IHR</td>
<td>International Health Regulation</td>
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<tr>
<td>ILAC</td>
<td>International Laboratory Accreditation Cooperation</td>
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<tr>
<td>KAP</td>
<td>knowledge attitude and practices</td>
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<tr>
<td>JMM</td>
<td>joint monitoring mission</td>
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<tr>
<td>LPA</td>
<td>line probe assay</td>
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<tr>
<td>LQAS</td>
<td>lot quality assurance sampling</td>
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<tr>
<td>M&amp;E</td>
<td>monitoring and evaluation</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goal(s)</td>
</tr>
<tr>
<td>MDR-TB</td>
<td>multidrug resistant tuberculosis</td>
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<tr>
<td>MoPH</td>
<td>Ministry of Public Health</td>
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<tr>
<td>NFM</td>
<td>New Funding Model</td>
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<tr>
<td>NGO</td>
<td>nongovernmental organization</td>
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<tr>
<td>NSP</td>
<td>National Strategic Plan to Control Tuberculosis 2014–2017</td>
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<td>NTP</td>
<td>National Tuberculosis Control Programme</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<td>-------------------------------------------------</td>
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<tr>
<td>NTRL</td>
<td>National TB Reference Laboratory</td>
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<tr>
<td>OR</td>
<td>operational research</td>
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<tr>
<td>PDR TB</td>
<td>poly-drug resistant TB</td>
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<tr>
<td>PHAEI</td>
<td>Provincial Hygiene and Anti-Epidemic Institute</td>
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<tr>
<td>PMDT</td>
<td>programmatic management of drug-resistant TB</td>
</tr>
<tr>
<td>PMU</td>
<td>project management unit</td>
</tr>
<tr>
<td>PMW</td>
<td>provincial medical warehouse</td>
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<tr>
<td>PTB</td>
<td>pulmonary tuberculosis</td>
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<tr>
<td>PTPI</td>
<td>provincial TB preventive institute</td>
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<tr>
<td>RRL</td>
<td>regional reference laboratory</td>
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<tr>
<td>rGLC</td>
<td>regional Green Light Committee</td>
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<tr>
<td>SL</td>
<td>second-line</td>
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<tr>
<td>SLD</td>
<td>second-line drugs</td>
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<tr>
<td>SL DST</td>
<td>second-line drug sensitivity testing</td>
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<tr>
<td>SNRL</td>
<td>supranational reference laboratory</td>
</tr>
<tr>
<td>SR</td>
<td>sub-recipient</td>
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<tr>
<td>SS+</td>
<td>sputum smear-positive</td>
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<tr>
<td>TA</td>
<td>technical assistance</td>
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<tr>
<td>TB</td>
<td>tuberculosis</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<td>UNOPS</td>
<td>United Nations Office for Project Services</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Executive summary

The Democratic People’s Republic of Korea and the World Health Organization coordinated this first Joint Monitoring Mission (JMM) from 9 – 19 May 2014, to review the country’s National Tuberculosis Control Programme (NTP). During the mission, the team met with the NTP officials, reviewed documents and reports provided to them, met national and international partners and visited health facilities implementing the national TB programme in the country at all levels. This report reflects the findings, outcome of discussions, conclusions and recommendations of the JMM.

Achievements and progress

Tuberculosis is a major public health problem and its control is a priority for the Democratic People’s Republic of Korea. The country started implementing the DOTS\(^1\) Strategy in 1998 and this has been expanded nation-wide by 2003. NTP, with support from the WHO, developed a multi-year strategic plan for 2008–2015, in line with the Global Plan to Stop TB. TB services are delivered through an extensive general public health system consisting of health facilities in 12 provincial units (includes three cities), 21 counties and over 7000 dong / ri clinics. TB-specific units at the central, provincial and county levels, and a network of about 200 TB sanatoria undertake TB case management. The Global Fund (GF) Round 8 grant currently contributes an estimated 77% of the total budget for TB control in the country. The country through a

\(^1\) DOTS (directly observed treatment, short-course), is the name given to the tuberculosis control strategy recommended by the World Health Organization. As of 1997, in its revised guidelines for national TB control programmes, WHO increasingly stopped spelling out the DOTS acronym. This was due to the perceived overemphasis on the directly observed therapy component (DOT), which is only one of the five essential components of DOTS.
‘concept note’ under the New Funding Model (NFM) can access additional funding for the coming three years.

Case detection occurs at community level through the nation’s extensive public health network. The current case-finding strategy appears to rely mostly on active case-finding at the dong / ri level through an extensive network of household doctors who regularly visit the community and refer TB symptomatic patients to the TB Section in the county hospitals for diagnosis. TB case notifications rose from 41,810 patients (all forms) in the year 2003 to 97,665 patients in 2013.

Treatment is provided at the dong / ri level with patients travelling to the clinic for directly observed treatment (DOT) daily in the intensive phase (IP) and thrice weekly in the continuation phase (CP). Sanatorium treatment is offered to patients who are smear-positive. Treatment success for successive cohorts of new sputum smear-positive (SS+) patients registered for treatment has consistently exceeded 85% since 2001 and 90% since 2009. While the absolute number of children (less than 15 years, all forms) notified by the programme was not available, data from the Global TB Report 2013 (Table A4.8, page 264) clarifies that new notifications for children under 15 years was about 2.7% of all new SS+ patients notified in 2010, declining to 1.6% in 2012. This proportion may be higher for all forms of TB, but clearly demonstrates low detection and notification of TB among children.

Smear microscopy is widely available and accessible across the country through a network of over 320 laboratories established at county level. Diagnosis of smear-negative, extra-pulmonary and childhood TB is made using designated algorithms and a process of referral to higher levels from the county up. A guideline on programmatic management of drug-resistant TB (PMDT) and a plan to expand treatment for multidrug resistant TB (MDR-TB) patients is in place. From June 2012 enrolment under PMDT has been initiated and currently, 220 patients are on treatment in two provinces.

The National Tuberculosis Reference Laboratory (NTRL) at the Central TB Preventive Institute (CTPI) in Pyongyang has expanded its capacity to include a range of laboratory tests. Based on validation tests
carried out in June 2012, with the supranational reference laboratory (SNRL) in Hong Kong, there was high concordance of results for first-line drug susceptibility testing (FL DST). However, concordance of only 70% for both rifampicin and isoniazid was shown on panel testing by the National Institute for Research in TB, Chennai, India in 2013. One XpertMTB/Rif was procured by WHO and has been used to support diagnosis and also a limited drug resistance surveillance (DRS) survey in one province. Interim results of this limited survey are in line with the WHO estimates of MDR among new and re-treatment patients, with Rifampicin resistance detected in 2.2% and 16.3% of new and previously treated smear-positive pulmonary patients respectively. The estimates of patients developing MDR-TB annually amongst the notified pulmonary TB patients remain approximately the same, i.e. around 3900. The first national prevalence is planned in 2014 to estimate the burden of TB in the country.

Patient treatment kits (for adults) and diagnostic laboratory kits are currently procured from the Global Drug Facility (GDF) for the entire country (except Jagang Province) using the GF grant. Jagang province is currently supported for adult patients, through an exceptional grant from the GDF. Paediatric anti-TB medicines are currently provided for the entire country through the GDF. However, there was a stock-out of paediatric medicines at central and provincial levels at the time of the JMM, which is expected to be resolved shortly. The GF grant also supports limited procurement of second-line drugs (SLD) for patients treated through the PMDT. An unknown number of patients are also treated in the country (since 2008) with SLD supplied by the Eugene Bell Foundation (EBF), with a regimen that is slightly different from NTP-recommended PMDT guidelines. Full details of the treatment monitoring and outcome data of these cohorts of patients were not available to the Mission.

NTP uses WHO-recommended standardized formats for recording and reporting case-notifications and treatment outcomes on a quarterly basis. Although recording and reporting is currently almost completely paper-based, the registers, records and reports were well maintained and of high quality and seemed to be submitted punctually within the required timelines. The CTPI and Provisional TB Preventive Institute
Vehicles and fuel for supervisory visits are available through the GF grant. Supervisory teams include a laboratory specialist and random re-checking of smears is regularly carried out during routine supervision (although the process does not ensure blinding of the re-checking). Standard checklists are used to capture information during these visits. Regular reviews are conducted at national (semi-annually) and provincial (quarterly) levels to review programme performance, identify issues for attention.

There is no report of HIV in the country. Sentinel surveillance is coordinated for nationals returning after foreign travel and it is reported that HIV co-infection was not detected in a ‘sample’ cohort of TB patients recently screened by a partner agency, namely Christian Friends of Korea (CFK).

NTP has developed a draft National Strategic Plan 2014–2017 (NSP) which aims to build on the ongoing 2008–2015 plan and which primarily aims to help the programme to achieve the Millennium Development Goals (MDG), to expand PMDT and intensify operational research within the programme, among others. This NSP will be revised following JMM and used in conjunction with the findings of the mission to contribute to the development of a comprehensive ‘concept note’ that will be used to access additional funding available from the Global Fund through its NFM.

**Major challenges**

Despite the considerable achievements and progress made by NTP over the last decade and a half, the Mission identified several challenges. These include the following:

1. Light microscopes used for smear microscopy in the country-wide laboratory network and the X-ray machines used for diagnosing smear-negative TB are old/dysfunctional and urgently require maintenance/replacement; external quality
(2) Although treatment observation is reportedly high and backed up with good treatment outcomes, most SS+ patients (first line treatment) continue to be routinely admitted into TB sanatoria for some part of their treatment with implications for the limited resources available for public health and patient / health worker safety and convenience; while Category II failures are recognized as 'suspects' for MDR-TB, there is no clear policy on their follow-up and admission into sanatoria while awaiting access to PMDT services.

(3) All first-line drugs for adult TB patients (except Jagang province) are currently procured with support from the GF; drugs for children with TB continue to depend on the exceptional GDF grant (due to expire in 2014) and are not part of the GF grant / domestic funding; quality assured drugs for adult TB patients in Jagang province are also dependent on exceptional GDF funding; complete dependence on external funding for all TB drugs seriously risks TB control efforts in the country.

(4) The recording and reporting system continues to be fully paper-based, with reports being physically transported to the higher levels. While programme reviews and supervision occur through a standard planned process, it is not clear that reporting units routinely receive feedback on their reports through a similar standard process, PMDT recording and reporting is not integrated with routine NTP system; drug ordering is coordinated by the medical warehouse at the county, provincial and central levels; it is not clear how this reporting is routinely reconciled with patient data.

(5) Despite dedicated and competent personnel, a number of issues continue to challenge quality diagnostic and culture/drug sensitivity testing (C/DST) laboratory service provision. Crucially, no consistently proficient culture and first line DST laboratory is available in the country. This seriously
challenges identification of DR-TB for appropriate treatment and may compromise the NTP’s plans to implement a national prevalence survey. Lack of appropriate equipment and their regular maintenance; limitations in access to current peer reviewed advances in technology and practice; inadequate agreements with the supranational laboratory for technical assistance, training and quality assurance; and limitations in access to postgraduate training of specialists to provide professional and effective laboratory supervision, combine to compromise and challenge timelines and quality of laboratory results and directly impact patient management and disease control.

(6) Procurement and supply chain management in the Democratic People’s Republic of Korea generally functions well, but there have been some supply problems in the past, predominantly due to global product shortages which affected the supply of set packed kits. This appears to be due to good support from the United Nations Children’s Fund (UNICEF) PSM team, regular interaction with WHO/GDF, stock record management and monitoring by NTP and a strong system for requisitioning and supply. Quantification is done using Excel spreadsheets taking into account consumption rates, stock in hand and in pipeline. Orders are placed taking into account delivery lead times and central stock levels. In addition, orders have been placed biannually (as opposed to annually), to minimize the risk of stock-outs and ensure that there is routine and regular supply. NTP submits central stock reports to UNICEF for GF-funded medicines only, but excluding data as to paediatric stock funded by GDF. With planned MDR-TB scale-up, more sophisticated quantification tools will be required and review of key performance indicators on a regular basis is encouraged.

(7) Although limited DRS data is available, to date, there is no nationally representative DRS data. Expansion of PMDT services has been slow, linked to available funding, diagnostic capacity, SLD supply, human resources to manage MDR-TB
patients, infection control measures, etc. Practices in relation to admission of MDR-TB suspects to sanatoria vary, and there is no system of tracking of the identified MDR-TB suspects not yet enrolled on SLD treatment. Two parallel models of care for MDR-TB patients currently exist in different areas of the country, both of which have complete in-patient care, leading to complex management issues for the NTP. Drugs for the management of adverse drug reactions (ADR) are available at limited sites. There is an ambitious scale up plan, although this is currently unfunded.

(8) Although a draft NSP 2014–2017 has been developed, it does not align with the funding cycles of the most important donor to the country – the Global Fund; the document also does not set aspirational programme targets that will demonstrate population level impact on TB incidence and mortality beyond the MDG and align with the post-2015 strategy approved by the Sixty-seventh World Health Assembly on 19 May 2014. The NSP also does not address the issue of funding for tuberculosis control, the process to mainstream domestic funding into the programme, and to coordinate inputs and support across partners in TB control including EBF and CFK.

(9) The Mission did not attempt to assess any other programmes in health sector of the Democratic People’s Republic of Korea, but believes some verticality exists, and they are as short of resources as the TB programme would be without GF support. However, any shift towards a more horizontal approach would, of necessity, require a major reallocation of personnel responsibilities, alignment of programme logistics and timing, and much training. It would need to be informed by a detailed analysis of the potential for efficiency gains, and require commitment at a higher level, technical support, major new funding and reassurance of staff at all levels that changes will benefit them and the country in the long term.

(10) Challenges within the overall environment of the health sector also have a major impact on public health and
specifically, TB control. Some observed challenges include the breakdown of piped water systems and inconsistency of power supply for many health facilities, lack of transport, poor road conditions, inadequate heating, inadequate basic training of personnel, lack of nursing staff, and unstable economic conditions due to international influences and current priorities for use of domestic resources. These challenges cannot be overcome by the TB programme, but again highlight the need for improved efficiency across the health system, the importance of programme integration and potential benefits of investment in public health.

Main recommendations

Due to the structure and function of the NTP in the Democratic People’s Republic of Korea, including a case-finding strategy that is mostly active and consistently achieving excellent treatment outcomes, the country is uniquely positioned to demonstrate impact, in terms of decline in incidence and mortality, from the sustained implementation of prioritized, internationally recommended interventions and policies. Keeping this in view, the broad recommendations below address major challenges that must be resolved to ensure the control of tuberculosis in the country.

(1) Old/dysfunctional light microscopes within the laboratory network should be rapidly maintained/replaced with microscopes including with alternate power source; X-ray units should be replaced in a phased manner to increase access to quality assured chest radiography for patients with smear-negative TB; a process to assure quality in smear microscopy through the WHO recommended lot quality assurance sampling should be urgently implemented; once this is in place, the requirement for three smears for diagnosis (diagnostic algorithm) and two smears for follow-up should be reviewed; adequate allocation of human and financial resources and equipment should be carefully planned and
ensured, and the prevalence survey should be implemented to provide clarity on the burden of TB disease in the country.

(2) The policy to routinely admit SS+ patients into TB sanatoria should be reviewed and full ambulatory treatment (global best practice) implemented for all patients on first line TB treatment; the financial and HR resources this will free up can be used for other programme priorities; admission practices into TB sanatoria for Category II failures awaiting enrolment into PMDT services should be standardized; medicines for children with TB should be urgently procured and funding for paediatric medicines from domestic/GF funding regularized to ensure uninterrupted supply; access to implementing partners should be provided to all central level stock reports for all anti-TB medicines, irrespective of the source of funding; access of partners to Jagang province should be reviewed; and dependence on external donor funding for anti-TB drugs reduced.

(3) Consideration should be given to transitioning to a comprehensive electronic system, such as e-TB Manager, for recording and reporting, including the use of the local intranet for transferring data within the programme; recording and reporting of PMDT should be integrated into the system; reporting system for drug ordering should be reviewed and integrated with patient data within the NTP.

(4) The laboratory service should be enhanced to provide timely and quality results, in terms of availability of supervision by specialist personnel, appropriate equipment with regular maintenance, continuous supply of necessary reagents, introduction of advanced technology, and access to current publications and information in the field; close liaison with SNRL on provision of technical assistance, training, concordance testing and panel testing for quality assurance should be ensured; laboratory technical assistance (TA) should be focused on getting the NTRL proficient for FL DST, with consideration of using XpertMTB/Rif as first test for MDR-TB suspects to detect Rifampicin resistance for initiating
SLD treatment (the diagnostic algorithms will need to developed and finalized accordingly); after the NTRL has consistently demonstrated proficiency, the first regional referral laboratory (RRL), should be established, in particular focusing on the required decentralized capacity for culture, enabling follow-up examinations of MDR-TB patients on treatment.

(5) The management practices for all MDR-TB patients treated under NTP should be: standardized (regimen, follow-up schedule) irrespective of source of support (GF or EBF); data and lessons learnt from treatment of MDR-TB patients supported by the EBF shared to inform future policy and guideline development; once culture converted, MDR-TB patients discharged from sanatoria to ambulatory care if the patients’ medical condition allows; an adequate supply of drugs ADR treatment ensured, and staff adequately trained to undertake ADR management, with a strategy of "zero hearing loss" from MDR-TB treatment adopted and implemented by NTP. Pharmaco-vigilance systems should be strengthened at all sites where M/XDR-TB patients are treated.

(6) A revision of the draft NSP 2014–2017 should be undertaken to incorporate recommendations coming from this JMM, including a review and revision of the PMDT expansion plan to accelerate it; align with the funding cycle of the GF in terms of the plan period; detail aspirational programme targets that align with the post-2015 strategy approved by the sixty seventh World Health Assembly; elaborate process to mainstream domestic funding to TB control in the country recognizing priority areas that will benefit from external support while ensuring sustainability of the programme; recognize and harmonize programme implementation across partners including CFK and EBF to add synergy to the NTP efforts and include a robust electronic system for monitoring and evaluating progress.

(7) Given the exemplary personnel, communications, training and supervision network maintained by the TB programme and
the financing available to it, and to address the new global recommendation to integrate TB control with other health programmes, ways should be devised to use these resources to strengthen health systems with a view to reduce the TB burden in the country. For example, including interventions to address childhood under-nutrition, high rates of smoking, and the growing burden of noncommunicable diseases in applications for new funding support can explicitly document the TB programmes’ contribution to health systems strengthening (HSS) in Democratic People’s Republic of Korea.

A high-level national commission should be established, with international support, to undertake a comprehensive review of the health system and recommend reforms aimed at improving the efficiency, flexibility and affordability of preventive and clinical care across programmes and the health system.

Measures to improve environmental and social determinants of health that contribute to TB and poor health by increased prioritization of health for domestic spending should be advocated.

1. **Introduction**

This first Joint Monitoring Mission (JMM) to review tuberculosis (TB) control in the Democratic People’s Republic of Korea was coordinated by the National Tuberculosis Control Programme (NTP) and the World Health Organization Country from 9–19 May 2014. The review team included international experts, national officers from NTP and representation from the United Nations Children’s Fund (UNICEF) and the World Health Organization (WHO).

1.1 **Objectives**

The objectives of the JMM were as follows:
(1) to review the performance of NTP compared to the National Strategic Plan 2008–2015;

(2) to review progress towards the TB-related targets of the Millennium Development Goals (MDG), the Stop TB Partnership and the NTP;

(3) to review technical policies, specially of the new interventions initiated since implementation of the GF grant;

(4) to review the draft National Strategic Plan to Control Tuberculosis 2014–2017 (NSP) and provide recommendations on plans, pathways and operational approaches; and

(5) to advocate for resource mobilization to achieve the objectives of NSP 2014–2017 and maintain progress towards the larger global goal of elimination of TB by 2050.

The observations and recommendations from this review are expected to contribute to (a) the planned revision of NSP that will follow this mission and (b) the development of a comprehensive concept note (CN) to the GF under its New Funding Model (NFM).

1.2 Methodology

A steering committee was formed to prepare for the JMM and included representation from NTP and WHO. The committee finalized and invited experts to participate in the JMM, and developed the objectives of the mission and terms of reference for each of the invited experts. It collated documents and epidemiological data for the mission and coordinated site visits to facilities at different levels of the health service. The final report will be presented to all stakeholders including the Ministry of Public Health (MoPH), WHO, UNICEF, other UN agencies and nongovernmental organizations (NGO) by the steering committee.

Four teams were constituted for the JMM, with each team comprising two international experts (details in Annex 1) and representation from NTP, UNICEF and WHO. All the four teams were scheduled to visit CTPI, the National TB Reference Laboratory (NTRL)
and the Central Medical Warehouse (CMW) at the national level as well as the Pyongyang City TB Preventive Institute, one district hospital and one Dong clinic in Pyongyang city. Additionally, the teams visited five provinces – North and South Hwanghae, North and South Pyongan and Kangwon provinces among themselves. Designated experts from the team were also allocated more time to visit two sanatoria that were treating MDR–TB patients, NTRL and the medical warehouse for more detailed assessments of programmatic management of drug-resistant TB (PMDT), the laboratory network and its capacity and drug supply chain management. The detailed agenda of the mission including sites visited by each of the teams and persons met with are available in Annexes 2 and 3.

1.3 Background

With a population of about 24 million people (2008 census), and although current estimates indicate a large number of TB patients, Democratic People’s Republic of Korea is not on the Stop TB Partnership’s list of ‘22 high TB burden’ countries in the world. Administratively, the country is divided into 10 provinces, two cities with special status and 209 counties which are further subdivided into over 7000 smaller administrative units called ri in rural areas and dong in urban areas. More than 60% of the population (over 14 million people) is estimated to live in urban settlements. The climate is temperate, with extremely cold winters and heavy monsoons followed by torrential flooding. A national 12-year free compulsory education policy ensures that all children complete secondary education and literacy rates are near universal.

The Constitution of the Democratic People’s Republic of Korea guarantees universal health coverage to all its citizens, ensuring free medical services for all, structured around the system of ‘household doctors’ and prioritizing prevention of disease. The percentage of government spending on health is estimated to be 5.5% (US$ 45/person/year). It is estimated that there are 3.3 physicians and 3.9
nurses for every 1000 population. Life expectancy at birth was estimated to be 69.3 years in 2008. Democratic People’s Republic of Korea is on track to achieve MDG 4, but progress on achieving MDG 5 has been slow despite high levels of antenatal care and institutional deliveries. Skilled health personnel attend all births. The infant mortality rate (per 1000 live births) was estimated at 26 for 2011. The maternal mortality rate has declined from 140 per 100 000 live births in 1995 to 81 in 2010. More than 88% of children in the age group 12–23 months are fully immunized and the country reports 98% BCG coverage for infants 0–12 months.

A recent national nutrition survey coordinated by the Central Bureau of Statistics in 2012, however, reports that a third of the children under the age of 5 years are chronically malnourished. In addition, the prevalence of tobacco smoking is very high and it is estimated that well over half the adult male population smokes.

1.4 Structure and organization of the health services and the National Tuberculosis Control Programme

MoPH has developed a ‘Mid-Term Strategic Plan’ in 2011, with technical support from WHO. This plan aims to mobilize and coordinate government and international funding to achieve the objectives set out in MDG 4, 5 and 6 by 2015. The plan clarifies four areas related to international health development that influence cooperation with the Government of Democratic People’s Republic of Korea – they include: (a) responsiveness to epidemic diseases and prevention and control of communicable diseases set out in the International Health Regulation (IHR); (b) climate change and its influence on human health; (c) social and environmental factors contributing to poor health; and (d)

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3 DPRK at a glance 2013. UNICEF Factsheet
6 Abstracted from the National TB Strategic Plan for TB Control 2014-2017
strengthening health systems. While the plan itself is elaborated through five strategic directions (for detail, please refer to the plan), there are important implications for TB control within this broader health plan. These include – further strengthening primary health care through ‘household doctors’, capacity-building for management and information at provincial and county levels, innovative financing through the setting up of a Democratic People’s Republic of Korea Health Development Fund, reduction of smoking prevalence albeit in a limited way and to remain HIV-free. The direct objective for TB control within this plan continues to be limited to ‘increase detection rates of TB cases’ with no clear objectives and impact indicators attached to this (although the strategy aims to eliminate malaria by 2015) and will benefit from a review during the finalization of the national strategic plan planned immediately after the JMM.

Health infrastructure and services are administered by MoPH at the national level and health departments located in the People’s Committees at the provincial/city/county levels. MoPH is one among other ministries in the Cabinet of the Government of Democratic People’s Republic of Korea and is responsible for coordination with other ministries as well as supervising the health departments at provincial, city and national levels. MoPH is also responsible for central level hospitals, specialized hospitals affiliated to it, central level hygiene and anti-epidemic institutes as well as drug procurement and supply chain management. City/district/county people’s hospitals are comprehensive units with special departments to provide special service, which fulfil their function as first referral units in the primary health care chain while central and provincial people’s hospitals and specialized health facilities are higher level units for specialized health service delivery. MoPH reports that there are 133 comprehensive and specialized hospitals at central and provincial level, 601 people’s hospitals at city (district) and county level, and 7237 people’s hospitals, polyclinics and clinics at ri and dong levels. The facilities at ri / dong levels are reported to be no more than 30 minutes’ walking distance of the local population. Drug procurement and supply chain management is managed through a department in the MoPH and follows a similar supervisory hierarchy - Central Medical Warehouse (CMW), provincial Medical warehouses (PMW) and county medical warehouses (cMW).
It is estimated that the health work force in the Democratic People’s Republic of Korea is about 300,000 strong and includes a network of about 45,000 ‘household doctors’ serving at the front line for preventive and health services delivery. Resources to train this large work force include 15 medical universities and 66 nursing schools at central and provincial levels.

Within MoPH, the Department of Communicable Disease, Hepatitis and Tuberculosis coordinates development of policy and planning, organization of TB services, provision of technical support, communications and international partnerships. The department coordinates these activities through a hierarchy detailed in the ‘structure of the NTP’ extracted from the fourth version of the National TB Guidelines provided to the JMM (Figure 1).
CTPI is the apex technical unit and is responsible for technical support, laboratory services, treatment services, training, monitoring and evaluation (M&E), routine programme supervision, recording and reporting and research. A central 100-bedded hospital attached to CTPI provides clinical services for TB patients and NTRL is also part of CTPI. While in this figure, it appears that the drug supply chain managed

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Footnote:

7 National TB Guideline (Fourth version), page 10.
through the medical warehouses is also part of NTP, it was clarified during the JMM that this is a parallel department within the MoPH and that the medical warehouses report directly to that department, although there is a process for reconciliation of information with NTP (patients notified and treated versus drugs procured and consumed) at all three levels (central, provincial and county). NTRL is responsible for EQA of the smear microscopy network across the country as well as for providing services for culture and DST to the programme.

The Global Fund grant has supported the setting up of a Project Management Unit (PMU) within NTP to support grant implementation. The integrated structure is provided in Figure 2.

Figure 2: *Integrated structure with NTP, Dept. of Drug Supply and PMU for the Global Fund grant*

This PMU supports both the TB and malaria programmes that receive a grant from GF – and includes capacity to support procurement
and supply chain management, as this is an essential element in both
the GF grants. Accordingly, there are seven staff positions within the
PMU allocated across the following functions: childhood TB and
partnerships; laboratory; supervision, monitoring and evaluation;
programmatic management of DR-TB; advocacy, communications and
social mobilization; and data management. One person is also available
to provide assistance to the NTP Manager.

2. **Tuberculosis epidemiology**

2.1 **Case notifications**

*Time trends*

The most marked feature in case notifications in the Democratic
People’s Republic of Korea is the exponential year on year increase in
case notification rate (CNR) since the initiation of the DOTS strategy in
1998. Countrywide expansion was achieved by 2003. TB case
notifications rose from 41,810 patients (all forms) in the year 2003 to
97,665 patients (all forms) in 2013. CNR for all forms of TB increased
from 178 / 100,000 population in 2003 to 394 / 100,000 in 2013\(^8\).

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\(^8\) *Epi-analysis of National TB Programme.docx provided to the JMM on Friday, 17 May*
The estimates for incidence were revised under the guidance of the WHO at least twice – the first time in 2007 following a sub-national ARTI survey and again in 2012 when case notification exceeded 100% of the estimated incidence. These substantial changes make analysis of the trends in TB incidence difficult, and it is likely that TB incidence is actually increasing over time, although active case-finding and improved recording and reporting are certainly contributing to the increases in notification. A national prevalence survey planned in 2014 will clarify this issue further. NTP has analysed the quarterly reports for the period 2006–2013 (32 quarters) and it appears that there is no seasonal variation in notifications within the year. The analysis provided by NTP to the JMM also reveals that the ratio of smear-positive to smear-negative pulmonary TB notified is almost 1 since 2004, with the programme increasingly notifying more smear-negative than smear-positive pulmonary TB patients since 2004.

**Table 1:** Province–wise CNR (2010–2013)

<table>
<thead>
<tr>
<th>Province Name</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyongyang</td>
<td>260</td>
<td>306</td>
<td>314</td>
<td>311</td>
</tr>
<tr>
<td>S. Pyongan</td>
<td>396</td>
<td>384</td>
<td>360</td>
<td>381</td>
</tr>
</tbody>
</table>
The proportion of retreatment patients (includes relapses) among all TB patients registered for treatment has declined from about 18% in 2004 to 14% in 2013. The absolute number of relapses registered for retreatment has, however, increased over the same period from 1663 in 2004 to 7074 in 2013. The expanding programme itself could have contributed to this increase. However, this absolute increase in the number of relapses requires further study.

There is some variation in CNR across provinces as the table shows.

Case notifications seem to be consistently higher in some provinces (N and S Hwanghae, N and S Hamgyong).

**Childhood TB**

The current NTP reports on case notification disaggregate data on all forms of TB among children under the age of 5 years and aged 5–14 years. At the national level, the CNR for children below the age of 5 years was 1 per 100 000 (smear-positive) and varied between 35 and 41
/ 100 000 (all forms) for the period 2011 – 2013 (period for which this data is available). For children aged 5–14 years, the CNR was about 13 /100 000 (SS+) and varied between 94–113 / 100 000 (all forms) respectively for the same period. While the absolute number of children (below 15 years, all forms) notified by NTP was not available, data from the Global TB Report 2013 (Table A4.8, page 264) clarifies that new notifications for children below 15 years of age was about 2.7% of all new SS+ patients notified in 2010, declining to 1.6% in 2012. This proportion may be higher for all forms of TB, but clearly demonstrates low detection and notification of TB among children. The process to diagnose TB in children uses a range of tools including purified protein derivative, radiography, histopathology and clinical diagnosis by paediatricians even at the county level.

**TB in women**

While the absolute numbers of male and female TB patients notified was not readily available, limited review of their CNR across age groups seem to show that equal numbers of male and female TB patients are notified upto the age of 14; after this, males are increasingly notified over females at about the rate of two males for every female patient. The highest CNR for both genders is in the age cohorts of 45–54 years.

**HIV-associated TB**

There is no report of HIV in the country. Sentinel surveillance is coordinated for nationals returning after foreign travel and it is reported that HIV co-infection was not detected in a large cohort of TB patients tested using rapid HIV test kits. HIV testing is available at central and provincial hygiene and anti-epidemic institutions/stations but not at the TB facilities.

**Drug resistance**

Interim results of limited DRS conducted in one province detected rifampicin resistance in 2.2% and 16.3% of new and previously treated
smear-positive pulmonary TB patients respectively. These figures are in line with estimates derived from the earlier WHO modelling exercise, and the estimate of patients developing MDR-TB annually amongst the notified pulmonary TB patients remain approximately the same, i.e. around 3900.

**Treatment outcomes**

*Figure 4: Treatment outcome of new smear-positive (SS+) cases, 2013 cohort*

![Pie chart showing treatment outcomes](image)

Cured: 88%
Completed: 3%
Died: 2%
Failure: 4%
Defalt: 2%
Transfer out: 1%
Other: 9%

Source: WHO Annual TB Report 2014, page 83

Treatment success for successive cohorts of new sputum smear-positive (SS+) patients registered for treatment have consistently exceeded 85% since 2001 and 90% since 2009. High treatment success rates were also reported for smear-negative/extra-pulmonary and retreatment TB patients at 92% and 84%, respectively.
2.2 TB mortality

TB mortality seems to sharply decrease starting from the early nineties, going beyond the target of 50% reduction of 1990 level already five years ago (see figure 5).

*Figure 5: Trend in estimated TB mortality rates 1990–2012, Democratic People’s Republic of Korea*[^1]

(Shaded areas represent uncertainty bands. The horizontal dashed line represents the target of a 50% reduction by 2015 compared with 1990. The other dashed line shows projections up to 2015. The “x” symbol represents the mortality data from vital statistics reported by the Democratic People’s Republic of Korea that were adjusted to

[^1]: Source: Tuberculosis control in the South-East Asia Region: Annual TB Report 2014; WHO Regional Office for South-East Asia
account for incomplete coverage — deaths with no reported cause — and ill-defined causes but not for miscoding of causes of deaths)

2.3 TB prevalence

The country plans to implement its first prevalence survey in 2014. TB prevalence rate was estimated to be flat until 2007 and to increase slightly afterwards (see figure 6). Projections for 2013–2015 predict an increasing trend and it seems highly unlikely that the country will reach the target of 50% reduction of 1990 level of TB prevalence. However uncertainty bounds are very wide, particularly the upper band.

Figure 6: Trend in estimated TB prevalence rates 1990–2012 and forecast TB prevalence rates 2013–2015, Democratic People’s Republic of Korea

(Shaded areas represent uncertainty bands. The horizontal dashed line represents the target of a 50% reduction by 2015 compared with 1990. The other dashed line shows projections up to 2015)

10 Source: Tuberculosis control in the South-East Asia Region: Annual TB Report 2014; WHO Regional Office for South-East Asia
2.4 Summary and recommendations

It is challenging to understand and analyse the TB situation in the country without open and easy access to the complete set of programme data. The exponential increase in CNR over time demands that the planned prevalence survey is completed early to provide realistic estimates of TB burden in the country. The reliance on ‘household doctors’ for active and early case-finding and the potential for improved surveillance has implications for setting realistic targets within the developing NSP that align with the WHO Post-2015 strategy for TB elimination.

(1) NTP must coordinate a detailed epidemiological analysis in collaboration with technical partners to give priority and direction to objectives and targets that will be developed in the national strategic plan. A realistic and result-oriented NSP is more likely to be funded by GF.

(2) NTP must take all steps to implement early the national prevalence survey that will provide an estimate of the burden of TB disease in the country and inform strategic planning and funding priorities.

3. Programme financing, budgets and management

3.1 Progress

Support to the NTP at the national level apart from GF Round 8 grant, is obtained from several sources including UN agencies such as WHO, exceptional grants from GDF for paediatric drugs (entire country) and adult first-line drugs for one province (Jagang) and partners such as CFK, EBF and Stanford University among others. No clear overview of the total picture of funding flows for TB control was provided to the review team.
The primary external donor for tuberculosis control in Democratic People’s Republic of Korea is GF and the current Round 8 grant is estimated to contribute 77% of the total budget for TB control in the country. In March 2009, the TRP approved a five-year grant budget of € 44,841,325 against the requested budget of € 47,102,407. The Phase 1 (years 1 and 2) approved grant ceiling was € 17,125,312, subject to negotiations with the GF Secretariat and a further efficiency savings of 10%. The Round 8 grant had a start date of 15 June 2010 and is now in Phase II of its implementation period. The summary budget available for years 3, 4 and 5 (June 2012 to June 2015) by ‘service delivery area’ is detailed in Table 2 below.

**Table 2: Summary budget (June 2012 to June 2015) by service delivery area**

<table>
<thead>
<tr>
<th>Service Delivery Area</th>
<th>Budget Year 1 US$</th>
<th>Budget Year 2 US$</th>
<th>Budget Year 3 US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality DOTS</td>
<td>8,347</td>
<td>5,178</td>
<td>21,000</td>
</tr>
<tr>
<td>PSM* – First line drugs</td>
<td>6,585,194</td>
<td>4,632,933</td>
<td>3,835,513</td>
</tr>
<tr>
<td>M &amp; E</td>
<td>630,048</td>
<td>561,806</td>
<td>229,072</td>
</tr>
<tr>
<td>PPM / ISTC*</td>
<td>19,722</td>
<td>21,857</td>
<td>19,722</td>
</tr>
<tr>
<td>ACSM*</td>
<td>75,875</td>
<td>71,953</td>
<td>45,151</td>
</tr>
<tr>
<td>MDR-TB</td>
<td>801,549</td>
<td>712,688</td>
<td>1,040,104</td>
</tr>
<tr>
<td>Improving diagnosis</td>
<td>2,948,276</td>
<td>802,572</td>
<td>827,182</td>
</tr>
<tr>
<td>HSS (beyond TB)*</td>
<td>727,911</td>
<td>559,574</td>
<td>563,544</td>
</tr>
<tr>
<td>Programme management / administration</td>
<td>3,085,468</td>
<td>2,832,727</td>
<td>2,703,054</td>
</tr>
<tr>
<td>Total</td>
<td>14,882,391</td>
<td>10,201,288</td>
<td>9,284,344</td>
</tr>
</tbody>
</table>

* PSM – procurement and supply chain management; PPM – public–private partnerships; ISTC – International Standards of TB Care; ACSM – advocacy, communications and social mobilization; HSS – health systems strengthening
3.2 Challenges

About 44% (US$ 15.05 million) of the grant over this three-year period is dedicated to first line drug procurement for the entire country except one province (Jagang). A further 43% is allocated to HSS (includes PPM, improving diagnosis, HSS beyond TB and programme management/administration). Currently, only 7% of the grant is allocated to MDR-TB and this will require reconsideration within the NSP development process to accommodate strategic expansion of PMDT to cover the entire country at the earliest possible date (refer to the chapter on PMDT).

The GF grant has been rated ‘A2’ in its most recent evaluation by the GF Secretariat. An amount of US$ 14 458 483 has already been committed to the country from the existing Phase 2 grant of US$ 34 368 022 for the period 2012–2015. The country through a ‘concept note’ under the NFM can access an additional US$ 28 564 491 for the period 2015–2017 effectively adding another US$ 8.65 million for one year beyond the end of the current grant period (June 2015).

The draft national strategic plan outlines a budget requirement of US$ 97 100 530 for the three-year period 2015 to 2017 with US$ 16 403 970 potentially coming from government budgets, leaving an enormous funding gap of US$ 80 696 560. Considering the limited availability of funding detailed in the previous paragraph, it is not clear how this funding gap will be bridged.

3.3 Recommendations

The development of the national strategic plan is an opportunity to review strategic priorities for interventions that will impact TB control in Democratic People’s Republic of Korea and leverage limited global resources to fund them. As part of the development of the NSP, the following steps should be undertaken.

(1) NTP should lead a discussion among partners that will provide a better understanding of the funding requirements
for TB control in the country, availability of domestic budgets and funding gap.

(2) NTP, in coordination with partners and technical support from WHO and other agencies, should identify priority interventions with costs that will impact TB control in the country and require external funding in the short term.

(3) NTP must lead coordination across partners to avoid duplication and allocate scarce resources to obtain synergy with the funding available through GF.

4. Findings and recommendations on major TB control areas

4.1 Case-finding

Progress

National TB guidelines were revised in 2001, 2004, 2008 and a fourth version was published in 2013. In general, these are in line with WHO recommendations, although the current version does not include the latest WHO definitions and recording and reporting formats.

Active case-finding is the main approach for tuberculosis case detection. The household doctors in ri and dong levels identify presumptive TB individuals through consultation and verbal screening of population. On average, one household doctor is responsible for 120–130 houses. Reportedly, the household doctor visits each house in their respective areas once a week to every ten days. Presumptive TB patients are referred to TB section of the county hospital for diagnosis. The laboratory from AFB smear microscopy is located in this TB section.

Sputum smear microscopy is the main tool for diagnosis of tuberculosis. Two weeks cough is defined as the main criteria for presumptive TB suspects. Three sputum samples - spot, morning, spot,
are taken for smear microscopy. Two positive smears or one positive smear and x-ray suggestive of tuberculosis define a smear-positive patient. In short, diagnostic algorithms are in conformity with WHO guidelines. Channels for patient and sample referral and laboratory result feedback are very well established.

On most occasions, patients come to provide sputum sample to the clinic; however, if needed, household doctors or TB focal staff also go to patients’ homes. All laboratory and TB clinic data the team had the opportunity to see were well documented, complete and accurate.

Smear-negative presumptive TB patients are screened using x-ray and fluoroscopes; the equipment used are several decades old and in dire need of replacement. X-ray and fluoroscopes are used with little or no protective measures, putting concerned health workers at serious radiation risk. Reportedly, all extra pulmonary tuberculosis is diagnosed using histopathology, bacteriological, aspiration test etc. where applicable. All county level hospitals have surgical facilities for obtaining samples for examination. For diagnosis of TB among children, history, tuberculin skin test, x-ray etc. are the main criteria for diagnosis. Childhood TB guidelines are yet to include the latest WHO recommendations. No HIV-infected patients have been reported in the country. However, it is reported to the Mission that people returning after long overseas stay and seamen are screened for HIV status. Confirmed TB patients are registered at TB section of the county hospital.

Case notification, although increasing over the years, has remained considerably low for females; 141/100k compare to 235/100 for male in 2006 to 297/100k in 2013 while it was 496/100k for men (See figure 7).
The system and procedures for referral and consultation on "Difficult to diagnose" patients is in place; ri, dong and county levels refer complicated patients to their respective provincial institutes or CTPI for further investigation, consultation and confirmation.

Contact tracing is reported to be conducted in the families of SS+ pulmonary patients, although there was no documentation that could be reviewed by the Mission to understand how this was tracked and followed up.

Over 300 laboratories provide sputum smear microscopy services. All the laboratories visited had binocular microscopes; most of them, however, were over ten year old. C/DST facilities are available at the central level only. All diagnostic services, sputum smear microscopy, x-ray, histopathology and other tests are conducted free of charge.

In summary, the team noted that a well-organized, functioning and effective active TB case-finding approach is in place; this was supported by an efficient network of smear microscopy laboratories with adequate, well-trained staff and functioning systems for patient and sample referral as appropriate.
**Challenges**

- Old microscopes and out-dated x-ray machines jeopardize the quality and reliability of diagnosis of tuberculosis and put health staff at risk of radiation.
- Use of fluoroscope is unnecessary and hazardous for health workers.
- Limitation of one C/DST laboratory in the country delays diagnosis, this situation will become more critical when the central laboratory will have to handle the prevalence survey workload as well.
- Neither the NTP 2013 guidelines include the latest WHO-recommended definitions and reporting formats; nor the childhood TB guidelines include the latest WHO recommendations.
- The detection and registration of paediatric TB patients are significantly low.

**Recommendations**

Plan, budget and implement universal access to TB care for all forms of TB in adults and children. Every individual suffering from TB, irrespective of age, the form of TB, DR status and HIV status and gender, should have early and full access to the most appropriate diagnostic and treatment services which are free of charge. NTP must, with technical support from the WHO and other partner agencies:

1. adopt and use the most recent WHO recommended definitions, recording and reporting formats; revise childhood TB guidelines adopting the latest WHO recommendations and strictly follow the recommendations for diagnosis of tuberculosis;
2. consider switching to two samples for diagnosis conditional to the prior implementation of a well-functioning EQA of
smear microscopy; (this will also require changing the definition of smear-positive pulmonary TB (PTB) patient;

(3) expand C/DST facilities to at least a few strategically located provincial-level institutes to ensure good access and minimize delays to diagnosis;

(4) stop the use of fluoroscopes; replace old and obsolete microscopes and x-ray machines; consider using XpertMTB/Rif for diagnosis of TB in children, TB HIV co-infected individuals and obviously as a screening tool for DR-TB presumptive patients; and

(5) establish and document regular contact tracing and screening of contact of SS+ PTB patients, including children.

4.2 Quality assured laboratory network

Capability / standard of NTRL

Progress

➢ Based on previous mission reports, it is evident that there is significant improvement in maintaining continuous supply of electricity. During the visits to NTRL, there was no break in electricity supply at all.

➢ Working equipment corresponding to the range of testing and workload of the laboratory was available.

➢ There was an adequate supply of reagents for laboratory operation.

➢ Staff in the laboratory are knowledgeable in their fields. They are familiar with detailed requirements of different tests, quality control procedures, reagent preparation, equipment requirements, etc. It is particularly impressive that during discussions, the staff raised pertinent queries on various laboratory-testing procedures and requirements. The
personnel are keen to acquire up-to-date knowledge and practices, and they work with a meticulous attitude.

**Challenges**

- All medical laboratories, especially NTRL, which is a TB reference laboratory for the entire country, need to be staffed by systematically and rigorously trained specialists in the field, to ensure its effective management and continuous development to meet evolving standards.

- There are continuous and rapid advances in the field, and the reference materials available to laboratory personnel are mainly reference books, which tend to be less up-to-date than peer-reviewed journals.

- Some equipment are not appropriate for test requirements or are not regularly serviced. For example, an electronic balance with sufficient degree of resolution is currently not available for accurate measurement of reagents to enable quality-assured laboratory results. The pH meter does not have a continuous supply of standard calibration solutions for accurate measurement. Servicing of biological safety cabinets, including high-efficiency particulate air filter change to ensure continued safe and effective operation is currently not being done. Nevertheless, there is a sufficient supply of N95 masks for use during manipulation of live TB cultures.

- Access to uninterrupted reagent supplies is not currently assured. In particular, the XpertMTB/Rif test cartridges have been out of stock for four months, severely affecting the rapid diagnosis of potential MDR-TB patients.

- All the above could potentially jeopardize the reliability of test results. In particular, in the most recent DST panel testing using solid media for 20 *Mycobacterium tuberculosis* isolates with results returned in August 2013, the concordance for rifampicin and isoniazid was 70% and 65% respectively. Various steps from the preparation of media/reagents to the
test procedures involving different items of equipment could have contributed to the low concordance.

**Recommendations**

It is critical to have a fully functional NTRL to support and quality assure routine smear microscopy; to service the needs of the rapidly expanding PMDT activities and to support special activities such as the planned prevalence survey in 2014. The following is a list of priority recommendations for NTP and the Government of Democratic People’s Republic of Korea.

1. Laboratory technical assistance should be focused on getting NRL proficient for FL DST (in the next 12 months). Use of XpertMTB/Rif as the first test for MDR-TB suspects to detect rifampicin resistance for initiating SLD treatment should be considered, and diagnostic algorithms developed and finalized accordingly (in 3–6 months).

2. Only after NTRL is well-established in performing comprehensive testing with reliable results for TB diagnosis and DST, should it take up other tasks such as the set-up of additional testing capacity (molecular testing, C/DST) in laboratories current performing only AFB smear (firstly in regional laboratories, followed by provincial laboratories).

3. Continuous and uninterrupted supply of reagents and consumables for the laboratory should be ensured to assure quality results; appropriate and regular maintenance is required for all laboratory equipment.

4. Anticipating the long-term establishment of a network of reference laboratories in the country with an enhanced scope of tests to enable ready access for patients residing in all geographical areas of the country, there is a need for a local systematic and comprehensive postgraduate training programme for specialist microbiologists, for sustained effective laboratory management and service development. Prior to the establishment of such a programme, international
technical assistance and attachment training to international laboratories should continue to be provided by the SNRL/partner NGOs through WHO arrangements. However, such external support should only be considered as an interim measure, pending the completion of training of local specialists.

(5) In order to keep up with the rapid advances in the field, it is recommended that laboratory personnel have ready access to current peer-reviewed publications and international standards, especially those relevant to the field.

(6) The line probe assay (LPA) test, when performed on SS+ sputum specimens, can yield DST results in 1–2 days. If LPA is introduced in the NTRL, NTP could consider the use of LPA (Hain’s) SL DST as "rule in" test for resistance to FQ and SL injectables. In 9–12 months, collection of a sample for SL DST on all patients who remain culture positive after four months of SL treatment should be considered. In three months, link with the SNRL in Hong Kong for SL DST, whilst building SL DST capacity in the country.

(7) The conventional method currently employed at NTRL is solid culture for MDR-TB. Isolation of MDR-TB takes up to eight weeks, and DST another four weeks, totalling 12 weeks from specimen reception to DST result reporting. The test demands proper reagent preparation, quality control procedures and technical skills. It is recommended for NTRL to critically review all steps to ensure consistently high standard of performance. Verification of performance should be undertaken by panel testing as provided by the SNRL (at least six-monthly) and concordance testing by SNRL of strains sent from NTRL (at least six-monthly).

(8) There is a move on a global scale towards liquid-based MDR-TB culture, which yields isolation results within 2–3 weeks, and DST results in 1–2 weeks, greatly improving timeliness of reporting. However, it is more demanding in accommodation for biosafety and supply of commercial reagents.
Procurement of the equipment for continuous monitoring of the culture tubes can standardize reading of results with economy of manpower. This technology should be considered when NTRL has demonstrated consistent proficiency in solid cultures.

(9) Although microscopic observation drug susceptibility assay is currently being performed in the NTRL on SS+ specimens with DST results in 2–3 weeks, it is more demanding than molecular testing and solid cultures in terms of accommodation requirements for biosafety. In addition, the quality of the test results is highly dependent on accurate in-house preparation of reagents and technical skills. It is recommended that microscopic observation drug susceptibility be discontinued, especially with the anticipated availability of molecular testing for rapid results, and proficiency in undertaking conventional DST.

(10) Testing for MDR-TB must be directly linked to the assured and continuous availability of SLD to treat diagnosed patients.

**External quality assessment for the smear microscopy laboratory network**

**Progress**

- NTP receives laboratory support through a cascading network: NTRL – provincial laboratories – county/district hospital laboratories – sanatorium laboratories (total 300+ participating laboratories).

- NTRL has been administering an external quality assessment programme to laboratories in PTPI since 2011 on a quarterly basis with three components. The first component is “on-site evaluation” using questionnaires. The second component is “blind rechecking”, where 100% positive and 10% negative slides are retained for this purpose by the participating laboratories.
laboratory (total around 200 slides kept in three months). A ‘third’ person randomly selects 10 positive and 10 negative slides, and ‘blinds’ before giving to the assessor for blind rechecking. According to records kept by NTRL, up till the most recent round, all participating PTPI have scored 100% correct all along. The third component is “panel testing”, which has been piloted once in 2005, but was not continued due to heavy workload. According to NTRL, panel testing will be reintroduced in Pyongyang City TPI and Hwanghae PTPI in the second quarter of 2014. A total of 20 kits are being prepared with 10 slides each (three negative / three scanty / two 1+ / one 2+ / one 3+).

Challenges

- With all PTPI laboratories obtaining perfect EQA results for all rounds so far, there is concern that the administration of the programme might not have assured “blindness” in rechecking.
- There is insufficient manpower for preparation of slides and administration of panel testing for more laboratories in the network.

Recommendations

1. A lot quality assurance sampling system as outlined in WHO guidelines is recommended, where there is off-site rechecking of slides by independent personnel, to ensure “blindness” and impartiality.

2. Panel testing should be scaled up in phases as more resources and manpower become available.
**NTRL accreditation**

**Progress**

- Standard operation procedures are available for various technical activities, and some management activities.
- There is meticulous recordkeeping.
- Personnel are keen to undertake the necessary activities to achieve accreditation to international standards.

**Challenges**

- To achieve accreditation based on the International Standards Organization (ISO15189 for medical laboratories), the accreditation body needs to be internationally recognized, such as a member of the International Laboratory Accreditation Cooperation (ILAC). For accreditation of NTRL, a major consideration is the accreditation body to which application for accreditation will be made. All documents, including standard operating procedures, and records, will need to be in the language accepted by the accreditation body.
- A number of management and technical requirements for accreditation are pending. The former includes document control system, continuous improvement programme (e.g. handling of incidents and discordant results, with timeliness and documentation), internal auditing programme, and the latter includes equipment maintenance programme (from acceptance test to regular preventive/corrective maintenance), test methods requirements (evaluation prior to method adoption, inclusion of quality controls). The above list is not comprehensive and contains only the more significant pending activities.
**Recommendations**

(1) With the issue of identifying the appropriate accreditation body, it is recommended to view accreditation as a long-term aspiration while currently focusing on increasing proficiency and quality-assured laboratory results relevant for clinical and epidemiological requirements.

(2) Implementation of various management and technical aspects consistent with accreditation requirements should continue to be undertaken as resources become available.

**Tuberculosis prevalence survey planned for 2014**

**Progress**

- A total of 70,000 people are to be enrolled for the prevalence survey within six months. Assuming 10% are symptomatic, requiring laboratory testing, NTRL expects to undertake testing of 14,000 specimens (two specimens per symptomatic) within eight months (around 90 specimens per working day), amounting to a rolling figure of up to 3,500 cultures at any point of time (duration of culture for each specimen taken as two months).

- The incubator capacity of NTRL as of this report is 3,700 tubes [Equipment room: Weiming incubator (2,000 tubes), Memmert incubator (200 tubes), Thermo Fisher incubation (1,000 tubes); Processing room: Weiming incubator (500 tubes)].

- The prevalence survey will be undertaken in parallel with the routine work (around 5,000 culture specimens per year, amounting to 850 tubes at any point of time). DST has not been taken into account in this report, since the workload was inconsistent during the past year.

- Two centrifuges are in working condition, with capacities of 24 and 16 tubes respectively.
A meticulous list of necessary equipment, supplies and reagents has been drawn up for the survey.

Manpower at NTRL should be sufficient to undertake the survey.

Equipment earmarked for RRL planned at Hamhung province will first be deployed for the survey.

Challenges

As such a large-scale survey has never been undertaken, it poses a challenge in terms of planning and anticipation of arising issues.

Recommendations

(1) This survey is expected to provide important data on the epidemiology of TB disease in the country. It is necessary to plan it in minute details with comprehensive step-by-step consideration, and to ensure all supplies, other requirements, manpower deployment and workflow are fully addressed when the survey is initiated.

(2) Considering the current available laboratory capacity and planned prevalence survey in 2014–2015, NTP should not plan to undertake a national representative DRS survey any earlier than in 2015.

4.3 Treatment (including patient support and DOT)

Progress

NTP treatment regimens are in line with WHO recommendations. (See Table 3)
**Table 3: Treatment category and regimens**

<table>
<thead>
<tr>
<th>Category</th>
<th>Type of patient</th>
<th>Treatment Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat I</td>
<td>New smear-positive&lt;br&gt;Serious new smear-negative&lt;br&gt;Serious extra-pulmonary</td>
<td>2(HREZ) / 4(RH)³</td>
</tr>
<tr>
<td>Cat II</td>
<td>Relapse&lt;br&gt;Failures&lt;br&gt;Lost to follow-up&lt;br&gt;Other</td>
<td>2S(HREZ) / 1(HREZ) / 5(HRE)³</td>
</tr>
<tr>
<td>Cat III</td>
<td>Mild new smear-negative&lt;br&gt;Mild extra-pulmonary</td>
<td>2(HREZ) / 4(RH)³</td>
</tr>
</tbody>
</table>

All registered TB patients receive standardized daily DOT during the IP, while intermittent, thrice weekly treatment is provided during CP of the treatment. Fixed dose combination drugs are used. Drug dosage is according to patient body weight. Drugs are available in patient kits for category I and II (although at the time of review category II drugs were in plastic bags as kit boxes were not available from the suppliers and these were being repacked in country). Paediatric formulations are available through an exceptional GDF grant, although they were out of stock at the time of the visit.

DOT takes place at ri or dong clinics and exceptionally in patients homes observed by a designated community helper. Most (60 to 70%) of SS+ and all category II patients are admitted to a county TB sanatorium for at least the IP of their treatment and continue their DOT at ri and dong clinics on discharge from the sanatoria. Reportedly patients are given choice to be treated at sanatorium or home. There are over 200 sanatorium in the country; besides the above mentioned, DR-TB patients are also admitted for the full course of treatment while chronic TB stay in the sanatoria indefinitely.

In summary, key achievements would include:
National Tuberculosis Control Programme: Democratic People’s Republic of Korea

- using standardized treatment regimen and good quality drugs procured through GDF NTP consistently achieved treatment success rates of 90% for past several years;
- lost to follow-up and death rates remained low;
- extensive health-care system with well trained and hardworking staff;
- dedicated patient treatment kits used to ensure availability of full course of treatment for a particular patient, while use of fixed dose combination reduces chances of mistreatment or mistakes, limits confusion and wastage and ultimately ensuring optimal treatment success and helps contain drug resistance; and
- contact of SS+ TB patients screened (adult through x-ray screening, children with tuberculin testing).

**Challenges**

All anti-TB drugs (first-line, second-line, paediatric) are funded through external grants and this seriously jeopardizes sustainability of the primary requirement of the programme.

Unnecessary hospital/sanatorium treatment - maintainance of these sanatoria have financial implications for the country’s limited resources; use of sanatorium for the sole purpose of treatment is also unjustified, as it disrupts family and social life. The Democratic People’s Republic of Korea has an extensive health-care system and a network of household doctors that can easily provide treatment observation services on ambulatory basis close to the home or work place.

**Recommendations**

NTP must, with technical support from the WHO and other partner agencies:
(1) limit hospital/sanatorium admission and treatment to only those patients who require management of complications, serious adverse effect and other critical conditions;

(2) budget and allocate domestic funding for at least a proportion of first-line TB drugs, ensuring that they are quality assured and conform to international good manufacturing practices;

(3) ensure that DOT is sensitive to, and supportive of the patient’s needs. In cases where the patient resides closer to the county hospital than the ri/dong clinic, DOT can be arranged at the county hospital, rather than make the patient travel farther for the DOT.

4.4 Management of anti-TB medicines and supplies

Progress

- Central Medical Warehouse (CMW) – A purpose-built facility has been built in Pyongyang, for storage of TB medicines and other essential medicines.

- Stock records - Good stock records are maintained at central, provincial and county level, with electronic stock registers at the central level. Quarterly stock reports are prepared and submitted at all levels of the hierarchy. These reports are used to determine the quantities for resupply from central to provincial level and from provincial level to county level.

- Funding/Procurement – currently funding for all TB medicines is provided by donors – GF – for all adult first-line medicines and SLD required in all provinces except Jagang; GDF for all adult and paediatric requirements for the Jagang Province, and for all paediatric requirements for the balance 11 provinces. Since 2012, UNICEF has been the principal recipient of the GF Round 8 grant, Phase II – 2012 to 2015
and is responsible for procurement through GDF of all TB medicines, as well as customs clearance and other processes.

- Quantification is done by UNICEF in consultation with NTP and WHO, based on the number of patients planned for enrolment, with subsequent review/adjustment for the number of patients actually enrolled over time and which may be greater or less than originally planned. In addition, orders are placed with staggered deliveries six months apart, to mitigate the risk of over/under stocking.

- Quantification for laboratory supplies for microscopy is done by NTP and shared with UNICEF. Information is reviewed by UNICEF and WHO, and validated before procurement is commenced. For the NTRL requirements, quantification is done by the NTRL/NTP with support from international partners, and the list formally shared with UNICEF.

- Estimation of requirements of consumable kits and sputum containers for sputum microscopy is based on the number of sputum smears anticipated to be covered in a period; each GDF kit caters for 1000 smears. NTP utilizes about 116 GDF kits per month and by the end of April 2014, 2280 kits were available in CMW.

**Challenges**

- Inventory management

Medicines and supplies are stored properly at CMW, but some improvements could be made as follows:

- Medicines are not organized logically and do not utilize a product map that will assist easy location within the warehouse.

- Products stored in the racks are not clearly labelled, together with their expiry dates, but are simply entered with their expiry dates on bin cards.
- FEFO (first expiry first out) is not practised consistently, and the same products are not grouped together in the same place. It was observed in the field that Cat I & III kits with expiry date June/July 2016 (ie fresh stock) had been despatched recently, when approximately 19,264 kits with expiry of October 2014 were still held at the central level.

- Products with short shelf life are despatched to the field even though it is clear that they cannot be utilized prior to expiry. It was observed in the field that RHZ (paediatric formulation) had been despatched in February 2014, with product expiry in April 2014;

- Constant temperature control, with temperature recording three times daily is not consistently done.

- Ceiling fans are not adequately utilized and direct sunlight streams into the warehouse due to the lack of appropriate curtains on windows.

- **Financing of medicines** – External donors finance all anti-TB medicines. No domestic funding has been allocated for medicines and donor dependency has been created.

- **Procurement/Fund disbursement** – In its capacity as the principal recipient for the GF grant, UNICEF advises that fund disbursement from GF to UNICEF is not always made in a timely manner. This has sometimes prevented UNICEF from placing orders in time and leads to delays.

- **Stock-outs** – No stock-outs were reported at central or provincial level. However, as at May 2014, there are stock-outs at central and provincial levels of PAS (Na), RH 60/60. In addition, there were low levels of stock for H300, Cat II kits. New deliveries for these items are pending.

- **MDR-TB** – There are 220 patients currently enrolled for MDR-TB treatment in the country using medicines funded by the GF, with a further 80 patients planned for enrolment by June 2014 and another 250 to be enrolled during June 2014 to June 2015. Enrolment is subject to availability of medicines
and prioritization of provinces to receive the medicines. The pending cohort of 80 patients cannot be enrolled, as the full regimen of medicines has not been received in country. Delivery is anticipated to be made in mid-June 2014.

- **Bar code labelling** – First-line medicines and SLD have been procured without any bar code labelling on the inner or outer packaging. Fully computerized inventory management is, therefore, not possible and this results in additional workload/the risk of human error, with potential for product expiry prior to utilization.

**Recommendations**

1. **Inventory management** – NTP is recommended to (1) make minor improvements to the infrastructure of the CMW, to ensure good air circulation and prevent direct sunlight on the medicines and (2) to organize the medicines in a manner which will ensures that FEFO is practised consistently.

2. **Financing of medicines** – As an initial step, provision for ensuring uninterrupted supply for Jagang province and childhood TB drugs for the whole country could be considered through the new opportunities of GF support. However, over-dependence on donor support for essential drugs needs to be reduced in a phased manner and to the greatest possible extent.

3. **Procurement/Fund disbursement** – In conjunction with UNICEF, NTP should liaise with GF to improve the procedure for fund disbursement, to ensure that orders can be placed in time and reflect the required procurement and supply chain management lead times.

4. **Stock-outs** – In order to avoid stock-outs in future and particularly to monitor the procurement of medicines for the anticipated scale-up of MDR-TB patients, it is recommended as follows.
(a) Quantification is done using QuanTB (or a similar tool), which will provide a summary of the months of stock on hand based on actual distribution and the reordering points to avoid stock-out.

(b) Revision of proposed orders and existing orders on a regular basis by an independent review group comprising NTP and key partners. Key performance indicators for review should include the following:

- actual versus estimated patient enrolment and consideration whether the monthly enrolment is above/below the estimated monthly forecast;
- months of stock of first line medicines and SLD on hand at central/peripheral level and shelf life/expiry;
- first line medicines/SLD on order and pending delivery/number of months before delivery is made with corrective action to be taken (orders revised) if required; and
- assuming that additional XpertMTB/Rif machines will be deployed in the country, the impact that the actual versus estimated enrolment will have on the quantification of XpertMTB/Rif cartridges.

(5) *Bar code labelling* – NTP/MoPH needs to consider utilization of bar code technology on packing of medicines/supplies with scanners in key storage facilities to allow for electronic inventory management of its TB medicines and supplies/all essential medicines. Technical assistance could be identified to make detailed recommendations/costing for an appropriate system and inclusion of a request for funding support in the HSS component of the next application to GF.
4.5 Programme supervision

Progress

Monitoring and supportive supervision is regularly carried out at various levels under NTP. The aim of the supervisory effort is to ensure that staff comply with quality implementation of the NTP guidelines on TB diagnosis, registration, treatment initiation, DOT, follow-up and programme logistics. Supervisory visits are carried out from the centre to each province twice a year; province to county and from county to ri (dong) every quarter.

The central supervisory team comprises central level staff of NTP. The team also includes a laboratory expert to supervise laboratory doctors’ practice for sputum microscopy and conduct on-site evaluation for EQA.

The formulation of the provincial supervisory teams is similar to the central teams, including laboratory supervisors. During each site visit, three contiguous counties are covered in two days each. The aim is that each county receives at least two supervisory visits from the provincial level each year.

Laboratory quality control has been mainly ensured through on-site evaluation combined with rechecking during field supervision.

Challenges

- A major challenge in monitoring and supervision is inadequate or non-availability of transport for travel at provincial and sub-provincial levels. Though funds are available to support travel, fuel, vehicle and schedule of public transport is not suitable.

- Routine programme reviews at national and provincial levels are conducted on quarterly basis to improve TB care and control services. This has been possible with GF support. The
reports from the central level meeting shared with JMM showed that the quality of analysis, discussion and reporting has been improving. However, evidence of performance analysis by each TB reporting unit, feedback mechanism and action taken reporting was not adequate.

**Recommendations**

(1) NTP should make transport provision at the provincial and county levels for the supervisory staff. For this, additional vehicle or coordination with other departments at that level and with People’s committee could be considered. Additional supervisory vehicles and necessary fuel provision at those levels could be most beneficial for other health programmes as well.

(2) Regular quarterly reviews with TB programme officials and all stakeholders at regional and national levels for guidance and support should be conducted for improving TB care and control services.

### 4.6 Recording, reporting and surveillance

**Progress**

CTPI under the Department of Communicable Disease, TB and Hepatitis in MoPH is responsible for supervision, surveillance, monitoring and evaluation (M&E) of all TB programme-related activities in the country. NTP has developed an M&E guideline, which provides direction for all levels of officials for M&E-related activities for TB care and control.

The objectives of the monitoring and evaluation system are to ensure that activities are implemented as planned, and data recorded and reported is accurate and valid to conduct analysis, supervision and review of the TB programme. It provides information for policy and decision-making, leading to remedial action to improve programme
performance and ensure continuous on-the-job sensitization for programme staff and other key stakeholders.

Quarterly reports on case notification, treatment outcomes and programme management are compiled at the county level and submitted to PTPI where they are reviewed and aggregated before submission to CTPI. Here these reports are again reviewed and aggregated into national reports for NTP. Computers are available at the provincial and central levels to assist data management and analysis. Data quality is routinely assessed during regular programme supervision and at least one data quality assessment supported by the GF was in December 2011 with good results.

NTP uses the WHO standardized recording and reporting formats for case notifications and reporting on treatment outcomes throughout the country on a quarterly basis, although it is noted that the formats do not incorporate the most recent revisions recommended by the WHO. These quarterly reports are compiled to prepare the NTP’s annual report on patients notified and treated. New smear-positives, relapses, failures, treatments after default, others (comprising the group of retreatment patients who do not fit into the relapse, failure or treatment after default categories), smear-negative and extrapulmonary patients detected are notified through this system. Treatment outcomes are reported as cured, completed, defaulted, failures, deaths, and transferred out as internationally recommended.

The county/district level TB section should report to PTPI by the fifth of the first month of the next quarter and PTPI to CTPI by the tenth of the first month of the next quarter. Supply and management of anti-TB drugs is performed through the medical warehouses within the department of drugs and pharmaceuticals under MoPH. Reports on anti-TB drugs flow through the system from peripheral to central level. Similar to other reports, the report on anti-TB drugs should be submitted from cMW to PMW by the fifth of the first month of the next quarter and from PMW to CMW by the tenth of the first month of the next quarter.
**Challenges**

- Although data reporting and compilation is presently of good quality, it is completely done manually through paper-based formats which are transported to the above level at fixed times. There may be delays, missed formats and incorrect data which are likely to lead to poor reports and data.

- Although data is computerized at some provincial levels; it is very basic in word or excel file formats.

- Intranet web-based system is available within the country, but is not utilized for TB recording and reporting.

- Capacity and competency of the M&E staff at various levels in computer-based data management is unknown.

- Computers and other required equipment for recording and reporting are available at provincial levels in the PTPI.

**Recommendations**

(1) NTP should plan to use an appropriate health management information system for TB data management; introduce a comprehensive, integrated electronic information system, possibly starting with PMDT which links NRL and RRL, treatment centres, drug storage units, reporting units and the central unit of NTP at the earliest. It must be explored whether the local intranet system or software such as e-TB Manager system, could be adapted to undertake this function. (In 12 months)

(2) A DR-TB registry should be introduced in all counties/districts – this will serve as a record of MDR-TB suspects, a "waiting list" of confirmed patients awaiting SLD treatment, and will enable the tracking of all diagnosed DR-TB patients in three months.

(3) All relevant R&R staff should be trained in data management using computerized systems.
4.7 Partner collaboration and coordination

Progress

The three major partners collaborating on the GF TB grant are: the national government, UNICEF and WHO. The same agencies collaborate on the malaria grant, but with a different government department. While WHO has worked to support NTP for over 15 years, UNICEF is relatively new to this area, having taken on principal recipient status for GF support, since it began in 2010. Both UN agencies maintain extensive collaboration with government in other areas of health and development.

Three international organizations have also supported the national TB programme: one academic (Stanford University) and two nongovernmental (the Eugene Bell Foundation [EBF] and Christian Friends of Korea [CFK]). Other development partners maintain a presence in the country and support the health sector, but do not contribute to the TB programme.

UNICEF and WHO report close and effective cooperation in their support for NTP, based on agreed separation of roles and responsibilities, carefully developed annual plans and regular consultation with a PMU set up for grant management by the MoPH. The rough breakdown of the GF allocation is 70% to UNICEF (largely for supplies, including medicines and diagnostic equipment) and 30% to WHO for technical assistance and training in partnership with NTP. The United Nations Office for Project Services (UNOPS) is the local fund agent of GF and has in-country presence.

The UNICEF-WHO-NTP partnership arrangement has worked very well for the four years of the grant, and is anticipated to continue if new GF resources are made available to the Democratic People’s Republic of Korea. There are several task forces related to programme administration. For example, all three partners meet on a biweekly/monthly basis to discuss procurement and other administrative issues; considerable flexibility is required to meet the
requests of government for particular specifications of equipment and vehicles, to circumvent international sanctions and to ensure efficiency. Another task force covering programme monitoring and evaluation meets quarterly to discuss progress against work plans, targets, activities, performance and new plans. There is also a fortnightly programme meeting, again of all three partners, in which the management and implementation of the grant is discussed. Quarterly field monitoring occurs with the participation of all three agencies.

**Challenges**

UNICEF’s GF support (for the TB and malaria grants) is administered by seven full-time international staff members, as well as national staff. WHO has three international staff and national staff supported by the grants. National staff are seconded from the government and given limited responsibilities. International personnel working on GF-supported activities in the country are heavily burdened with processes and activities that could normally be undertaken by locally hired staff. In addition, the heavy vetting of reports and slow release of data by NTP, lengthy negotiations on small details and formality of processes results in cumbersome programme administration.

Moreover, the availability and choice of some supplies is heavily restricted by the sanctions placed on the country by the international community. For example, procurement of the only XpertMTB/Rif devices in the country took about one year, X-ray machines had to be procured from un-established manufacturers in a neighbouring country. The functioning of the programme is now also threatened by new restrictions on bank transfers into the Democratic People’s Republic of Korea imposed by international sanctions. UN agencies cannot now import hard currency electronically. This is severely limiting the effectiveness of international partnership with the country.

Finally, there is the challenge provided by a parallel importation and drug distribution system by the EBF. There is no regular contact with this agency, and no attempt by NTP to coordinate its assistance with GF-supported activities. While official data suggest that only 200
patients have been treated for MDR-TB, JMM has learned that EBF may have provided treatment for up to 1300 patients in five provinces, including those visited during the mission.

**Recommendations**

To support partner collaboration and coordination and increase efficiency across partner agencies, NTP must coordinate with MoPH to:

1. establish long-term, full-time posts for national staff at UN agencies in the Democratic People’s Republic of Korea, to improve programme efficiency and reduce the costs associated with international staff;

2. while acknowledging the context, simplify communication between partners, approval of reports and release of data to increase donors’ sense of recipient openness;

3. request GF to identify strategies to mitigate adverse effect of international sanctions on the public health efforts of UN and partner agencies in the country; and

4. phase out the parallel importation and distribution of MDR TB drugs by EBF, and work to coordinate EBF support for other areas of TB control that could benefit from NGO partners strengths.

### 4.8 TB-HIV

**Progress and challenges**

The Central Hygiene and Anti-Epidemic Institute (CHAEI) and Provincial Hygiene and Anti-Epidemic Institutes (PHAEI) manage HIV counselling and testing in the country. A National Strategic Plan for HIV (2014–2018) is in the process of being finalized and appears to be focused mostly on prevention. There are around 50–60 000 HIV tests done in the country annually. Majority of these are for returning travellers
(nationals only) and for nationals working with foreigners (hotel and hospitality industry). For travellers, testing is done upon return from every travel while for the latter, annual testing is done. HIV testing is done as part of blood transfusion safety and in maternity services. Again the latter group is focused on pregnant women returning from overseas travel (as reported during the facility visits). No HIV infected person has been reported till date in the country among the nationals. None of the teams visiting various health facilities could get any information on HIV testing happening in the TB centres.

HIV testing algorithm used at the CHAEI is Assay 1 – colloidal gold; Assay 2 – Elisa; Assay 3 – Western blot. Reportedly, assay 1 is done at the provincial levels and any suspected samples are then sent to the central lab for confirmation. CHAEI tests around 50-60 000 samples for Assay 1 annually; around 2000 are put through assay 2 and about 18–20 through assay 3.

It was reported that HIV testing is offered to uniformed personnel but no details were made available. In prison settings, testing is reportedly offered and done. It was reported that the prison doctor draws the blood samples and sends them to the provincial or central institute for testing. At the blood services, the HIV testing is part of blood safety.

It seems no detailed analysis of HIV tests performed in the country is done. It would be useful to have testing data analysed by age groups, gender, and population groups. It was conveyed to JMM that the PHAEI staff visits TB centres for offering HIV testing to TB patients, but this was not corroborated during the visits to the TB centres.

**Situation of STI and hepatitis in the country**

STI patients have been reported in the country. Male patients get STI services from the dermatology departments, while female patients are referred to the maternity services. The STI patients are offered HIV testing, but there is no information on how many actually take the test.
Prevention services for STI/HIV are not very clear. Condom use is recommended, but no specific information could be obtained.

The country has a high prevalence of hepatitis B – 12% reported in the sero-prevalence estimates by WHO. Since 2005, the hepatitis B routine vaccination has been strengthened and the birth dose of hepatitis B has been introduced. Within one year of introduction, the hepatitis B zero dose coverage increased to 27–98%. UNICEF supplies the hepatitis B vaccine; when there are shortages, locally made vaccine is used. (National Hepatitis Strategy 2009–2013)

**Recommendations**

Given the situation where we do not have any reported case of HIV in the country, the activities need to focus on prevention. The entry points (apart from those done currently) for expanding HIV diagnosis in the programme settings could include:

- HIV testing and counselling in:
  - TB services
  - maternity services - pregnant women
  - STI services - patients including partner testing
  - hepatitis B and C patients presenting at the hepatology units.
Clients for HIV testing would include:

- TB patients who are identified to be ‘at risk’ for HIV co-infection
- pregnant women with history of vaginal discharge and regular partners of these women
- males presenting with STI and their partners.

The package of services should include:

- **Counselling (pre and post-test)** – basic information on HIV; factors facilitating transmission; HIV testing; symptoms of STI and where to go for diagnosis and treatment; condom use and safe sex; blood transfusion and injection safety. For pregnant women – information on mother-to-child transmission and prevention of the same; partner testing, especially for those with STI.

- **HIV testing** – the current algorithm is cumbersome and requires laboratory support. For expanding HIV testing services, HIV diagnostics need to be simplified and decentralized. Currently, cases needing verification after the first assay are sent to the central laboratory. The feasibility of using rapid testing algorithms that can be done in the periphery should be explored. This would of course depend on the relative cost-effectiveness of the alternative algorithm. Quality assurance of laboratory tests including validation of the testing algorithms is needed.

- **Identifying risk groups** - the concept of high-risk groups is limited only to travellers and those working with foreigners. This may be restrictive in focusing the testing. HIV-infected persons are at risk for TB and vice-versa. There was no data analysis available on the HIV tests performed in the country. With this caveat, it is possible that many people are retested at frequent intervals. There is a need for a retesting policy for returning travellers. An HIV test, even if one were to acquire it while travelling to another country, would become positive.
only after two months, as all the tests used are antibody tests. For people travelling frequently, perhaps a policy on testing once every six months would be more effective than after every visit outside the country.

- **Ensuring privacy and confidentiality** - HIV is associated with stigma and discrimination and with no reported patients, this could be a greater challenge in the country. It is important that apart from privacy and confidentiality, sufficient safeguards are ensured for patient protection while expanding testing in services for diseases like TB, which itself is a stigmatizing disease.

- **Surveillance** - While the country has no documented case of HIV till date, there are risk factors; and border areas where there is migration pose a challenge. It is important that there is robust surveillance for HIV. Imparting information to communities on the risk factors and reinforcing safe sex behaviours, use of condoms for prevention of STI along with timely diagnosis and management of STI constitute combination prevention for STI/HIV. There are important opportunities for expanding IEC aside of health services. People gather in public libraries and for community service. These places can be used for providing information on HIV prevention in a non-threatening manner.

### 4.9 Programmatic management of drug-resistant TB (PMDT)

**Progress**

As of May 2014, there is no direct nationwide DRS survey data available for the Democratic People’s Republic of Korea. In 2010–2011, a high level of rifampicin and isoniazid resistance was observed in a conveniently sampled group of Category II failure patients. From modelling undertaken by WHO using data from the SEA Region, it was estimated that the level of MDR-TB in new patients was 2.2% and in
previously treated patients 14.7%. This approximates to an estimated ~3900 patients of MDR-TB developing per year in the country.

A national DRS survey had been proposed to be conducted using GF Round 8 support, with WHO technical assistance. In September 2011, it was agreed that a national DRS survey was not feasible considering the laboratory and resource constraints. As an alternative, it was therefore proposed that a smaller representative DRS survey in Pyongyang City (population around 3.1 million) would be conducted in Spring 2012. From this smaller survey, it was hoped that a limited set of representative DRS data would be available to the country. However, as NTRL was not accredited, this survey was not conducted. With the availability of XpertMTB/Rif in 2013 and as per the recommendation of the September 2012 Green Light Committee (GLC) mission, a small scale, rapid DRS survey was conducted in 13 counties of North Hwanghae Province in late 2013 with technical support from WHO. A total of 362 consecutive new SS+ and 98 SS+ previously treated PTB patients were enrolled in the survey and tested using Xpert MTB/Rif. Rifampicin resistance was detected in 2.2% (n=8) and 16.3% (n=16) of new and previously treated smear-positive PTB patients. These figures are in line with the figures derived from the earlier WHO modelling exercise, and the estimates of patients developing MDR-TB annually amongst notified smear-positive PTB patients remain approximately the same i.e. around 3900.

NTP developed the first draft of an “Expansion plan for Programmatic management of drug-resistant TB (PMDT) in the Democratic People’s Republic of Korea” in 2011, and in 2012, the PMDT guidelines were finalized after wide consultation with stakeholders and expert review. The expansion plan was revised in 2013; its goal being to provide universal access to diagnosis and treatment for all DR-TB patients as per the WHO established norms and standards so as to contribute to the overall goal of elimination of TB as a public health problem in the Democratic People’s Republic of Korea.

Effective June 2012, NTP introduced PMDT services into Pyongyang City, with two treatment sites based at two sanatoria in Pyongyang City supported by the GF Round 8 funding. By the end of
2012, the first annual cohort of 50 MDR-TB patients had been enrolled on treatment. Under the GF Round 8 Phase II from June 2012 to June 2015, it was planned that a further 500 MDR-TB patients in total were to be treated, three laboratories were to be established to provide diagnostic and follow-up capacity (NTRL and two provincial laboratories), and treatment provided via 26 treatment sites. The plan was to enrol 120 patients between July 2012 and June 2013, 130 between July 2013 and June 2014, and 250 between July 2014 and June 2015. In June 2013, 120 patients were enrolled on treatment, and a further 50 patients in December 2013 as GF supported SLD became available in-country. At present, there are 10 supported treatment sites (at eight sanatoria in Pyongyang City and two in North Hwanghae province). To date, a total of 220 MDR-TB patients have been enrolled on SLD treatment under programmatic conditions. However, the scale-up of services is slow, and to date, NTRL has not yet become consistently proficient to diagnose MDR-TB patients, and establishment of the first Provincial culture/drug sensitivity testing (C/DST) laboratory in the South Hamgyong PTPI (at Hamhung City) has made limited progress.

In the NTP PMDT Guidelines, four “high MDR-TB risk” groups of patients are prioritized for the identification of MDR-TB suspects under the GF project, namely:

1. patients who fail a Category II treatment (i.e. a “chronic” case);
2. close contacts of known MDR-TB patients, who develop symptoms of TB disease;
3. treatment failure with an unknown regimen (from departments outside of the NTP); and
4. patients who fail a Category I treatment.

As the capacity to diagnose and manage MDR-TB patients increases, it is planned to expand the criteria to include all retreatment patients, with the ultimate goal of testing all SS+ PTB patients for DR. Since all TB patients are monitored at the TB sections of the
county/district hospitals, the identification of suspects for MDR-TB is done there. All such patients are to be referred by the county/district hospital to their respective TB sanatorium, along with the patient’s complete history including details of TB drugs intake. The sanatorium PMDT committee, along with specialists from the linked hospital, will take appropriate decision on referral for sputum examination and enrolment as per the national guidelines. The sanatorium will inform their respective PTPI, which will then arrange for sputum collection from the suspect patient. PTPI will also arrange for sending the sputum sample under appropriate conditions to the respective culture and DST laboratory.

However, during the JMM field visits, it was observed that in practice, only patients who were failures of Category II treatment were being tested. In addition, the practice of admitting MDR-TB suspects to the sanatoria varied across the sites visited. In some sites, the Category II failure patients that had been identified as MDR-TB suspects were being allowed the option of remaining at home. Wherever the patient was residing whilst awaiting their C/DST result, treatment comprised Koryo medicine and allopathic symptomatic treatment. There is no record of what happens to these patients. The sputum samples for C/DST were being collected from patients during the monthly visit of NTRL team to those sanatoria, which are providing MDR-TB services (10). In 2013, diagnosis has been made at NTRL and treatment initiated based on the C/DST results of NTRL. Prior to this, treatment was only initiated after confirmation of the C/DST result by SNRL at Hong Kong. A number of the last cohort of MDR-TB (i.e. those started on SLD treatment in December 2013) had their treatment initiated based on the rifampicin-resistant result from testing by XpertMTB/Rif, and with a confirmatory C/DST being set up subsequently.

Currently, there is ongoing parallel management of MDR-TB patients supported by EBF. The JMM learnt that EBF has possibly enrolled around 1300 MDR-TB patients on treatment since 2008.

There appears to be an overlap between the MDR-TB activities of EBF (model 1) and the GF-supported PMDT activities (model 2). Although full information was not made available to JMM, it appears
that EBF supports the management of MDR-TB patients in 12 sites across five provinces. It was unclear to JMM on what basis patients were being identified as an “MDR-TB suspect” under EBF support. It was informed that EBF team visits the country every six months during which time they diagnose patients from those listed by the sanatoriums supported by it. Earlier treatment with SLD was started based on clinical history and evaluation. From 2013, EBF has been enrolling patients on SLD based on XpertMTB/Rif results using the system they bring in with them and take out while leaving. EBF brings in SLD, ancillary drugs for management of adverse effect to SLD, and other support for patient care and laboratory. They also conduct on-site training of sanatorium staff on the management of MDR-TB patients.

Having two parallel different models of care creates complex managerial challenges for the implementation of PMDT across the country. From the 2012 Annual Report of the EBF11, it appears that they plan to enrol 50–60 patients annually in each centre with the overall objective of enrolling about 500 MDR TB patients annually into their project.

Within the PMDT activities of NTP, a standardized MDR-TB regimen, based on WHO recommendations, is used by NTP. The regimen consists of kanamycin, levofloxacin, cycloserine, ethionamide and pyrazinamide for 8–10 months, with dosages based on body weight, followed by 12 to 14 months of levofloxacin, ethionamide, cycloserine, and pyrazinamide.

Currently, MDR-TB patients stay in the respective sanatoria for the full 20–24 months of treatment. In-patients who deteriorate or have clinical conditions requiring specialized treatment, will be referred to the linked hospital or the respective PTPI as the situation warrants. As had been noted by previous missions, in the GF-supported MDR-TB regimen, amikacin was being used as the second line injectable agent in place of kanamycin. Hence the intensive phase (IP) actually being used was 8–10 Am Lfx Eto Cs Z, with pyridoxine throughout. Duration of the

IP is based on time to culture conversion. It is reported that the regimen being provided to patients under EBF is for 20–24 months durations with sodium PAS included in addition to Am Lfx Cs Pto (in place of Eto) Z.

The progress of patients is monitored via monthly smear examination at the sanatorium laboratory and culture at NTRL. Recording of the culture results in the patients' treatment cards and the MDR–TB registers appeared to be delayed. There does not appear to be a policy of when a sample needs to be taken for SL DST in patients who appear to be failing treatment. As yet, there is no in–country SL DST capacity and any such sample will need to be sent to SNRL in Hong Kong for said test. However, two patients in the Moranbong District Sanatorium remain culture positive after 10 months of SLD treatment, and hence require SL DST being done as soon as possible.

There have been no reported stock-outs of SLD, and at the two sanatoria visited, there were sufficient SLD in stock to continue treatment for those patients who have already started treatment as long as the next tranche of SLD arrives in the coming months as anticipated. However, it should be noted that due to limited supplies of SLD that have been available to the NTP to date, distribution to the selected sanatoria has been on a "push system" i.e. when SLD arrive in the country, a certain amount of SLD (pre–determined at the central level) are allocated and supplied to the respective sanatoria for a pre–determined number of patients. The SLD under GF are supplied via GDF, and hence the drugs are procured according to WHO and GF quality assurance procedures and standards. The source, and hence quality, of SLD supplied by EBF are unknown to the mission.

Adequate ancillary drugs were seen in Moranbong sanatorium during the visit of JMM team – this sanatorium was included in the first group of sanatoria where PMDT services were provided by NTP. However, there were no ancillary drugs available in Songrim City sanatorium, which was in the second group of sanatoria to provide PMDT services. Despite this, and as expected many ADR being reported, no patient has as yet had to have their treatment stopped or any of their SLD being stopped and/or changed. The staff appeared to be
generally taking the appropriate steps when ADR occur. But a number of patients had suffered hearing loss during their treatment with the SL injectible drug, and it was not clear whether any baseline hearing assessment had been performed. Nor was it clear what action the staff had taken to reduce the incidence of hearing damage due to second line injectible use.

In 2013, a total of 170 MDR-TB patients had been enrolled onto treatment with GF support. However, although almost keeping pace with the targets and available resources included in the developed PMDT expansion plan, this was less than 5% of the estimated MDR-TB patients existing amongst the notified patients in the country. As yet, no final treatment outcomes are available for patients treated via GF support. Culture conversion at 12 months in the initial 50 patient cohort was reported as 86%. During the field visits, it was reported to the mission that treatment success under the EBF support varied between 57 — 75%, and was seemingly declining in two out of three sites. However, actual patient numbers and details were unavailable, and the definition of "success" is unknown. There is currently no policy of following MDR-TB patients after treatment completion.

Records in relation to clinical and drug management were well kept. However the reports for PMDT activities are not included in the routine NTP reporting system, partly as the treatment site is based in the sanatoria and not in the usual county/district level-reporting site i.e. the TB section in the respective county/district hospital. In one site, it appeared that NTRL and not the sanatoria were preparing the interim and final outcome reports. All records and reports related to PMDT activities (outside of NTRL) are paper based.

The 2013-revised PMDT expansion plan included timelines for scale-up as shown in the following Tables 4 and 5. The plan envisages that by 2018, all provinces would be covered by PMDT services, five C/DST laboratories would be functioning, with LPA and XpertMTB/Rif available at multiple levels, to enable NTP to detect and enrol on SLD treatment 3000 MDR-TB patients per year.
### Table 4: Geographical expansion of PMDT services

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<td>3</td>
<td>6</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Pyongyang</td>
<td>Pyongyang</td>
<td>South Hamgyong</td>
<td>Rason Kangwon</td>
<td>North Hwanghae North and South Pyongan</td>
<td>South Hwanghae Nampho Jagang</td>
<td>All covered</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>9</td>
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<td>12</td>
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<td>Counties covered</td>
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<td>66</td>
<td>96</td>
<td>163</td>
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<td>208</td>
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<tr>
<td>DR-TB patients enrolment</td>
<td>50</td>
<td>120</td>
<td>130</td>
<td>250</td>
<td>1000</td>
<td>2500</td>
<td>3000</td>
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</table>

### Table 5: Expansion of laboratory services

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
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<tbody>
<tr>
<td>Expected number of cultures</td>
<td>2800</td>
<td>5000</td>
<td>8000</td>
<td>15 000</td>
<td>30 000</td>
<td>50 000</td>
<td>60 000</td>
</tr>
<tr>
<td>C/DST laboratories</td>
<td>1 (NRL)</td>
<td>1 (NRL)</td>
<td>2 (NRL + RRL)</td>
<td>3 (NRL + 2 RRL)</td>
<td>4 (NRL + 3 RRL)</td>
<td>5 (NRL + 4 RRL)</td>
<td>5 (NRL + 4 RRL)</td>
</tr>
<tr>
<td>LPA</td>
<td>NA</td>
<td>1 (NRL)</td>
<td>1 (NRL)</td>
<td>1 (NRL)</td>
<td>3 (NRL + 2 RRL)</td>
<td>3 (NRL + 2 RRL)</td>
<td>5 (NRL + 4 RRL)</td>
</tr>
<tr>
<td>Xpert MTB/RIF*</td>
<td>NA</td>
<td>1 (NRL)</td>
<td>2 (NRL + RRL)</td>
<td>3 (NRL + 2 RRL)</td>
<td>13 (NRL + 1 per province)</td>
<td>25 (NRL + 2 per province)</td>
<td>37 (NRL + 3 per province)</td>
</tr>
</tbody>
</table>
* Location of Xpert MTB/Rif within province may be at PTPI and the TB Section laboratory of the county/district hospital where the PMDT sanatorium is actually located, as most of the screening for DR-TB will be done at the county/district hospital or at PTPI.

**Challenges**

- no nationally representative DRS data available;
- considering the actual MDR-TB burden in the country, expansion of PMDT services is slow and linked to available funding, diagnostic capacity, SLD supply, human resources to manage MDR-TB patients, infection control measures;
- to date, no consistently proficient culture and first-line drug sensitivity testing (FL DST) laboratory available in-country;
- varied practices in relation to admission of MDR-TB suspects to sanatoria and no tracking system for the identified MDR-TB suspects in place;
- two parallel models for diagnosis, treatment and care for MDR-TB patients currently being implemented in different areas of the country;
- patients remain in sanatoria for full 20–24 months of treatment;
- cultures done monthly for follow-up with implications for workload on the laboratory;
- NRL does not have proficient capacity to conduct second-line DST, and also the PMDT guidelines do not include agreed XDR TB regimen
- drugs for XDR-TB patients unavailable and ancillary drugs supply is not uniform;
- apparent high incidence of hearing loss due to SL injectables;
- PMDT-related activities not included in routine NTP reporting system, recording and reporting all paper based; and
- ambitious scale-up plan, currently unfunded.
**Recommendations**

The following recommendations reflect the findings and challenges listed above:

1. Establish a standardized policy in relation to the admission of MDR-TB suspects to the sanatoria;

2. No need to routinely admit new or previously treated SS+ patients to the sanatoria unless medically indicated;

3. Any drug-susceptible smear-positive patients admitted to the sanatoria, should be discharged to ambulatory care once smear converted or at the intensive phase whichever occurs first; (in 3–6 months, links with recommendation in section 5.3);

4. Strengthen sputum collection and sample transportation network from the selected PMDT sanatoria to the NTRL for C/DST. (in 3–6 months);

5. Data and lessons learnt from treatment of MDR-TB patients supported by EBF needs to be shared to inform future policy and guideline development. (Immediately); and NTP to consider organizing a meeting of all partners to discuss future expansion of PMDT services in the country; (within next 3–6 months)

6. Standardization of management practices for all MDR-TB patients treated under the NTP PMDT guidelines (regimen, follow-up schedule, etc), irrespective of source of support; (Within the next 4–6 months, links with recommendation in section 5.7)

7. Consider discharging MDR-TB patients from sanatoria to ambulatory care once culture converted if medical condition allows and continue to provide to patient at their home, the same additional social benefits as provided to the patient during their in-patient stay; (In 3–6 months)
(8) Consider dropping the culture examinations at months 1 and 2, and performing cultures every two months in the CP rather than monthly as recommended by previous GLC monitoring missions and laboratory strengthening missions and based on required laboratory capacity; (In 3–6 months);

(9) Develop guidelines on the management and treatment regimen of XDR-TB patients, and ensure adequate drugs are procured for both XDR-TB and poly-drug resistant TB (PDR-TB) patients;

(10) Strengthen the pharmacovigilance systems across all sites where M/XDR-TB patients are treated in six months and also ensure adequate supply of drugs for ADR treatment, and staff training to undertake ADR management in three months;

(11) Adopt and implement a strategy of "zero hearing loss" from MDR-TB treatment;

(12) Integrate the reporting on PMDT-related activities into the routine NTP reporting system; (in six months)

(13) Explore shorter regimens including newer drugs in an operational research model under advice from the WHO as appropriate; and

(14) Review and revise the current PMDT expansion plan and NSP to accelerate expansion of services in order to achieve universal access to MDR-TB diagnosis and management by 2018.

Based on previous experiences, NTP should aim to be able to diagnose, enrol on treatment and follow up at least 1000 patients in 2017. By the end of 2018, the network of diagnostic and management services should be in place to achieve universal access, and enrol 3000 MDR-TB patients in 2019. (Review and revise expansion plan within six months)
4.10 Involving all care providers

**Progress**

NTP is responsible for providing all TB care and control services through MoPH in the country. The country does not have any private sector that can provide TB care services. Other governmental sectors that provide health care to workers include the railways, industries and armed forces. NTP has established coordination with these sectors so that uniform TB care can be provided to the beneficiaries. As already mentioned elsewhere, a few international NGOs involved in supporting TB care at sanatorium, MDR-TB services and NTRL are: EBF, CFK and Stanford University. EBF provides diagnostic and treatment services for MDR-TB patients at 12 sites, but their contribution and patient data is not available. CFK and Stanford University have been involved in providing technical support for maintenance of NTRL and sanatoria with infrastructure, nutrition, water and electricity supply.

**Challenges**

The following challenges are encountered:

- very limited involvement of NGOs and other sectors;
- sharing of data and reports among and across NGOs, implementing partners and NTP is limited; and
- civil society and local NGOs engagement is limited due to low technical and financial capacity.

**Recommendations**

1. All NGOs and other organizations involved in TB care and control should be trained as per the national TB guidelines.

2. All NGOs must strictly adhere to the NTP guidelines in TB services and report to the NTP.
(3) Sharing of routine programmatic data and other information between the NTP and the NGOs need to be regularized.

(4) NTP should explore areas of collaboration with other iNGOs, local NGOs and community-based organizations to develop a comprehensive community engagement plan for TB control for long-term TB control goals. This must be part of the NSP and must be clearly elaborated therein.

4.11 Contributing to health system strengthening (HSS)

NTP is a quintessentially vertical set of activities implemented by staff dedicated to TB prevention, diagnosis and management from national to community level. If all health programmes had such excellent penetration and provided routine care with the claimed rates of success, then the model demonstrated by this country would be one to emulate indeed, if it was sustainable, affordable and efficient.

NTP manages the policy, governance, financing, human resource, information, clinical and laboratory components of the programme, and also coordinates the supply of diagnostic equipment, and medicines, with the MoPH Department of Pharmaceuticals. The hierarchy headed by NTP continues through national, province, county- and city-level TB preventive institutes, and these bodies also oversee these various programme components.

To the extent that specialist clinicians (paediatricians, respiratory physicians, women’s health specialists) are involved in TB patient management, there is overlap of the TB programme with other health services, but this is the exception to the rule above grass-roots level. While the vertical programmes do become integrated at the most basic level, in essence, NTP functions independently of other health activities and does not contribute substantively to HSS.
**Challenges**

NTP has a staff cohort of many thousands working at the TB institutes and treatment facilities at each level. Prevention, diagnosis, clinical management, supervision, logistics and reporting are almost entirely TB-specific. Accounts varied as to whether the ri/dong doctors who oversee TB clinical care participate in other clinical activities. If not, then almost 20% of the nation’s frontline health human resources are dedicated to TB alone, which is clearly excessive. In any case, the inefficiency of having a contained, vertical programme for a relatively uncommon disease, implemented by such a large number of dedicated personnel is likely to be unsustainable. Even if only those staff working in the TB sanatoria were partly freed up for other programmes, it would potentially improve those programmes.

JMM did not attempt to assess any other programmes in the country’s health sector, but United Nations agencies personnel based in Pyongyang indicated that most are also implemented vertically, and are desperately short of resources to the extent that other programmes are: lacking trained personnel, equipment, or reporting capacity; implemented with poor quality, or relatively unsupervised. The TB programme or its resources could be tapped for HSS through expanded engagement in other areas. Such programmes include maternal, newborn and child health; community nutrition screening and supplementation; safe water, sanitation and hygiene; child vaccination; tobacco control; cancer screening; noncommunicable disease prevention and management; adolescent engagement and care; promotion of ways to improve indoor air quality; sexually transmitted disease prevention, screening and management; promotion of health literacy and community mental health care. This shift towards a more horizontal approach would, of necessity, require a major reallocation of personnel responsibilities, alignment of programme logistics and timing, and a lot of training. It would need to be informed by detailed analysis of the potential for efficiency gains, and require visionary leadership at the highest levels, technical support, major new funding and reassurance of staff at all levels that changes will benefit them and the country in the long term.
External to, but impacting the health system, the overall environment for the health sector has a major impact on TB and other programmes. The obvious challenges are the breakdown of piped water systems and inconsistency of power supplies for many health facilities, lack of transport, poor road conditions, inadequate heating, lack of nursing staff, and unstable economic conditions due to current priorities for use of domestic resources and international influences. These challenges cannot be overcome by the TB programme, but again highlight the need for improved efficiency across the health system, the importance of programme integration and potential benefit of major reform.

**Recommendations**

(1) Given the exemplary personnel, communications, training and supervision network maintained by the TB programme and the financing available to it, ways to use these resources to benefit less well-supported activities and address the new global recommendation to integrate TB control with other health programmes should be devised. For example, childhood under-nutrition, high rates of smoking, and the growing burden of noncommunicable diseases, prioritization of these areas for support using TB programme resources including TB staff should be considered.

(2) A high-level national commission should be established with international support to undertake a comprehensive review of the health system and recommend reforms aimed at improving the efficiency, flexibility and affordability of preventive and clinical care across programmes and across the life cycle.

(3) Measures to improve environmental and social determinants of health that contribute to TB and poor health, by increased prioritization of health for domestic spending should be advocated for.
4.12 Infection control

**Progress**

Infection control (IC) measures were observed to be of varied standards across the different sites that were visited by the JMM teams. Personal hygiene and cleanliness of facilities, albeit basic, were practised within the limitations of the water supply etc. In general, the health facilities at the county/district and ri/dong levels fortunately had fairly good natural ventilation. However, there is no policy for fast tracking/triage\(^{12}\) of MDR-TB suspects at the county/district hospitals after they have been referred from the ri/dong clinics. Hence the MDR-TB suspects may sit in the same waiting room as all other TB suspects and patients, and await their turn to be seen by the doctors.

However, the JMM teams saw no evidence of IC guidelines or plans at facilities visited other than the MDR-TB sites. General staff awareness of IC issues at the county/district and ri/dong levels appeared limited. Also, although personal protection measures (e.g. N95 respirator masks) were available for staff at the NTRL and the two sanatoria visited, they were not available to staff in the other facilities visited. In addition, there is no regular occupational health screening programmes for the health-care workers in place, bar when a staff member becomes symptomatic.

The safety practices at NTRL were adequate. Staff were aware of biohazards, and exercised appropriate precautions. Safety equipment such as biological safety cabinets, centrifuges with lidded buckets, and autoclaves were available. The performance of the safety equipment was regularly monitored, but preventive maintenance (such as replacement of the HEPA filters of BSC) and corrective maintenance were not readily available. Personal protective equipment was appropriately used, including N95 masks, for procedures involving

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\(^{12}\) Fast tracking or triage in this context refers to the sorting of patients (as in an emergency room) according to the urgency of their need for care: hence the prompt identification of people with TB symptoms (triage), separate infectious from non–infectious patients, control the spread of pathogens (cough etiquette and respiratory hygiene), and minimize time TB patient spend in health-care facilities.
manipulation of TB cultures. The procedures at the smear microscopy laboratories in relation to IC were probably adequate within the limitations placed on the laboratories related to water supplies etc. Sputum collection was generally done outside of the TB Section in the open areas of the hospitals.

As noted in the PMDT Chapter, the practices for admission to the sanatoria related to new and re-treatment smear-positive (Category II) patients, and MDR-TB suspects varied across the sites visited. In relation to the non-MDR-TB patients, this ranged from almost all of these patients being admitted to the sanatoria in one instance versus only the re-treatment patients being admitted in the other. For all patients admitted to a sanatorium, in principle, the patient is discharged to ambulatory care once they have smear converted. However, patients may choose to remain longer in the hospital even after smear conversion. In some sites, rather than being admitted to the sanatoria, patients identified as MDR-TB suspects by NTP failing the Category II re-treatment regimen were allowed the option of remaining at home. Wherever the patients were residing whilst awaiting their C/DST results, their treatment comprised Koryo medicine and allopathic symptomatic treatment. In two of the sanatoria visited by the Mission, MDR-TB patients were physically separated from the drug susceptible patients.

The earlier design of the patient rooms at the sanatoria present many challenges in relation to the provision of adequate IC measures, especially during the winter months. During warm days, the patients can remain outside for much of the time and adequate ventilation can be maintained if the room window and front door are left open.

Sanatoria staff were issued with N95 respirator masks. Patients were issued with surgical masks to be worn when required.

**Challenges**

- IC guidelines or plans unavailable;
- no policy for fast-tracking/triage of MDR-TB suspects at county/district hospitals;
no regular occupational health-screening programme for the health-care workers;

- variable practices for admission of patients to the sanatoria;
- inadequate IC measures in current sanatoria infrastructure;
- non-availability of regular preventive maintenance programme for laboratory safety equipment and readily accessible corrective maintenance services in NTRL; and
- varied availability of personal protection equipment.

**Recommendations**

1. IC guidelines should be developed and finalized, widely disseminated and relevant staff trained on IC. (in 6–9 months)

2. Policy of fast tracking/triage of MDR-TB suspects at county/district hospitals should be developed and implemented. (in three months)

3. Programme for regular occupational health screening of the health workers, in particular related to TB, for those workers who deal with TB patients, to be implemented. (in six months)

4. A DR-TB registry should be introduced in all counties/districts – this will serve as a record of MDR-TB suspects, a "waiting list" of confirmed patients awaiting SLD treatment, and will enable the tracking of all diagnosed DR-TB patients. (in three months) (link to recommendation in section 5.6)

5. A standardized policy should be established for admission of new or previously treated SS+ patients and MDR-TB suspects to the sanatoria. There is no need to routinely admit new or previously treated SS+ patients to the sanatoria unless medically indicated. If any drug-susceptible SS+ patients are admitted to the sanatoria, they should be discharged to ambulatory care once smear converted or at the intensive
phase whichever occurs first. (in 3-6 months) (Link to recommendations in sections 5.3 and 5.9)

(6) As a priority, a further detailed review of the IC practices at all sanatoria where PMDT services should be provided needs to be conducted. (In the next 4–6 months).

(7) Required renovations should be undertaken to the in-patient rooms within budgetary availability, including the improvement of the heating facilities. (in the next six months)

(8) It must be ensured that all staff dealing with infectious TB patients are provided with N95 respirator masks. With due care by the respective staff member, these masks could be changed on a weekly or two weekly basis. (in 3–6 months)

(9) Laboratory safety equipment items must have regular preventive and corrective maintenance servicing (link to recommendations in section 5.2).

### 4.13 Human resource development

#### Progress

When it comes to human resources, the Democratic People’s Republic of Korea has, arguably, a well-resourced health system, with a pervasive hierarchy of personnel from the highest-level echelons to the grassroots level. The ratio of health human resources to population (7.6 per 100 000) is among the highest in the WHO South East Asia Region\(^\text{13}\), although the doctor:nurse ratio is typically high.

GF grant at NTP is administered by a PMU within the Directorate of TB and Hepatitis, itself a section of the Department of Communicable Diseases at the MoPH. Within the NTP is CTPI which has several divisions (laboratory services and diagnosis; epidemiology;

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management; drug procurement and distribution etc.) headed by technical specialists. CTPI oversees 12 provincial equivalents (PTPI), one for each province/municipality and each staffed similarly by specialists and generalists. They in turn supervise similar institutes in the nation’s 210 counties and cities (cTPI). The lowest-level facilities are the ri (rural) or dong (urban) clinics, which number approximately 6500 across the nation and are staffed by around five doctors and additional allied health workers, each responsible for overseeing the health of around 130 nearby households. There are also ~1500 ri hospitals which provide inpatient services for several ri clinics located far from the county hospital. TB specialists staff each of these rungs in the NTP ladder with specific training in their areas of responsibility, even at ri/dong level, where one of the doctors oversees the management of TB patients diagnosed in his or her community. In terms of personnel dedicated to TB, JMM identified no human resource needs in NTP.

Moreover, JMM was informed that basic and refresher training of TB personnel at all levels occurs, using materials developed with WHO support. The programme is also supported by a regular system of hierarchical supervision (formally on a quarterly or biannual basis from national to province, province to county and county to ri/dong levels, and informally at the lowest level every month). Supervision includes the use of checklists and provision of feedback on both programme management and clinical issues. The capacity to conduct supervision has been markedly improved with GF grant support.

All doctors receive six years of basic training after their primary and secondary education (formerly ten years, now 12). Some go on to receive specialist training, but those destined for grass-roots community service return to their place of origin upon completion of their degree.

Globally, the biggest problem in the area of human health resources is maintaining a rural health workforce. The Democratic People’s Republic of Korea has overcome this by selecting and training

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individuals from each community and redeploying them to the *ri/dong* clinics in their place of origin.

**Challenges**

Observers have suggested that medical training emphasizes textbook learning rather than acquisition of competency, and limited access to updated knowledge, technologies and practices\(^{15}\). This resonates with the JMM’s observations on the very poor standard of diagnostic equipment (x-ray machines, microscopes), lack of access to modern communication, the very basic standard of clinical care and the limited ability of staff to participate in quality assurance or remote learning activities. For routine management of PTB, the existing staffing is excellent; for investigation of MDR, management of complicated patients, difficult decisions on prophylaxis and other clinical or public health considerations that are not routine, the situation most likely relies on a high degree of supervised care which is itself of uncertain quality and may not be sustainable.

The vertical nature of the programme also limits its flexibility, and the capacity of personnel to adapt to the changes likely to evolve as the nation moves to a more integrated health system. The recommended embedding of TB prevention, diagnosis and management in broader clinical and public health services will expose the inefficiency of having literally thousands of TB personnel with detailed knowledge of and working on only one programme, and the need to train or redeploy those personnel in new programme areas. This will be costly in the short term, but will massively improve health system efficiency and most likely the availability of TB diagnosis and treatment capacity and quality.

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**Recommendations**

(1) A limited survey of TB programme staff should be undertaken in a broad sample of locations to ascertain the knowledge and practices of TB programme staff, and their flexibility in taking up new areas of health work, should this be required in future, A local university could be entrusted to conduct this study, using a purpose-built tool and appropriate sampling techniques.

(2) An additional external review of the quality and content of both basic medical training and TB programme training at all levels should be conducted with a view to seeking additional support for improving the same.

(3) Additional training of the existing TB personnel in areas appropriate to the upgrading of the programme (such as in X-ray or microscopy using new equipment; other approaches to diagnosis using culture, gastric aspiration etc.) and changes made on the basis of the survey or integration of TB activities with other health programmes should be undertaken.

(4) Computerized capacity-building for remote learning using CDs or the Internet if possible, focusing on complicated patients and independent decision-making should be introduced.

### 4.14 Community engagement and health promotion

**Progress**

In line with and conforming with the Global TB Programme Strategy, NTP has prepared a comprehensive ACSM plan for TB care. This multiyear strategic plan adopted by NTP envisages raising community awareness about TB and its curable nature, enhancing communication with patients to improve utilization of services and of the community to promote health-seeking behaviour for earlier detection and improved
compliance to treatment. The strategic goal of the plan can be summarized as - “Citizens of Democratic People’s Republic of Korea are aware and empowered with knowledge about tuberculosis and services available for its care and cure in the country.”

NTP has reportedly established ACSM task force at the national level and sub-committees at the provincial level with representation from staff with core competencies in capacity-building and institutional strengthening, community advocacy and events, mass media production and distribution and monitoring and evaluation.

The ACSM plan includes –

- intensified training and supervision for doctors and other clinical providers to instil a culture of ‘client first’ enhanced service delivery and effective inter-personal communication;
- ACSM material production and logistics including dissemination of interpersonal communication (IPC) resources, patient charter and specific campaign themes; and
- conduct of a baseline survey to identify TB knowledge, attitudes, practices and beliefs (KAP) and related performance indicators.

A comprehensive ACSM plan guides the NTP and TB care-providers with tools to engage community and civil society groups. The NTP has been able to involve local civil society organization like Korean federation for prevention of disability, Korean Federation of Red Cross, Women’s Union, Youth League, Trade Unions and Korean Union of Agriculture workers in annual ACSM sensitization workshops. These are annual workshops conducted at provincial and county levels. The engagement is reportedly funded by GF grant.

**Challenges**

- availability of adequate technical capacity and funds for ACSM activities;
limited sensitization and involvement of community and civil society organizations for TB services;

- non-availability of simple printed material for later reference and take home messages;

- very limited use of other tools like radio, television, street plays or other culturally relevant methods; and

- non-availability of analysis and evaluation of contribution in TB control by trained and engaged civil society groups.

**Recommendations**

(1) Adequate funds to support ACSM activities should be allotted.

(2) Relevant staff of NTP from national and county levels should be trained in advocacy and community involvement.

(3) The contribution of the trained groups should be analysed and evaluated with feedback to the relevant groups for better coordination and improvement of TB services.

(4) Printed material should be developed and disseminated as take-home information for community members during community meetings.

(5) Locally available and relevant modes for awareness and education on TB control should be used.

4.15 Operational research

**Progress**

Operational research (OR) is increasingly being recognized as important for reducing the gap between knowledge and implementation, optimizing the performance of health programmes and achieving
improved health outcomes. While it appears that there is interest within NTP to pursue OR, and considerable talent within the large and relatively young health workforce, JMM was not able to review any OR that is underway within the NTP. It was also apparent that there were many programme issues that would benefit from carefully conducted operational research. Some of these issues include the work load imposed on the laboratory network due to the requirement of a third smear for diagnosing drug-sensitive TB, or the steady increase in the absolute number of relapses registered for treatment over time. Published research would also bring visibility to the success of NTP within the country and serve as documentation for mobilizing funding and attention to priority areas for investment in TB control in the country.

**Challenges**

Important challenges to implementing systematic operational research in such a programme setting include:

- lack of dedicated resources – funding and manpower to implement OR;
- limitations in capacity in developing prioritized research questions and robust protocols that can be simply implemented; data collection, collation and analysis; challenges with publishing documented research in peer reviewed journals;
- lack of a prioritized agenda for research within NTP that could provide direction to interested researchers; and
- limited collaboration with academic institutions in the country.


Recommendations

The revision of NSP provides the opportunity to make OR an important element in implementing TB control in the country and could include at the minimum the following recommendations to ensure that OR is mainstreamed into public health programming in the country:

(1) dedicated funding to OR within the next plan period;

(2) coordination with technical partners and agencies to develop a prioritized research agenda that will focus on critical programme issues and which can then serve as the framework to develop research questions and implement OR;

(3) coordination with technical partners and agencies, including academia, to systematically develop and train research capacity within the country with adequate funding which will lead to the creation of a pool of skilled resources including mentors to lead cutting edge OR within the country;

(4) establishment of a credible agency that will review all research and provide ethical approvals as appropriate;

(5) linking published research with a strategic dissemination campaign that will focus attention including funding on the identified issues; and piloting shorter treatment regimen for MDR under operational research conditions as recommended by WHO. (in 9–12 months)
Annex 1

List of reviewers

The Joint Monitoring Mission included the following members:

Dr Nevin Wilson
JMM Team Leader; Independent Consultant and TB Expert,
New Delhi, India

Dr Janice Lo
Head / Consultant Medical Microbiologist
Supra National TB Reference Laboratory, Hong Kong

Dr Razia Pendse
Scientist - HIV Prevention
WHO Regional Office for South-East Asia, New Delhi

Ms Caroline Bogren
Technical Officer- Global Drug Facility
World Health Organization
Regional Office for South-East Asia, New Delhi

Dr Akhtar Muhammed
Medical Officer (TB)
World Health Organization, Indonesia

Dr Douglas Fraser Wares
Medical Officer
World Health Organization, Geneva

Dr David Hipgrave
Senior Health Specialist
UNICEF, New York

Dr Subhash Yadav
Independent Consultant and TB Expert
New Delhi, India
Annex 2

Programme of the JMM

<table>
<thead>
<tr>
<th>First week Date</th>
<th>Programme</th>
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</table>
| 9 May (Friday)  | Arrival in Pyongyang city  
|                 | Briefing with JMM members, NTP, WHO and UNICEF at Koryo Hotel  
|                 | (Introduction of JMM participants, adopting the JMM goals and objectives, forming teams, and confirming the schedule of JMM) |
| 10 May (Saturday) | Review of NTP structure, policies, technical documents and other documents at WCO |
| 11 May (Sunday) | Continue desk review and finalize checklist for field visit as per four separate JMM field visit teams |

<table>
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<th>Second Week Date</th>
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| 12 May (Monday)  | Team 1: Visit Central TB Preventive Institute, National TB Reference Laboratory  
|                  | Team 2: Visit Pyongyang cTPI, Pyongyang city medical warehouse, TB section of Ryongsong district people’s hospital, Unha polyclinic  
|                  | Team 3: Visit Pyongyang cTPI, Pyongyang city medical warehouse, TB section of Ryongsong district people’s hospital, Unha polyclinic |
|                  | Team 4: Visit Central TB Preventive Institute, National TB Reference Laboratory |
| 13 May (Tuesday) | Team 1: S. Hwanghae, Jaeryong county  
|                | Team 2: Visit TB section of Moranbong  
|                | Team 3: Visit S. Pyongan county,  
<p>|                | Team 4: Visit Kangwon, Anbyon |</p>
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<tr>
<th>Date</th>
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<th>County</th>
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<tr>
<td>14 May (Wednesday)</td>
<td>Samjigang district, Unsan county</td>
<td>Hwasan county, Hwasan district</td>
<td>Visit N.Hwanghae PTPI, PMW, TB section of Unpa county people’s hospital, county MW, Kangan Ri hospital in North Hwanghae Province, Work at National TB reference laboratory, Songrim city TB sanatorium in N. Hwanghae province, Visit N.Pyongan PTPI, PMW, TB section of Jongju city people’s Hospital, city MW, Songnam Dong poly clinic in North Pyongan Province, Visit Central Hygiene Anti Epidemic Institute &amp; Academy of Medical science for HIV</td>
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<tr>
<td>15 May (Thursday)</td>
<td></td>
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<td>Working meeting to integrate observations from field visits and work on draft recommendations, With MoPH, WHO, UNICEF</td>
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<tr>
<td>16 May (Friday)</td>
<td></td>
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<td>Work on draft recommendations and JMM report structure, WHO office, Discuss the first draft JMM presentation with NTP key officers, Taedonggang diplomatic club</td>
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<tr>
<td>17 May (Saturday)</td>
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<td>Work to draft the JMM mission report, Koryo Hotel</td>
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<tr>
<td>18 May (Sunday)</td>
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<td>Work to draft the JMM mission report, WHO office</td>
</tr>
<tr>
<td>19 May (Monday)</td>
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<td></td>
<td>Debriefing meeting to present the finding and recommendations with all stakeholders (including CCM, Taedonggang diplomatic club, Departure of JMM members</td>
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<tr>
<td>other UN agencies and NGOs</td>
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## Composition of teams and areas of review

<table>
<thead>
<tr>
<th>Team</th>
<th>JMM members</th>
<th>Thematic areas</th>
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<tbody>
<tr>
<td>Team 1</td>
<td>Dr Nevin Charles Wilson Dr Aktar Muhammad</td>
<td>General TB control programme management including TB epidemiology, case-finding, treatment, OR, paediatric TB</td>
</tr>
<tr>
<td>Team 2</td>
<td>Dr Douglas Fraser Wares Dr Janice Lo</td>
<td>PMDT, TB laboratory network including NRL</td>
</tr>
<tr>
<td>Team 3</td>
<td>Ms Caroline Bogren Dr David Hipgrave</td>
<td>Anti-TB drugs, procurement and supply management, partner collaboration and coordination, HSS</td>
</tr>
<tr>
<td>Team 4</td>
<td>Dr Subhash Yadav Dr Razia Pendse</td>
<td>HIV, public–private mix, programme supervision, R&amp;R, surveillance system ACSM and NSP</td>
</tr>
</tbody>
</table>
Annex 3

List of people met

(Names of non-official individuals and patients met has not been recorded to maintain confidentiality)

| Name of Person        | Designation, Organization                                      |
|-----------------------|================================================================|
| **National level of National TB Control Programme**             |                                                                |
| Dr Choe Tong Chol     | Director and National Programme Manager, MoPH                  |
| Dr Ri Chan Hyok       | Vice Director, MoPH                                           |
| Dr Ri Jong Chan       | Director, CTPI                                                |
| Dr Kim Myong Chol     | Vice Director, CTPI                                           |
| Dr Choe Kum Song      | Senior Official, Dept of TB and Hepatitis, MoPH                |
| O Yong Nan            | Laboratory Section Chief, National TB Reference Laboratory    |
| Dr Pak Kwang Sam      | Laboratory Doctor, National TB Reference Laboratory           |
| Dr Kim Hyon           | TB PMU                                                        |
| Dr Ko Jin Hyok        | TB PMU                                                        |
| Dr Choe Sung Hwan     | TB PMU                                                        |
| **HIV Control Programme**                                    |                                                                |
| Dr Hwang Chol         | Chief, CHAI and HIV laboratory department                      |
| Dr Paek Un Jong       | Laboratory doctor, CHAI and HIV laboratory department          |
| Dr Han Yong Sun       | Laboratory doctor, CHAI and HIV laboratory department          |
| Dr Kim Hui Ok         | Laboratory doctor, CHAI and HIV laboratory department          |
| Dr Kang Hye Gyong     | Director, Academy of Medical Sciences                           |
| Dr Choe Yong Sik      | Chief, HIV Research Section, Academy of Medical Sciences       |
## Peripheral of National TB Control Programme

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Kim Ki Hyok</td>
<td>Director, Ryongsong District Hospital</td>
</tr>
<tr>
<td>Dr O Myong Ju</td>
<td>Chief of the District TB Section, Ryongsong District Hospital</td>
</tr>
<tr>
<td>Dr Kim In Suk</td>
<td>Director, South Hwanghae PTPI</td>
</tr>
<tr>
<td>Dr Kim Yang Ui</td>
<td>Vice Director, South Hwanghae PTPI</td>
</tr>
<tr>
<td>Dr Jong Nam Su</td>
<td>Director, Health Dept, S Hwanghae People’s Committee</td>
</tr>
<tr>
<td>Dr O Kim Yong</td>
<td>Staff of the Health Dept, S Hwanghae People’s Committee</td>
</tr>
<tr>
<td>Dr Choe Jong Ok</td>
<td>TB doctor in Unha Clinic</td>
</tr>
<tr>
<td>Dr Kim Song Ho</td>
<td>Director, Pyongyang City TPI</td>
</tr>
<tr>
<td>Dr Kim Pong Nam</td>
<td>Vice Director, Pyongyang City TPI</td>
</tr>
<tr>
<td>Dr Kim Kuk Hyon</td>
<td>Chief of Supervision Dept, Pyongyang City TPI</td>
</tr>
<tr>
<td>Dr Kim Yong Ae</td>
<td>Reporting Doctor, Pyongyang City TPI</td>
</tr>
<tr>
<td>Jo Son Hak</td>
<td>Supervisory staff of Pyongyang City TPI</td>
</tr>
<tr>
<td>Kim Guk Hyon</td>
<td>M &amp; E staff, Pyongyang City TPI</td>
</tr>
<tr>
<td>Dr Choe Myong Chan</td>
<td>Director, North Hwanghae PTPI</td>
</tr>
<tr>
<td>Dr Ri In Mo</td>
<td>Vice Director, North Hwanghae PTPI</td>
</tr>
<tr>
<td>Ok Chol Jin</td>
<td>Supervision staff, N Hwanghae PTPI</td>
</tr>
<tr>
<td>Pak Sang Hun</td>
<td>Staff of External Dept of People’s Committee, N Hwanghae</td>
</tr>
<tr>
<td>Dr Pak Yong Ho</td>
<td>Director, Jaeryong County People's Hospital, South Hwanghae</td>
</tr>
<tr>
<td>Dr Ri Myong Gi</td>
<td>Chief of TB section, Jaeryong County People's Hospital, S. Hwanghae</td>
</tr>
<tr>
<td>Dr Rim Gun Man</td>
<td>Chief of Health Section, County People's Committee, Jaeryong County</td>
</tr>
<tr>
<td>Pae Il Gwang</td>
<td>Staff of People’s Committee, Jaeryong County</td>
</tr>
<tr>
<td>Dr Gi Son Chol</td>
<td>Laboratory Tech, TB section, Jaeryong County People's Hospital, S.Hwanghae</td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
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<tr>
<td>Dr Kim Song Chol</td>
<td>Director, S Pyongan PTPI</td>
</tr>
<tr>
<td>Dr Ri Gi Chol</td>
<td>Vice Director, S Pyongan PTPI</td>
</tr>
<tr>
<td>Ri Hye Song</td>
<td>Head, Unsan County Medical Warehouse, S Pyongan</td>
</tr>
<tr>
<td>Jang Chol Su</td>
<td>Supply Officer, Unsan County Medical Warehouse, S Pyongan</td>
</tr>
<tr>
<td>Pak Yong Jin</td>
<td>Store Keeper, Unsan County Medical Warehouse, S Pyongan</td>
</tr>
<tr>
<td>Jo Hye Suk</td>
<td>Head, N. Pyongan Provincial Medical Warehouse</td>
</tr>
<tr>
<td>Ham Jong Chol</td>
<td>Supply Officer, TB and Malaria Commodities, N Pyongan</td>
</tr>
<tr>
<td>Im Sang Ryol</td>
<td>TB Statistical Doctor, S. Pyongan Provincial TB Preventive Institute</td>
</tr>
<tr>
<td>Kim Kum Chol</td>
<td>Director, Unsan County People's Hospital</td>
</tr>
<tr>
<td>Jang Hye Song</td>
<td>Chief of TB section, Unsan County People's Hospital</td>
</tr>
<tr>
<td>Ri Myong Chol</td>
<td>Director, N. Pyongan Provincial TB Preventive Institute</td>
</tr>
<tr>
<td>Kim Song</td>
<td>Section Chief, N. Pyongan Provincial TB Preventive Institute</td>
</tr>
<tr>
<td>Kim Gwang Nam</td>
<td>Statistical Doctor, N. Pyongan Provincial TB Preventive Institute</td>
</tr>
<tr>
<td>Kang Myong Il</td>
<td>Director, Jongju city People's Hospital, N. Pyongan</td>
</tr>
<tr>
<td>An Song Il</td>
<td>Chief of TB Section chief, Jongju city People's Hospital, N. Pyongan</td>
</tr>
<tr>
<td>Hyon In Chol</td>
<td>Head, Jongju City Medical Warehouse, N. Pyongan province</td>
</tr>
<tr>
<td>Ri Jong Gum</td>
<td>Supply Officer, Jongju City Medical Warehouse, N. Pyongan</td>
</tr>
<tr>
<td>Jang Hyon Su</td>
<td>Soknam Dong Polyclinic</td>
</tr>
<tr>
<td>Dr O Yong Il, Dr Han Song Guk</td>
<td>NTRL Manager and Biosafety Officer, Director, Moranbong District Hospital</td>
</tr>
<tr>
<td>Dr Jong Gyun Tal</td>
<td>Director, TB Sanatorium, Songrim City</td>
</tr>
<tr>
<td>Dr KIM Hyon Chol</td>
<td>Microscopy, Culture &amp; DST Manager, NTRL</td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
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<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Dr PAK Gwang Song</td>
<td>EQA Manager, NTRL</td>
</tr>
<tr>
<td>Dr KIM Myong Hyok</td>
<td>Doctor performing Culture/DST, NTRL</td>
</tr>
<tr>
<td>Dr Ri Hyon Rim</td>
<td>Chief, Unha Polyclinic</td>
</tr>
<tr>
<td>Dr Yun Tae Han</td>
<td>Director, Kwangwon Provincial TB preventive Institute</td>
</tr>
<tr>
<td>Dr Han Yok Ok</td>
<td>Information staff, Kwangwon Provincial TB preventive Institute</td>
</tr>
<tr>
<td>Dr Han On Jun</td>
<td>Director, Anbyon County People’s Hospital</td>
</tr>
<tr>
<td>Dr Tak Ryong Won</td>
<td>Chief of TB Section, Anbyon County People’s Hospital</td>
</tr>
<tr>
<td>Dr Ri Mun IL</td>
<td>TB Doctor, Anbyon County People’s Hospital</td>
</tr>
<tr>
<td>Dr Ri Suang Gi</td>
<td>Chief, Hwanson Ri Clinic</td>
</tr>
<tr>
<td>Dr Kim Mun Man</td>
<td>Doctor, Hwanson Ri Clinic</td>
</tr>
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## WHO and UNICEF

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>Dr Stephan Paul Jost</td>
<td>WHO Representative to the Democratic People’s Republic of Korea</td>
</tr>
<tr>
<td>Dr Partha Pratim Mandal</td>
<td>Project Manager, WHO</td>
</tr>
<tr>
<td>Dr Shushil Dev Pant</td>
<td>M&amp;E Officer, WHO</td>
</tr>
<tr>
<td>Dr O Hyang Song</td>
<td>National Officer, WHO</td>
</tr>
<tr>
<td>Dr Ri Song Gun</td>
<td>National Officer, WHO</td>
</tr>
<tr>
<td>Ms Desiree Jongsma</td>
<td>UNICEF Representative to Democratic People’s Republic of Korea</td>
</tr>
<tr>
<td>Dr Kamrul Islam</td>
<td>Chief of Health, UNICEF</td>
</tr>
<tr>
<td>Ms Joyce Bakka</td>
<td>PSM, Specialist</td>
</tr>
<tr>
<td>Mr Irfan Akhtar</td>
<td>M &amp; E Specialist, UNICEF</td>
</tr>
<tr>
<td>Ms Olga Basurmanova</td>
<td>Programme Specialist</td>
</tr>
<tr>
<td>Dr Ri Son Hui</td>
<td>National Officer, UNICEF</td>
</tr>
<tr>
<td>Dr Song Sol Ryon</td>
<td>National Officer, UNICEF</td>
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Annex 4

Map of Democratic People’s Republic of Korea
The Democratic People's Republic of Korea and the World Health Organization coordinated this first Joint Monitoring Mission (JMM) from 9-19 May 2014, to review the country’s National Tuberculosis Control Programme (NTP). The review was undertaken jointly by the Ministry of Public Health, DPR Korea and the WHO with active participation of partners including UNICEF, Global Drug Facility; Green Light Committee, and technical experts.

The objectives of the Mission were to review the performance of the National TB Programme compared to the National Strategic Plan 2008-15 and achievements against the set targets, and to review technical policies, specially, of the new interventions initiated since implementation of the Global Fund grant.

The team reviewed documents and reports provided to them by the NTP, met with the NTP, national and international partners and visited health facilities implementing the national TB programme in the country at all levels. This report reflects the findings, outcomes of discussion, conclusions and recommendations of this JMM.