

rGLC COUNTRY SUPPORT MISSION REPORT

Country: Sri Lanka

Inclusive dates of mission: 08th – 12th July 2019

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Some of the graphs and flowcharts in this report are adapted from the NPTCCD documents/ Presentations

The programme has agreed with open sharing of this report

Persons met during the Mission

As per Annexure-1

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Abbreviations and acronyms

AFB	acid-fast bacilli
aDSM	active TB drug-safety monitoring and management'
AIDS	acquired immunodeficiency syndrome
CBO	community-based organizations
CPT	co-trimoxazole preventive therapy
DCC	district chest clinic
DCCL	district chest clinic laboratory
DDG-PHS	Deputy Director General of Public Health Services
DGHS	Director General of Health Services
Dlm	Delamanid
DOTS	directly observed therapy – short course
DRS	drug resistance survey/surveillance
DR-TB	drug-resistant tuberculosis
DST	drug susceptibility testing
DTCO	district TB control officer
EQA	external quality assurance
FDC	fixed-dose combination
FLD	First-line (anti-TB) drugs
GDF	Global (TB) Drug Facility
GF	Global Fund (Global Fund to Fight AIDS, Tuberculosis and Malaria)
Gx	GeneXpert
HRD	human resource development
IC	infection control
IPT	isoniazid preventive therapy
IC	infection control
LPA	Line Probe Assay
MDR-TB	multidrug-resistant tuberculosis
M&E	monitoring and evaluation
NGO	nongovernmental organization
NHRD	National Hospital for Respiratory Diseases
NPTCCD	National Programme for Tuberculosis Control and Chest Diseases
NSP	National Strategic Plan

NTP	National TB Programme
NTRL	national TB reference laboratory
PHC	primary health care
PLHIV	persons living with HIV/AIDS
PMDT	programmatic management of drug-resistant tuberculosis
PPM	public-private mix
RDHS	Regional Director of Health Services
RR	rifampicin-resistant
SDG	Sustainable Development Goals
SEAR	South-East Asia Region (of WHO)
SLD	Second-line anti-TB drugs
SL LPA	Second line Probe Assay
SOPs	standard operating procedures
TA	technical assistance
TB	Tuberculosis
TWG-TB	Technical Working Group on TB
WHO	World Health Organization
XDR-TB	extensively drug-resistant TB

I. Executive summary

1) TORs of the mission

Objectives of the PMDT mission

1. Review progress of PMDT activities in general and specifically in reference to recommendations made during the last mission
2. Review country PMDT guidelines and hold discussions with NPTCC as well as clinical experts team regarding
 - a. Adoption of updated WHO guidelines on management of MDR-TB
 - b. Policy and practice on adverse events monitoring and management specifically in view of new and repurposed drugs to be used as per updated WHO guidelines
3. Visit at least one MDR-TB implementation site and DCC to review programmatic management, recording and reporting, and treatment practices
4. Review current National Reference Lab Capacity and plans for strengthening lab network to meet the demands for implementing updated WHO guidelines for management of DR TB
5. Provide report as per the rGLC template including recommendations for adopting updated DR-TB guidelines

Activities

1. The consultant will review all National Guidelines, Manuals, Standard Operational Procedures related to DR-TB before commencing the mission.
2. Monitoring of PMDT activities will include review of overall program performance, laboratory performance, case finding, clinical activities, infection control practices, preventative strategies, patient support systems, Procurement and Supply Chain Management, pharmacovigilance and recording and reporting.
3. The activities will include visiting district TB centers (Colombo and Kegale), NTRL and district laboratories, TB hospitals, OPD clinics, STD/ART center, Private hospital, MDR TB center and OPD, Central Drug Store Microscopy centers, DOTS centers, and interviews with patients (including one home visit), Community Health Workers and staff

2) Overall PMDT Implementation compared with targets in NSP

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Target	14	14	14	10	14	15	20	28	30	
RR /MDR TB patients detected	8	12	5	4	13	13	17	25	14	Q1 6 Q2 6
Enrolled in same year	4	5	4	4	11	13	17	22	13	Q1 4 Q2 6
Enrolled in next year	1	4	1							
Total no. and % put on treatment	5 63%	9 75%	5 100%	4 100%	11 85%	13 100%	17 100%	22 88%	13 93%	

Achievements/Program Strengths

- 1) Good public health infrastructure (UHC, strong education system, etc).
- 2) Committed health care professionals at all levels of service delivery.
- 3) Good electronic surveillance and case management system -EPIMs.
- 4) Strong clinical, programmatic, and laboratory management of TB.
- 5) Low levels of drug resistance.
- 6) High level of political commitment to End TB.
- 7) Rapid expansion of GeneXpert, with GOSL and GF contribution. 31 machines in place now

Challenges

- 1) Missing cases (3000 to 4000).
- 2) Need to update and strengthen treatment guidelines.
- 3) Logistic hurdles for filling vacancies and fixing broken equipment.
- 4) Need for a central structure for coordinating PMDT activities.
- 5) Contact evaluation (low percentage of contact completing evaluation in Colombo).
- 6) Emerging high risk groups- drug addicts, Diabetics, CKD, Elderly
- 7) Private sector participation/ sharing of patient information
- 8) Engagement of Community Based Organization and Non Governmental Organization at district level
- 9) Community empowerment and engagement
- 10) Integrating service delivery between different programs (MCH, NACP, NCD).
- 11) Partnerships (NGOs, private sector, interagency).
- 12) Multisectoral accountability framework to End TB.

Priority recommendations of the mission (max 10):

Sl. No.	Recommendation	Responsible persons/agency	Timeline
1	Establish a PMDT unit at the national level to monitor all PMDT activities and ensure appropriate diagnosis, treatment, monitoring and relapse-free cure for all DR TB patients and fill all vacancies in programme staff (DTCO, MO, nurses, PHI, microbiologist, LT, etc) on priority	MoH, NPTCCD	Initiate in 3rd quarter 2019 and complete within the year
2	Bridge the gap between reported and estimated TB by implementing universal DST for all TB cases; expand Gx to all confirmed and high risk presumptive DR TB patients; ICF in high risk populations	NPTCCD, NTRL	Initiate in 3rd quarter 2019 and complete within the year
3	Start initiating at least 80% of all eligible cases on the all oral bedaquiline-containing treatment regimen with strict drug safety monitoring and management practices	NPTCCD, NTRL	Initiate in 4th quarter 2019 and ongoing

4	Strengthen patient counseling to reduce diagnostic delays and engage partners (NGOs, Funding organizations, Private providers) in the provision of TB services such as ACF, DOT provision, IEC, contact evaluation, etc.	NTP/MMA/ Other Partners	Initiate in 3rd quarter 2019 and ongoing
5	Ensure DOT for DS and DR TB patients; continue to explore ICT models for treatment adherence. <ul style="list-style-type: none"> • Mobile phone DOT (99 DOTs model) • Video DOT • Medication Event Reminder Mechanisms (MERM) for MDR TB • Community based DOT 	NPTCCD	Initiate in 4th quarter 2019 and ongoing
6	Decentralize MDR TB care by expanding DR TB treatment initiation to two more centers - Kandy and in/around Jaffna. Redistrict Colombo to three sites (in progress).		Initiate in 4th quarter 2019 and ongoing
7	Consider shifting to an ambulatory care model for DR TB treatment as the all oral regimen is implemented after culture conversion in order to: <ul style="list-style-type: none"> • Improve patient quality of life • Decrease risk of transmission in hospital settings • Decrease cost to the system • Further decentralize PMDT services 	NTP/ National AIDS Control Programme	Initiate in 4th quarter 2019 and ongoing
8	Ensure adequate funding to sustain all TB activities and implement key recommendations to improve PMDT management.	MoHS/NTP/WCO/ In-country Partners	Ongoing

Status of Priority recommendations of previous mission (April 2018)

Recommendations	Status	Comment
Learnings from Intensified Case Finding pilot districts should be replicated soon in other districts to improve case notifications	Ongoing	(i) Gx access improving (ii) Sputum transport needs further strengthening (iii) Contact examination to be strengthened (iv) X-ray services still not improved
Universal DST for all TB cases can be achieved	Ongoing	(i) Gx access improving with expansion to 31 machines (ii) Eight districts have started U DST for all confirmed cases and
Start initiating at least 80% of all eligible cases on shorter regimen with strict drug safety monitoring and management practices	Ongoing	(i) Shorter regimen has been implemented in about half the MDR TB patients
Expand DR-TB treatment initiation to at least two more centres – Kandy and in/around Jaffna	Not done	(i) DR TB treatment services still need expansion and further decentralization
Patient centred care is important for all patients including provision of psychosocial- economic support	Ongoing	(i) Recording and reporting largely paper based (ii) EPIN eight district pilot; pan to expand to all districts
Engaging with private hospital association for dissemination of key messages	Ongoing	(i) Private sector engagement has been an ongoing activity (ii) Collaboration with private sector hospitals

Organize a national consultation on ending TB (and AIDS) with multi stakeholder engagement including other government departments, private sector, NGOs, community representatives and international partners like WHO	Ongoing	A national consultation on ending TB with multi stakeholder engagement has been scheduled for later this year (2019) along with WHO.
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Achieved	
Some progress/ ongoing	
No change	

II. Detailed report

A. Introduction/Background (Health care set-up in the country, overall TB and DR-TB burden)

The National Programme for Tuberculosis Control and Chest Diseases (NPTCCD), Sri Lanka, is primarily responsible for the control of tuberculosis in the country and is a central level organization which functions through a network of chest clinics, laboratories, chest wards and hospitals. The work of the NPTCCD is under the supervision and guidance of the Director General of Health Services (DGHS) and the Deputy Director General of Public Health Services (DDG-PHS). The NPTCCD is assisted by a technical National Advisory Committee under chairmanship of the DGHS and consists of representatives from the Directorates of Health Services, Consultant Respiratory Physicians, Consultant Microbiologists, representatives from Professional Colleges, representatives from Prison and Social Service Department, other senior administrators, public health professionals, university academia, private practitioners and non-governmental organizations.

The demographics of Sri Lanka have been changing over the years with markedly reduced birth and death rates (universal health care) and an expected increase in the elderly population over the coming years. There is good public health infrastructure (UHC, strong education system, etc.) with committed health care professionals at all levels of service delivery. There are 26 districts with 13 TB wards and one tertiary care TB hospital with a specialized MDR TB ward of 10 beds. The National TB Reference Lab is a BSL 3 lab with culture and DST capability; there are four Intermediate Reference Labs with culture capability and there are 31 Gx machines in the country. The private sector is growing quickly and is contributing to TB diagnosis, but the extent to which the private sector is diagnosing TB and the potential gaps in reporting cases to the NPTCCD has not been evaluated.

Per WHO estimates (Global Report 2018) Sri Lanka, with a population of 21 million, is considered a relatively low burden TB country with an estimated TB incidence of all forms of TB of 64/100,000 population, an estimated MDR TB incidence of 0.42/100,000, an estimated incidence of HIV/TB of 0.23/100,000 and TB mortality, excluding TB-HIV, of 3.2/100,000 population. The actual reported TB incidence was 47/100,000 in 2017 leading to an overall gap in case notification of about 3000 to 4000. In 2018, Sri Lanka notified 8856 patients (up from 8511 the previous year) (Figure 1) of all forms of TB of which 4181 (47%) were bacteriologically confirmed, 2431 (27%) were EPTB, and 591 (6.7%) were retreatment cases. The majority of cases occur in the Western province (40%), with most reported from Colombo (25%) (Figure 2). Case notification has increased for the first time since 2015 likely due to the increased use of Gx and CXR for diagnosis. The proportion of retreatment case has been low, however treatment failure and loss to follow-up are high amongst those who are enrolled suggesting that previously treated patients are either not getting enrolled or are being misclassified as new TB patients underlining the necessity for UDS.

A recent DRS from 2017 showed that 0.56 % of new and 5.1% of previously treated patients had RR/MDR TB and there have been 13 to 25 annual RR/MDR TB cases diagnosed over the past five years with the greatest number diagnosed in the year of the DRS. Treatment success rate was 84% among all forms of TB in 2017 (Figure 3) and approximately 75% among MDR TB patients from the 2014-2016 cohort. The overall goal of the NSP (2016-2020) is to decrease the prevalence of TB by 10 % by 2020 based on 2014 WHO estimates of burden. The objectives of the NSP are to:

- 1) Improve TB control by detecting at least 80% of incident TB cases by 2017 and 90% of incident cases by 2020
- 2) Improve the outcome of enrolled TB patients by
 - a. achieving 90% treatment success rate of all forms of non MDR TB patients and
 - b. maintaining at least 75% treatment success rate among MDR TB cases by 2017.

- 3) Integrate TB control activities in to general healthcare system by establishing TB diagnostic and treatment services in 40% of all hospitals up to the level of Divisional Hospitals Type B or above by 2017 and in 80% -by 2020
- 4) Improve the accessibility to TB treatment and care by engaging 30% of all private health care providers (Hospitals and General Practitioners) in TB control by 2017, and 50% by 2020
- 5) Ensure that quality TB services in line with current international standards are provided by qualified and regularly supervised personnel at 100% of all implementation sites by 2017

Figure 1: Case Detection of Tuberculosis - 2005 - 2018

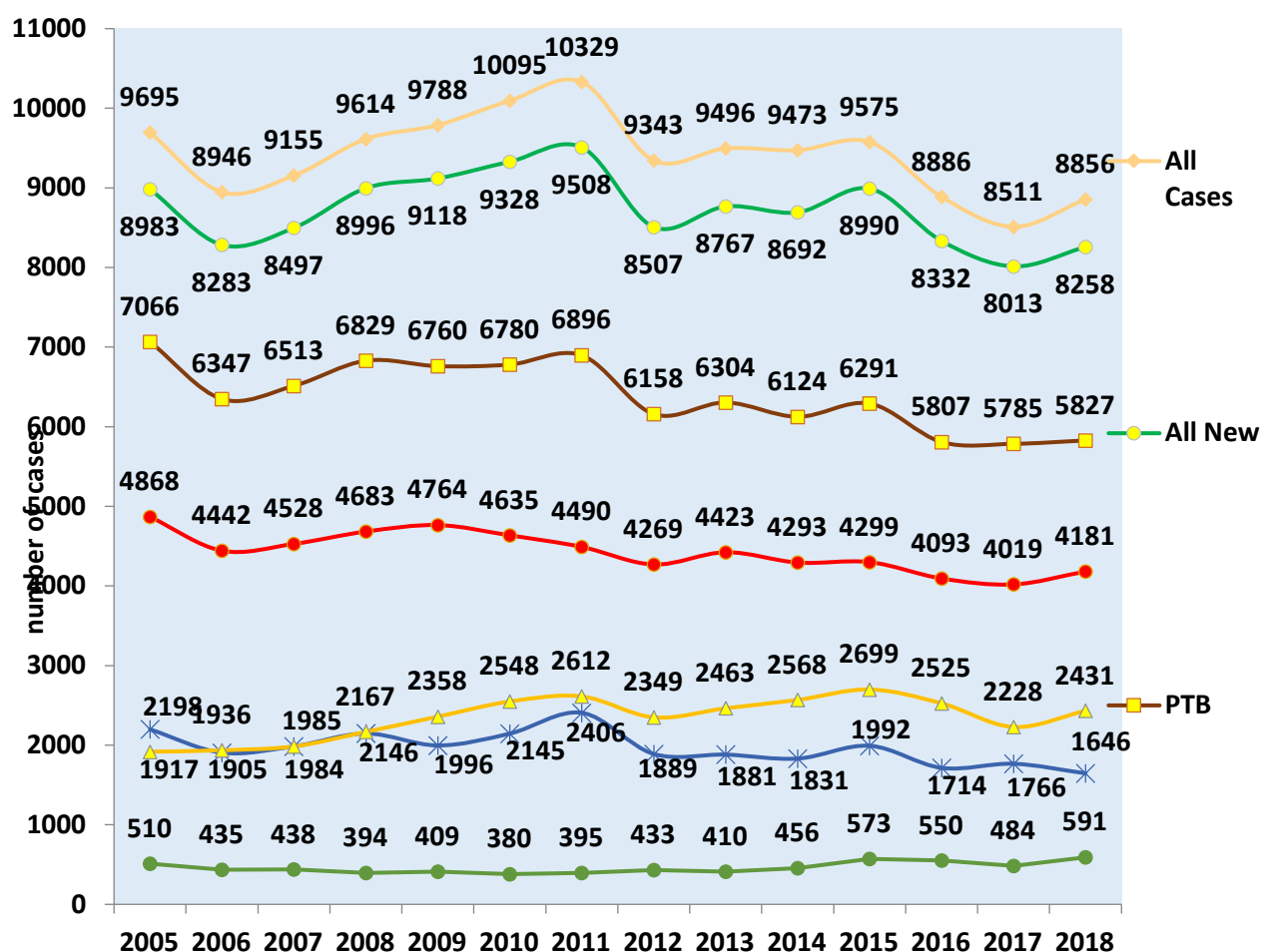


Figure 2: Distribution of All TB Cases Detected - 2018

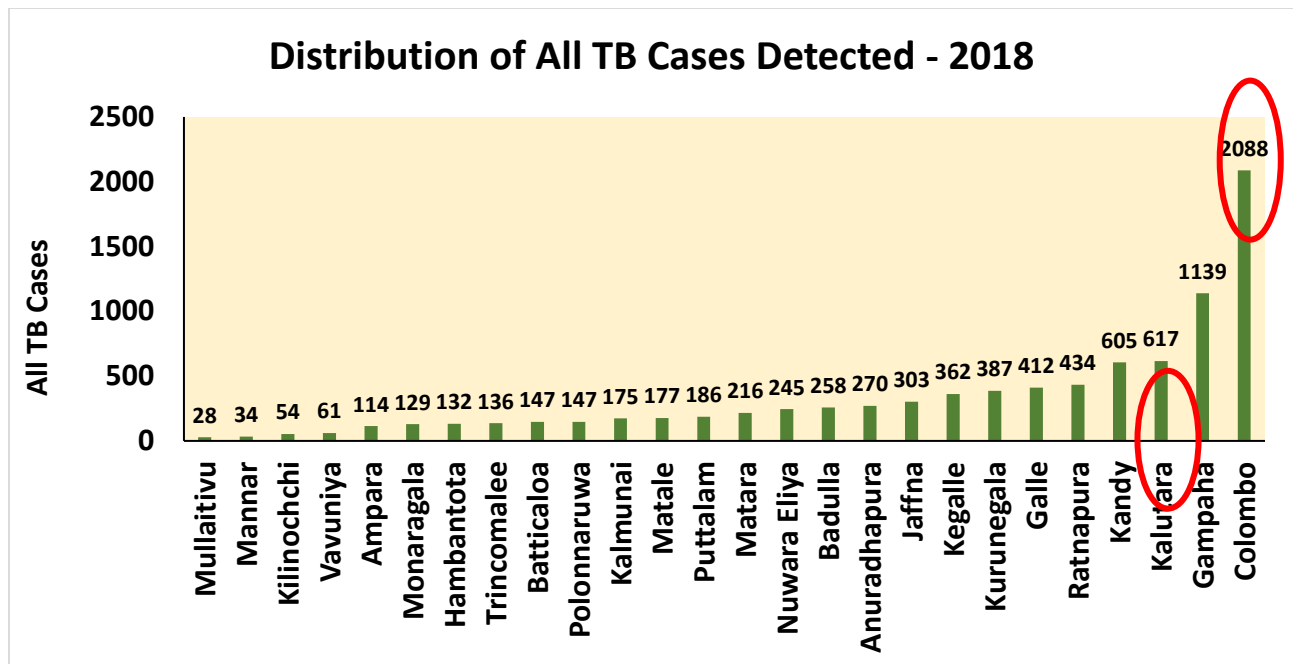
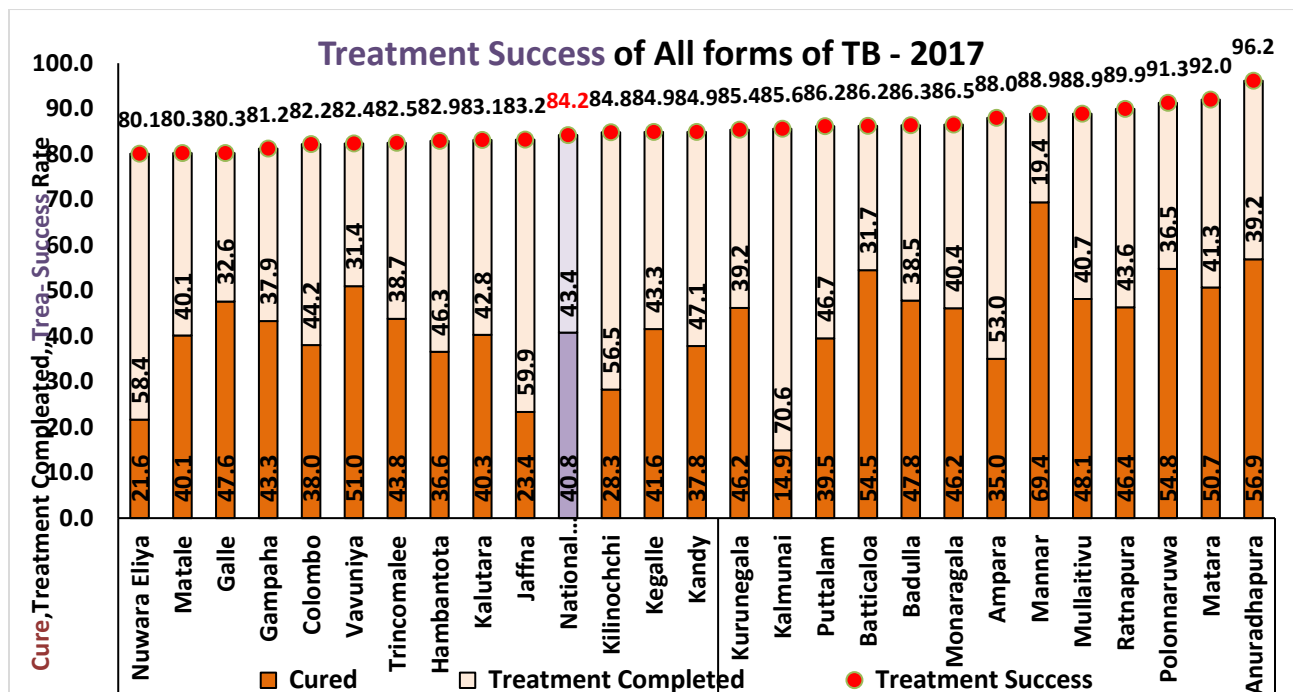


Figure 3: Treatment Success – all forms of TB 2107



It is also observed that children contribute to 3% of the notification rate and should comprise 6% per WHO estimates. There has not been a single case of RR/MDR TB reported in the pediatric population.

The majority (94%) of TB patients are being screened for HIV and there is a policy in place to screen all TB patients for DM with a random blood sugar. There are few NGOs and partner organizations that are involved in TB activities. The country receives GF grant which supports TB activities and procures TB medications either directly through the GDF (second-line drugs) or indirectly from GDF through the GoSL (first-line drugs).

B. Overall programme performance (DR-TB)

The programmatic management of drug resistant TB was initiated in 2014 with the formation of the first PMDT central committee and a diagnostic algorithm for RR/MDR TB. In 2015, PMDT guidelines were written, SLD treatment initiated, and Gx and SL LPA added to the diagnostic algorithm. The PMDT guidelines were printed and disseminated in 2016 and MDR TB training was started for MOs, DTCOs and NOs. In 2017, the MDR TB shorter regimen was started, an aDSM program was started and a circular on patient management was issued. In 2018, a circular on restriction of FQ use, a circular on phasing out the CAT II regime was issued and preparations were made for the use of new MDR TB regimens including bedaquiline per WHO 2018 guidance. Moving forward, the plan is to initiate UDST for all bacteriologically confirmed patients, to incorporate the new 2019 WHO guidelines switching to all oral bedaquiline-based MDR regimens whenever possible, and to integrate a PMDT module into the current electronic national TB surveillance system (EPIMs).

MDR TB outcomes have been good with the majority of patients (75%) achieving cure from the 2014-2016 cohort. However, under-diagnosis, mortality, and loss to follow-up are still issues that need to be addressed. The fact that 25 patients were diagnosed in 2017 at the time of the DRS suggests that implementing UDST will lead to complete capture of MDR TB patients that are currently being missed. It is worrisome that 3/25 (12%) of patients in 2017 were never started on treatment and that mortality among MDR TB patients has been high (24% in 2016 and 18% in 2017) in recent years (Table 1).

Table 1. MDR TB outcomes (2014-2019)

Year	Total	Treatment Started	Cure/ Cure rate (%)	Still on SLD	Death	Failure/Treatment withheld	Loss to follow-up
2014	13	11	9(81.8)	0	1	0	1
2015	13	13	10(76.9)	0	2	0	1
2016	17	17	11 (64.7)	0	4	2	0
2017	25	22	13	4 (CP)	4	0	1
2018	14	13	2	11(CP)	0	1	0
2019	12	12	--				
Q1	6	6		4 (IP)	1	0	1

Q2	6	6		6 (IP)	0	0	0
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The majority of MDR TB patients are diagnosed in Colombo (28% from 2017-2019), but cases are occurring throughout the country. Of note, from 2016 to 2019, 37/68 MDR TB cases occurred in new patients suggesting person to person transmission of MDR TB.

Recent DRS results from 2017 showed that 0.56 % of new and 5.1% of previously treated patients had RR/MDR TB (Figure 5), however this may be an underrepresentation of the proportion of MDR TB as only smear-positive patients were samples and all previously treated MDR TB patients were excluded from the analysis. Furthermore, the low numbers of RR/MDR TB patients explains the large confidence intervals, especially in the previously treated patient group, making the results less reliable.

Table 2. DRS results

		n	%	95% CI
RR TB	New	1421	0.49	0.20-1.01
	Retreatment	98	4.08	1.12-10.12
MDR TB	New	1421	0.07	0.05-0.39
	Retreatment	98	1.02	0.03-5.55
RR/MDR TB	New		0.56	
	Retreatment		5.1	

The country has expanded the criteria for Gx testing in an effort to move towards universal DST and ultimately all TB patients are to be tested for drug resistance (see case finding section). There are currently 31 Gx machines located throughout the country and the current use of these machines needs to be optimized (see Lab section). As noted above, in the recent years, it is observed that most of the MDR-TB cases detected are amongst the New MDR-TB suspects. This further strengthens the argument for upfront DST in all TB patients.

There is currently one accredited culture and DST laboratory – the National TB Reference Laboratory that has facilities for solid, liquid and LPA. The NTRL performs DST for first line drugs (INH, RIF, EMB) and has the capability to perform first and second-line LPA, but the single LPA machine has been out of service since February, 2018 and will not be fixed until October, 2019. There is currently no mechanism for second-line DST. There currently remains little information available on SLD resistance in the country, and certainly representative data on SLD resistance patterns is lacking.

C. Role of partners in delivery of TB and MDR-TB care/Private Sector

The majority of presumptive TB patients are seen and diagnosed in the public sector, but presumptive TB patients can be seen by the private sector and should be referred to the public sector for care and management. Very little, if any MDR TB is diagnosed and treated in the private sector. The private sector may include the following:

- 1) Private hospitals

- 2) Corporate health services in particular tea estates
- 3) Private physicians including GPs. Many of these chest physicians work in the public health sector during the day and in the private sector during the evenings
- 4) Non-allopathic healthcare providers
- 5) Pharmacists

TB drugs are not available from pharmacies without prescription which supports the assumption that TB patients are primarily receiving treatment in the public sector. A visit to a private hospital, Asiri hospital, however sparked concerns that private patients diagnosed in the private sector are not being referred to the public sector for treatment and management. The Asiri hospital laboratory performs AFB smear microscopy, AFB culture and first- and second-line DST, interferon Gamma Release Assays (QFT gold plus), another assay for TB (T-SPOT), CXR and high resolution CT scans. Many presumptive TB patients are seen at Asiri hospital in the OPD and approximately 10 to 15 are hospitalized for TB treatment annually. Ten to twelve QFT plus tests are performed daily and approximately 10 to 20 specimens are sent to Lal Path labs in India for Gx monthly. We were informed by the Medical Director and the Laboratory Director for Asiri hospital that approximately 40 patients have a microbiological diagnosis of TB every one to two months and that a line list of patient names and phone numbers are sent to the NPTCCD every few months. Patient addresses and other identifying information are not sent due to worries for patient confidentiality. The Medical Director and the Laboratory Director were aware of TB reporting requirements, but were reluctant to commit to regular reporting of TB even on a weekly basis. They asked that NPTCCD send a circular outlining the legal TB reporting requirements. The NPTCCD Director conformed that the program has received a communication from Asiri hospital twice in the past year, but that the lag in reporting the patients has been greater than 6 months from diagnosis date.

There are very few partner organizations, both technical and implementing, that are involved in TB activities in Sri Lanka. The program is not using NGOs, CBOs or other partner organizations for specimen collection and transport, patient and family education, contact tracing or monitoring and evaluation activities. The only partner that has been involved in TB activities _____ is no longer providing any services. There has been no partnership meeting and no systematic engagement of the private sector through medical organizations in the recent past.

Recommendations:

- Engage partners (NGOs, CBOs, Funding organizations, Private providers) in the provision of TB services such as ACF, DOT provision, IEC, contact evaluation, etc.
- Strengthen partnership collaboration including PPM.
- Hold a TB partners meeting to energize partners to contribute to TB activities.
- Map private sector providers in each district (start with Colombo).
- Circular to private providers (and labs) regarding mandatory notification.
- Ensure mandatory notification of TB cases from the private sector.
- Visit private providers and inform them of public health services for Gx and other diagnostics, free TB drugs, and DOT/patient support.
- Private sector engagement through a stakeholder meeting with private doctors through the Chest Physician Association.
- Review last six month reports from Asiri hospital to ensure that all patients diagnosed with TB are in the public health system receiving treatment.
- Based on above activities, analyse the contribution of the private sector to the 3000-4000 missing cases.

D. Case finding strategy

Gx testing has been rapidly expanded since the last rGLC mission with an increase from 14 to 31 machines available throughout the country. Per the PMDT expansion plan the following categories of patients are high risk for DR TB (10 presumptive high risk categories) and should receive Gx testing.

Category A¹: High risk cases for drug resistance

1. Symptomatic contacts of MDR-TB patients or those asymptomatic contacts screened with CxR having changes suggestive of TB
2. First line regimen failures and non-converters/ delayed sputum conversion
 - Category II (patients on retreatment regimen with first line drugs) failures and Category II patient remaining sputum smear positive at 3rd month
 - Category I failure (patients who are on treatment with first line drugs for a new episode of TB) and Category I patients remaining sputum smear positive at 2nd month
3. Patients with history of repeated treatment interruptions
4. All other previously treated TB patients

Category B: Patients with moderate or low risk of drug resistance but in whom the risk of mortality or chance of spread of resistant bacillus to contacts is high

5. Patients with TB/HIV co-infection,
6. Institutionalized patients e.g.:- prisoners
7. Drug addicts
8. Healthcare workers
9. Those who return from abroad with active TB.
10. TB patients treated outside the NTP.

GeneXpert tests are also be used in smear-negative patients (including paediatric cases) and extra-pulmonary cases (except pleural fluid which is considered sub-optimal sample. The criteria for the use of Gx was expanded as of 2017 as noted below:

NPTCCD now recommends the use of Gx for the following indications:

As the initial test:

- 1) Presumptive TB meningitis
- 2) Critically ill patients in whom Tb is suspected
- 3) Presumptive TB in pediatric patients
- 4) TB testing in PLHIV
- 5) Presumptive TB in pregnant or peri-partum women
- 6) Presumptive patients with evidence of immunosuppression
- 7) Presumptive EPTB patients in whom tissue or fluid aspiration from affected site is possible

As a follow-on test:

- 1) Patients with negative sputum smears but having evidence of PTB on clinical features or CXR or Mantoux testing (smear-negative PTB)
- 2) Those with clinically stable presumptive TB with one of the above ten risk factors for drug resistance

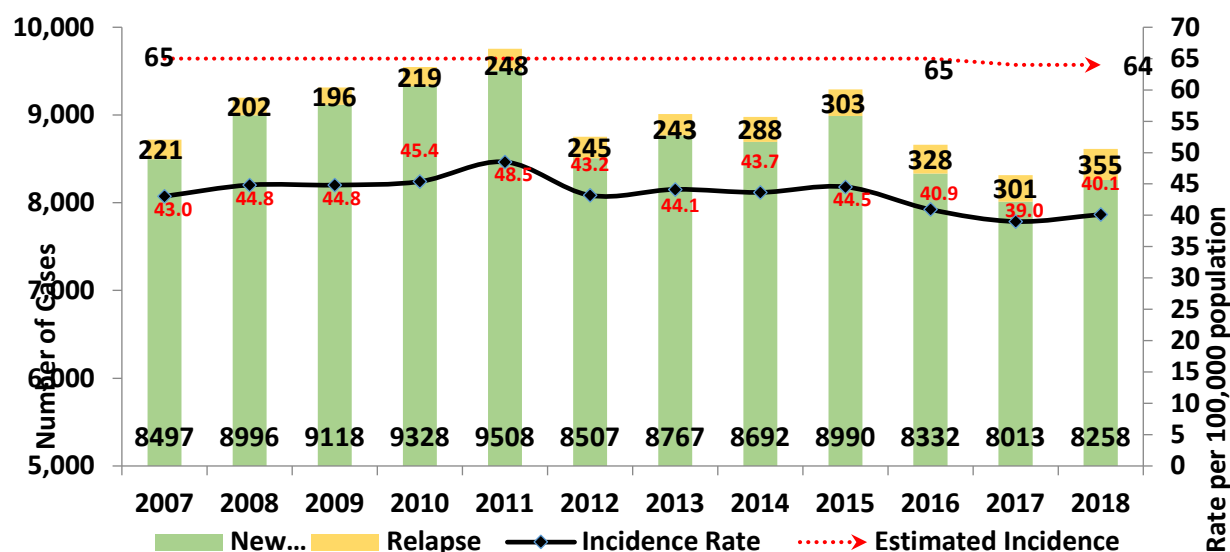
Gx has also been expanded recently to include all bacteriologically confirmed patients (UDST) in an eight-district pilot.

¹ The categorisation of risk cases is temporary and only for prioritisation for using GeneXpert tests. The categories will be used only till such time the country has enough capacity to test all cases at risk of drug resistance

Despite the expansion of criteria for the use of Gx and the rapid increase in Gx testing, case detection has remained stagnant over recent years (Figure 4) with a case detection gap of approximately 4000 patients. Detection of RR TB is also suboptimal as UDST has not been adopted, but the eight-district pilot may yield greater RR/MDR TB case detection. The LPA machine has been broken since February 2018, therefore rapid molecular testing for FQ and SLI resistance is not being performed affecting the diagnosis of SLD resistance.

Intensified case finding among high risk populations (congregate settings, slums, IVDU, Diabetic clinic, etc.) is happening in some high prevalence districts (Colombo), but has not been scaled country-wide. Contact tracing is being performed, but with variable success. Less than 40% of contacts are completing evaluation in Colombo.

Figure 4: TB case detection- stagnant over the years



There are approximately 227 sputum microscopy centers country-wide, but since many centers are under-utilized, there is a plan to have more sputum collection centers that will then arrange for transportation of specimens to fewer centrally located microscopy centers. This would require better sputum collection methods in the periphery and a systematic, efficient sputum transport mechanism country-wide. The quality of specimens and efficiency of sputum transport was noted as being a problem by several public health staff throughout the sites visited.

Recommendations:

- Bridge the gap between estimated and diagnosed TB cases (3000-4000) through provision of adequate human resources, expansion of laboratory services, engagement of private sector, ensuring functional laboratory equipment, and expanding Gx use.
- UDST (Gx) for all diagnosed (100%) and high-risk presumptive TB patients.
- Use Gx as the initial diagnostic test in symptomatic pediatric and extra- pulmonary patients and ensure that each patient who meets criteria for Gx receives the test.
- Increase active case (ICF) finding activities in high risk populations (congregate settings, IVDU, diabetic clinic, slums, etc.).
- Mobile vans with CXR and Gx to reach patients in hard to access areas.
- Consider expanding ICF to high-risk districts that have low numbers of cases.
- Improve TB notification from private sector providers.

- Train Health Staff to identify high risk presumptive TB patients using four symptom screen.
- Strengthen the tracking the patients pathway from periphery to diagnostic facility.
- Provide Information and Education Campaigns in the community to increase awareness of TB and promote screening (maybe 30 second clip during the news on TV).
- Boost contact investigation/evaluation – consider cash incentive or vouchers for contacts to ensure that all contacts to active TB are evaluated.

E. Laboratory services and expansion plan

Smear Microscopy:

There are approximately 227 Microscopic centers (many of which have LED microscopes) and they are located in the District Chest Clinic laboratories (26) and peripheral health institutions-primary health care centres and base/district General hospitals. There are also sputum collection centers and due to underutilization of smear microscopy centers, the plan is to increase the number of sputum collection centers and decrease the number of microscopy centers. EQA for smear microscopy services using the Lot Quality Assurance system is in place and is covering the entire nation.

Gene Xpert sites:

Gx is available at the NTRL, 4 IRLs, key hospitals and district chest clinics and has been expanded from 14 machines at the time of the last rGLC review to 31 machines currently. There are 30 sites with 31 machines (the NTRL has one sixteen module and one four model machines). Gx utilization is low and there are issues with broken modules that have not been repaired in over a year and a cartridge stock-out last year. In the NTRL, there is one four module and one sixteen module machine and one module in both machines has been broken for the past year. There are generally two runs a day and sometimes three for approximately 1000 tests per month. Utilization in Kegalle district is much lower (Table 3) and is probably more representative of Gx use country-wide.

Table 3: Gx usage details at Kegalle District

2018 # of tests		2019 # of tests	
June	40	January	127
July	98	February	93
August	80	March	63
September	78	April	67
October	89	May	81
November	123		
December	103		

EQA for Gx is carried out by the NTRL and Gx machines are serviced annually by the manufacturer. There was a stock out of cartridges last year and there have been issues with broken modules (two at the NTRL) that have not been fixed for over a year.

Cx and DST Labs

Currently, the NTRL is a BSL3 lab which performs Phenotypic culture (solid – LJ and liquid -MGIT) and first-line DST for INH, RIF, EMB and SM is performed only in solid media. There is one LPA machine, but it has been out of service since February 2018 and is projected to be replaced by October 2019. The

NTRL provides QA for microscopy and Gx for both public and private labs throughout the country. There are four IRLs (Kandy, Rathnapura, Galle, Karapitiya) which perform solid culture but no DST.

There is currently no second-line DST capability in Sri Lanka. Occasionally, a specimen is sent to the Supranational Laboratory in Belgium, but this is not the standard procedure even for known RR/MDR TB patients. Therefore, most RR/MDR TB patients have no additional first- or second-line DSTs making the diagnosis of confirmed MDR, pre-XDR, XDR TB, and additional second-line resistance difficult. There is no genotyping performed at the NTRL at this time. There is a plan to expand to 9 labs with culture capacity, but this has not yet been undertaken (Table 4).

Table 4: Laboratory Expansion Plan

	2014	2015	2016	2017	2018	2019
No of intermediate culture labs	2	4 (2)	5 (2)	6 (4)	6 (4)	6 (4)
No of Gx machines	1	7 1	7 (1) + 1	7 (9) + 1	7 (14) + 1	7 (31)
No of Bact/Alert machines	1	1	1	1	1	1
No of MGIT machines	0	1	1	1	1	1
No of LPA labs FLD	1	1	1	1	1	1
SLD	0	1	1	1	1	1

Target in black; actual in blue

As per the National policy all presumptive TB patients have three sputum specimens collected (spot, morning, spot) for TB diagnosis and Gx testing is per policy as described above. This needs to be reduced to two samples aligning with WHO recommendations possibly taken as spot specimens one hour apart. This will substantially reduce the workload, considering the availability of limited human resources, and that only 2 Biosafety cabinets are available at NTRL. Both biosafety cabinets are located in the same room making it difficult to perform different types of testing at the same time. There is only one microbiologist at the NTRL and only one Gx technician at the NTRL and other Gx sites. This is the reason for underutilization of the Gx machines (only two to three runs daily in most sites). Further, transition to liquid culture from solid culture will improve the detection of smear-negative TB, improve time to reporting of DST results, and will also reduce the work load of laboratory staff. These two measures of collecting two samples for presumptive TB patients and using liquid medium will substantially reduce the current turn around time of laboratory results for initiating treatment and patient recruitment. Sputum collection is suboptimal; twenty-five percent of microscopy specimens sent to the NTRL for QA are found to be of poor quality. There is no standardized specimen transport system in place and often patients and families are asked to transport specimens.

Recommendations for Laboratory services:

- Augment human resources at all levels (need one more microbiologist/LT at NTRL, need more LTs in the field, fill all vacant positions) and ensure that staff are trained appropriately.
- Provide adequate space for performing laboratory procedures effectively (need to have a separate space for biosafety cabinets so that different types of work can be performed at the same time).
- Modify the current policy of obtaining three sputum samples at diagnosis (spot/morning/spot) to two quality assured spot specimens taken one hour apart followed by a morning specimen to minimize patient loss to follow-up.
- Improve the detection of smear-negative TB by transitioning to liquid medium (MGIT) from solid medium methodology for phenotypic culture and DST.
- Perform Liquid culture for all follow up samples and discontinue solid culture, this will result in reduced work load of laboratory personal
- Begin performing second line LC DST in NTRL and first line DST at IRL Cx labs.

- Send MDR isolates to supranational reference lab for full first- and second- line DST.
- Begin genotyping (WGS, Sanger) for all MDR TB isolates.
- Fast track repair of laboratory equipment (GeneXpert modules, LPA machine, BSL III equipment).
- Ensure annual maintenance for all laboratory equipment.
- Field staff needs to be trained in proper sputum collection as most of the samples received are salivary, which contributes for poor culture recovery rates
- Improve the sputum transport and referral system with adequate follow-up (if there are more collection centers, transport of specimens is crucial).
- Ensure uninterrupted & adequate supply of Gx cartridges and functioning of Gx machines through proper maintenance by mobilizing resources and ensuring funding.
- Replace light microscopes with LED microscopes in high throughput settings in a phased manner.
- Optimize Gx testing in terms of the number of tests (runs) per machine.
- EQA from SNRL, to be implemented
- Strengthen the EQA of Smear Microscopy and expand LED FM services to more microscopy sites

F. Treatment strategy

PMDT Expansion and Decentralization of PMDT services

PMDT expansion has been rapidly progressing since 2014, but the care of MDR TB has not yet been decentralized to the district level. There is one major hospital (Welisara) which is a tertiary care hospital with bed strength of 382 for TB and 186 for non-TB patients. It also has a special ward of ten beds for MDRTB patients. Currently, all MDR TB patients are admitted to Welisara Hospital at time of diagnosis for the duration of the intensive phase which includes an injectable agent. They are then discharged to their respective district for completion of MDR TB treatment. There is a plan to expand DR-TB treatment initiation to at least two more centres – Kandy and in/around Jaffna, but this has not yet been implemented.

Gap in MDR-TB case detection

In relation to the 2016-2020 National Strategic Plan (NSP) MDR TB detection targets, there is a gap in MDR detection. The fact that 25 cases were detected during 2017, the year if the DRS, suggests that MDR TB patients are being missed due to the lack of UDST. Increased utilization of existing Gx machines and increased implementation of diagnostic services in rural areas (improved sputum collection and transport, greater utilization of chest radiography) as well as urban centers (more Gx testing) is needed. Increase testing of pediatric and extrapulmonary samples by Gx will also improve case detection. Subsequently, expansion of Gx to all TB patients (universal DST) will improve case detection overall (especially given the extremely high proportion of clinically diagnosed cases – approximately 50% overall) and, specifically, MDR-TB case detection in urban centers such as Colombo.

It is also noted that no pediatric MDR-TB patients have ever been diagnosed in Sri Lanka indicating that MDR-TB is likely not being adequately diagnosed in the pediatric population, especially pediatric household contacts of infectious MDR-TB patients. Further, appropriate specimens such as gastric aspirates in children under 5 years of age and testing with Gx will improve case detection in children. Currently gastric aspirates are not being used in the evaluation of pediatric patients.

Treatment Regimen

The program is currently using both a longer conventional treatment regimen with an injectable agent and the shorter MDR regimen. The shorter regimen was started in 2018 after the WHO guidelines recommending this regimen were released in 2016. Currently, of the 25 patients that are on SLD treatment for MDR TB, 15 are on the longer regimen, 9 are on the shorter regimen, and one is on a bedaquiline containing individualized regimen for pre-XDR TB.

The longer conventional treatment currently being used is 8KmCsEtoLfxZEH/12CsEtoLfxZEH. The shorter regimen being used is 6(AM,Mfx,Cfx,Pto,Z,Highdose,E)/5(Mfx,Cfx,Z,E). All patients started on the shorter MDR regimen after February 2018 (likely all nine) did not have SL LPA testing to exclude FQ and/or SLI resistance which is an exclusion criteria per WHO guidelines. Of these nine patients, four are considered to be cured but are still on post-treatment follow-up, two were switched to the longer regimen due to side effects/toxicity, and three are still on treatment. All patients on the longer regimen and the pre-XDR TB patient are still either in the IP or the CP of treatment. One pre-XDR patient was placed on both bedaquiline and delamanid and died shortly thereafter. Delamanid has not been used for many patients although the drug is available in country (there have been no pediatric MDR TB cases). Although AK has been substituted for KM in the shorter regimen, this has not happened for the longer treatment regimen. There is one MDR TB patient who is co-infected with HIV. This patient is apparently doing well.

A presentation was made by the consultant introducing the new WHO guidelines for DR TB management and the new classification of drugs. The need to shift towards an all oral bedaquiline containing regimen was emphasized and at the conclusion of the consultation the program had planned to start its first MDR TB patient on an all oral bedaquiline containing regimen. Clinical discussions were held with the chest physicians at Welisara Hospital, at DCC Colombo and DCC Kegalle and with the NTRL. The following issues were discussed:

- 6) The composition, duration and monitoring requirements for the longer bedaquiline containing regimen
- 7) KM, ETO, Z, E and PAS have been downgraded and are generally not recommended to be part of the all oral treatment regimen.
- 8) The need to perform SL LPA BEFORE starting the shorter MDR regimen
- 9) The need to switch to AK from KM in all regimens for which injectable agents are being used
- 10) The need for monthly audiograms if an injectable agent is being used
- 11) The proper dosing of Pyridoxine if Linezolid or Cycloserine are being used
- 12) The use of high dose H in patients with confirmed RR TB
- 13) The need for full first- and second-line DST in all RR/MDR TB patients given the low numbers of such patients

Several individual patients were discussed (two reported below):

- 1) Pre-XDR TB patient – This patient is a 54 y/o male who was a treatment failure with Cat I regimen and was subsequently diagnosed as pre XDR (FQ resistant). He is on the following regimen: 6 BDQ + 12 (LZD, MPM, PAS, CFZ, E, Z)/ 8 (PAS, CFZ, E, Z). The following recommendations were made:
 - a. Add high dose moxifloxacin
 - b. Add CS
 - c. Stop E, Z
 - d. Consider stopping MPM and PAS after first six months
 - e. Confirm culture conversion
 - f. Discharge to outpatient management as soon as patient culture converts

- 2) CNS TB patient – 23 y/o HIV-negative female diagnosed with TB meningitis. She has been hospitalized for some time and was initially started on CAT I drugs. She did not improve, and her current regimen is LZD, AK, ETA_____. She was initially started on corticosteroids, but the dose was tapered over one month and she has not been on steroids for the past two months. She did have a few tuberculomas on initial MRI, but the recent MRI (after stopping steroids) shows many tuberculomas and significant edema. Patient was cachectic, lying down, unable to walk or speak. Only able to open eye. She is deaf per report. Alert and oriented x 0. This patient probably has Immune Reconstitution Inflammatory Syndrome given the quick steroid taper.
 - a. Start high dose INH, moxifloxacin, CS
 - b. Restart high dose steroids (Prednisone 40 mg) and taper slowly over 6-8 months
 - c. Monitor closely for side effects of medicines

Currently all MDR TB patients are hospitalized for the duration of the IP. A discussion was held about the benefits of community-based care for MDR TB and the potential for discharging patients earlier to complete treatment in the outdoor setting or starting MDR TB treatment in the OPD, especially as there is a shift towards an all oral regimen.

TB/Co-morbidities

HIV/TB co-infection is rare with between 15 to 29 TB patients with HIV co-infection between 2014-2019. PLHIV are seen at the STD clinic for ART and TB symptom screening.

A visit to the STD program led to the following observations:

- 1) PLHIV are screened with four symptom screen at diagnosis of HIV and every follow-up visit, but weight loss and night sweats are not regularly documented as the stamp that is placed in the chart only includes fever and cough.
- 2) Results of screening with CXR, Gx and sputum, if collected, are not updated regularly in the registry that is kept at the clinic.
- 3) There is a Gx machine on site, but it is only used for HIV viral load and specimens for TB are sent to the NTRL with a turn-around-time of 1-2 weeks.
- 4) Sputum is collected outdoors in a dedicated sputum collection booth which is clean and well-kept.
- 5) ART is being initiated in all co-infected patients
- 6) IPT is being initiated on a subset of patients who are adequately screened and agree to take treatment for LTBI

There are guidelines for screening of all confirmed TB patients for DM with RBS, and, from the charts reviewed, most patients are receiving RBS at time of diagnosis. There is an operational research study which is about to begin screening asymptomatic patients in Diabetes clinic for active TB. There is no systematic screening for EtOH and smoking.

Pediatric DR TB

Pediatric TB is underdiagnosed as only 3% of TB cases and there are an estimated 6% pediatric TB case

in Sri Lanka. Contact investigation around DR TB cases is occurring, but no secondary cases have been found. Gastric aspirates are not being used for diagnosis in children under five and this may be the reason for underdiagnosis of pediatric TB cases. Child contacts under five years are not routinely receiving IPT.

Integrating the MCH and TB programs may improve the evaluation of children for TB infection and disease.

MDR/XDR-TB Outcomes

MDR TB outcomes have been good with the majority of patients (75%) achieving cure from the 2014-2016 cohort, however 14% died and 5 % were lost to follow-up. Post treatment monitoring should be occurring with one sputum specimen at 3 months post treatment completion and then at 6, 12, 18 and 24 months post treatment completion. It was not clear whether this monitoring for relapse is occurring systematically.

Drug Dosages

There are new WHO recommended doses for second-line drugs, especially for the pediatric population that will need to be adopted, but a review of the current SLD doses being used suggested that the previous WHO recommended weight-based drug doses are being used.

Treatment delivery (DOT)/ adherence and social support for patients

All MDR TB patients receive full DOT administration of medications while hospitalized during the intensive phase. Once discharged, patients continue their treatment in their home district and receive community -based DOT, however the method of DOT for patients does not seem to be standardized. Many seem to be receiving family DOT rather than HCW DOT and it is not clear whether daily or weekly DOT is being given. DS TB patients are reported to receive daily DOT during the initiation phase, but many are receiving intermittent (weekly or twice monthly) DOT in the continuation phase likely due to the HR demands of daily DOT. There is no system in place for ICT-based adherence strategies at this time.

MDR TB patients are supposed to receive 5000 Sri Lankan rupees monthly, but it is not clear that this is happening as the actual payment is up to the Provincial Administration. There is no systematic provision of nutritional support for patients. Patient counseling services are available at diagnosis and at every visit at were observed at DCC Colombo. There is varied quality of counseling provided based on the knowledge of the counselors in different settings. In Kegalle, some of the nurses were knowledgeable about side effects of drugs and others were not.

Patient Interviews

Several patients were interviewed in the indoor MDR TB treatment facility at Welisara (discussions were held in Tamil). Observations from these discussions are as follows:

- 7) Patients were generally unhappy with being hospitalized for such long periods of time and, in fact, two patients stated that 50% of their “depressed mental status” was due to separation from family
- 8) Patients wanted more interaction with the physicians and felt that their questions were not being adequately addressed
- 9) Patients complained about the quality and amount of food being served
- 10) One patient asked for benches to be placed in the garden behind the indoor facility as this is the only space in which MDR TB patients can go outside
- 11) One elderly prison patient was very concerned about complete hearing loss in his left ear
- 12) The pre-XDR TB patient, a government employee, was quite knowledgeable about his disease and had many intelligent and insightful questions/thoughts about his care
 1. Why were AFB cultures being taken monthly instead of bimonthly as he could only be discharged once culture-negative and there is a 6-8 week lag in culture

results being available. He wanted to be discharged as soon as possible to be with his family and return to work.

2. Why was he being housed along with smear-positive infectious patients
3. Could the quality of the food be improved as nutrition is very important for TB patients
4. He wanted more interaction with his physicians

13) Patients were very concerned about the recent death of one of the pre-XDR TB patients

A Tamil speaking patient and his wife were interviewed in a tea plantation (estate) in Kegalle which was a several hour drive from the DCC. The patient, who was diabetic, had never been previously treated and had no family members or friends with TB. He became ill and was treated by several physicians over a few years before receiving a diagnosis of TB. AFB smears and cultures were performed and the CXR was initially atypical with a lower lobe infiltrate with cavitation and was treated for community acquired pneumonia, fungal etiologies including aspergillosis, and other diagnoses over the course of a few years before he was finally found to be AFB smear-positive. He failed CAT I treatment and was found by Gx to be RR. There were no other DST results and he was on the longer conventional MDR regimen and doing well. He had been at Welisara for the IP and was now back at home on the tea estate where he and his family had been working when he became ill. He was living with his wife and another elderly relative, had sons and daughters and grandchildren who visited. His wife went to the DOTS center daily to collect his medications and she was the DOT provider. She verified that he was taking his medication daily without side effects or missed doses. He complained of being deaf in the left ear and had many basic questions about his illness. His main request was to go back to work as his wife had adult onset nephrotic syndrome and neither of them were working. They were receiving 500 Sri Lankan rupees a month for her illness, but were not receiving the 5000 Sri Lankan rupees for MDR TB patient support. He requested the DTCO Kegalle to help with getting these funds. His questions were answered and he was advised to complete treatment without any missed doses.

Recommendations:

- Update PMDT guidelines
- Decentralization of MDR-TB treatment initiation services – Kandy is a possibility. Another centre in or around Jaffna could be a possibility considering distance from Colombo.
- Begin to implement the new all oral bedaquiline based longer MDR TB regimen for all patients.
- Use Delamanid, especially for children < 18 years of age.
- Continue shorter MDR-TB regimen (STR) only if the following criteria are met.
 - Patient meets inclusion criteria
 - Availability of second-line LPA at time of diagnosis to exclude FQ and SLI resistance
 - Start STR at the time of diagnosis of MDR/RR and modify based on second line LPA/DST results.
 - Patient agrees to injectable agent for 4-6 months and is aware of the risks
 - Availability of monthly audiograms to monitor for ototoxicity
- Change all patients on KM to AK (those currently on the longer regimen).

- Consider shifting to an ambulatory care model for DR TB treatment as the all oral regimen is implemented after culture conversion in order to:
 - Improve patient quality of life
 - Decrease risk of transmission in hospital settings
 - Decrease cost to the system
 - Further decentralize PMDT services
- Ensure the Hr-TB guidelines are implemented (although Hr-TB is not a big problem per the recent DRS).
- Follow revised dosing schedule from new guidelines for all drugs.
- Treatment should be DST-guided whenever possible.
- Strengthen patient counselling services and reduce diagnostic delays in order to improve enrolment.
- Ensure that psychosocial and financial support is being provided to all MDR TB patients in the indoor setting and in the community after discharge.
- Increase and strengthen the involvement of community volunteers for provision of DOT, especially in urban areas.
- Ensure DOT for DS and DR TB patients; continue to explore ICT models for treatment adherence.
 - Mobile phone DOT (99 DOTs model)
 - Video DOT
 - Medication Event Reminder Mechanisms (MERM) for MDR TB
 - Community based DOT
- Follow successfully treated MDR TB patients at 6-month intervals for 2 years post treatment as per guidelines.
- Perform operational research to determine the reasons for high mortality among TB patients.

TB/comorbidities

- Integrate HIV/TB charts and ensure good documentation.
- Update HIV/TB register weekly to ensure that test results and treatment outcomes are clearly documented in a timely manner.
- Ensure Gx testing on site at the STD/HIV center so that co-infected patients have access to early diagnosis and treatment initiation.
- ART to be initiated early in TB/HIV coinfecting patients.

- Strengthen symptomatic screening amongst HIV-positive individuals by adding night sweats and weight loss to the screening algorithm (stamp).
- Improve implementation of IPT for asymptomatic HIV-positive patients in whom TB disease has been excluded.
- Ensure all TB patients are systematically tested for diabetes and appropriate anti-diabetic treatment given whenever required.
- Address smoking cessation and EtOH for all TB patients.

Pediatric TB

- Perform Gx right away in sputum/gastric lavage samples of presumptive pediatric TB patients to increase the yield.
- Training and education for pediatricians on TB diagnosis.
- Improved contact evaluation for children in DS and DR TB households.
- Integrate pediatric TB screening into regular MCH home visits.
- Improve the provision of IPT for children under 5 who are household contacts of infectious patients.

F. Pharmacovigilance/ aDSM

MDR TB patients are receiving routine monitoring of blood work, especially while at Welisara. There is a checklist for adverse side effects, but it is not clear whether monitoring for common ADRs is occurring in the field. Audiograms are not being performed routinely while patients are on injectable agents and it was observed that several patients were partially or completely deaf. An ECG was being performed routinely for the one patient on bedaquiline. Interview with the nursing staff at Welisara, DCC Colombo, and DCC Kegalle showed different levels of understanding of the signs and symptoms of ADRs and no systematic protocol for monitoring, recording or reporting of ADRs at the peripheral and central levels. There is no electronic database module for ADR management/pharmacovigilance. SAEs seem to be reported, but there is no systematic process for recording and reporting SAEs. There is currently no causality assessment for MDR TB deaths although the program plans to implement this, especially with the advent of new drugs and regimens, through the district PMDT committees.

Recommendations

Strengthen aDSM for all DR-TB Patients

- 1) Convene a National aDSM workshop for training and education, finalizing an aDSM plan/guideline, and implementing a national database for aDSM monitoring and management, including causality analysis for SAEs
 - a. Incorporate a pharmacovigilance system into the national surveillance system for early reporting/recording of Serious Adverse Events (Death, Hospitalization, Life-threatening AE)
 - b. Perform Causality Assessment for all MDR related deaths through PMDT committee

- c. Provide training and education for all levels of HCW staff in the close ongoing monitoring, management, recording, and reporting of ADRs and SAEs
- 2) Provide patient education for signs and symptoms of ADRs

F. Drug Supply management/Logistics

The central drug store is located adjacent to the Welisara Chest Hospital and is responsible for estimation, procurement, supply and distribution of fixed dose combination and other first- and second-line TB drugs for the entire country. First line drugs are mainly procured in the form of FDCs through GDF (from 2019 onwards from GOSL funds) and are available for patient care only at the DCC level and issued only for registered patients. During the recent transition from direct procurement of FDCs from GDF to procurement of FDCs through the GOSL, there was a stockout of pediatric FDCs necessitating the use of loose drugs for children, but this problem was transient and has now been resolved. Individual drugs are procured through a different mechanism and there have been problems with this procurement recently leading to a complete stock-out of all individual first-line drugs at the central drug store and, as a result, at the district level. This problem is being resolved per the program. Second line Drugs are procured through GDF/GLC mechanism and there has been no stockout of SLDs in the recent past. GX cartridges are also procured by the central drug store and there was a shortage of cartridges last year which has been resolved, but with the anticipated increase in Gx testing, there was a worry among staff that there may be future shortages in Gx cartridges.

The forecasting of drugs at the central drug store is based on targets set with Global Fund and the lead time for ordering is at least six months ahead and there was enough buffer stock of all first-and second-line drugs except for individual drugs. Drug storage and inventory were commendable, with sufficient space, temperature control and daily monitoring, and observation of first-expiry-first-out in all facility sites visited (Colombo, Kegalle). Ancillary drugs for management of adverse reactions were available in the facilities and are provided free of charge to all patients in need. These include omeprazole, diclofenac, allopurinol, pyridoxine, levothyroxine, etc. New drugs such as bedaquiline and delamanid were present in small quantities with reasonable shelf lives. There was a large stock of Capreomycin and Kanamycin that will likely be wasted due to no clear indication for its usage in patient care other than MDR TB (KM might be used).

Currently, the two pharmacists at the central drug store deliver drugs to the Districts on a quarterly basis, but there are no dedicated vehicles for this activity and the vans currently do not have air conditioning for proper storage of drugs during transport. The Central Drug Store provides supervision for every district drug store quarterly using a standardized form at the time of drug delivery. There have been no issues with expired drugs or cartridges. It was reported that no pharmacists outside of the public sector stock or issue anti TB treatment. There is a plan for an electronic database for drug procurement, supply and distribution, but this has not yet been fully developed. Some of the other issues noted were receiving drugs with short shelf life from GDF and the high cost of certain drugs.

Recommendations:

- 1) Incorporate supply management system into electronic surveillance system to better track central and district wise drug supply to avoid stock outs and drug expiry.
- 2) Streamline new procurement mechanism for FDC through government.

- 3) Collaborate with SAARC for pooled drug purchasing.
- 4) Ensure dedicated transport vehicles for drug delivery from central drug store to district drug stores or have district pharmacy staff collect drugs quarterly with proper procedure (AC equipped vehicle and proper packaging).
- 5) Ensure stock of individual first-line drugs (HREZ) for IPT and for use during re-challenge for ADRs.
- 6) Ensure the availability of Gx cartridges in view of expanded use of this test in the guidelines.

G. Recording and reporting, and data management

The country is currently using a paper-based recording and reporting system except in eight districts where the EPIN (electronic case-based national surveillance system) is being piloted. EPIN is a good surveillance and case management system for reporting and tracking of patients from diagnosis to eventual outcome. There is a module for contact tracing and there is a plan to link the laboratory results and the central drug store supply chain management system. There is also a plan to have a comprehensive PMDT module for reporting, recording, and tracking of DR Tb patients and aDSM will also be incorporated. The system appears to be working well in Colombo, with GIS mapping of patients, and should be expanded to cover the entire country soon. A paper-based system makes it extremely difficult to track patients as they make their way through the patient care pathway from diagnosis to eventual treatment outcome, so it is imperative that the EPIN system be expanded quickly to ensure good patient reporting and outcomes.

Recommendations:

- 1) Expand EPIN system from 8 district pilot to nationwide use and link the following:
 - a. Case based reporting module
 - b. Contact evaluation module
 - c. Central/District drug store module
 - d. Lab module
 - e. Digital xray module
 - f. PMDT module
- 2) Begin routine analysis of PMDT data on a quarterly basis to capture trends in DR TB in order to prioritize PMDT activities.

H. Prevention

Infection control

The data presented by the PMDT coordinator (Table 5) shows that 54.4 % of MDR-TB is occurring among “new” patients and this percentage is increasing over time as only half of the patients for 2019 have been recorded. This is very worrisome for ongoing transmission of MDR-TB in the community and in the hospitalized settings. Unless there is a great error in eliciting previous treatment history from patients and diagnosis, these are extremely high rates of primary MDR-TB. In order to address

infection control, there are three levels of controls – administrative, environmental, and personal protective equipment.

Table 5: New versus Previously Treated Patients (2016-2019)

Category	2016	2017	2018	2019 (Q1&2)	Total
New (pre-Tx)	2	10	7	8	27 (39.7%)
New (2/12 +ve)	5	2		3	10 (14.7%)
New (total)	7	12	7	11	37 (54.4%)
Retreatment	10	13	7	1	31 (45.6%)
Grand Total	17	25	14	12	68

Administrative

Infection Control Guidelines have been developed and provide general instructions for infection control measures for health care workers in different settings -- outpatient departments, hospital ward settings, laboratory, intensive care units and medico-legal units. In alignment with global guidelines, the national guidelines incorporate infection control measures at three levels –administrative, environmental and personal. The NPTCCD follows these general guidelines. There was no evidence of IC committees at different levels of care or any IC policies or procedures at the hospital or clinic level and there was no discussion of such policies or procedures during site visits to different facilities.

Environmental

Both the DS TB ward and the DR TB ward were visited in Welisara. There seemed to be relatively good ventilation, especially in the MDR/XDR TB ward, but the only segregation of patients was based on gender. There was no segregation of patients based on infectiousness (smear-positive versus smear-negative), extent of resistance (MDR versus XDR), HIV status (there were no HIV -infected patients in the wards). There were no isolation facilities noted. There were no UV lights in place. In the DS TB ward, there was no clear segregation of TB patients from non-TB patients that were housed directly next to the TB ward. It was stated that there are plans to construct an isolation facility and to segregate different types of patients in the future. At the Colombo DCC OPD, there was an outdoor waiting areas for TB patients, but there was no segregation of smear-positive from smear-negative, DR-TB from DS-TB patients or HIV-positive from HIV-negative patients. The Kegalle OPD was indoor without good ventilation and very crowded with all chest patients sitting together. At no facility were health care workers aware of the number of air exchanges in their environment. There were fans being used for cooling the environment that were likely not conducive for infection control measures. There was no fast tracking or triaging of patients who were symptomatic with cough at any facility. At the Colombo DCC, the sputum collection area was a small open space which was grass and dirt and not very cleanly. There was no HCW coaching patients on how to collect good specimens and no booth for sputum collection. At the ART center, there was a good collection booth surrounded by a large open area with good ventilation.

Personal Protective Equipment

In most facilities visited, including laboratories, staff were not using N95 respirators, including in the Welisara MDR TB indoor treatment facility. The NTRL was the only facility where N 95 respirators were being routinely used. There was no information about N95 respirator fit testing and only one size of respirator was available. There were no N95 respirators at any other OPD, indoor facility or laboratory visited. At the Kegalle microscopy center, the LT was preparing direct smears without an N 95 respirator.

HCW screening

At no facility was there any proactive HCW screening policy or procedure. Symptom screen may be used sporadically, but that was hard to establish. At several facilities, there were reports of HCW who had been diagnosed and treated for MDR-TB.

Recommendations:

- 1) Ensure that adequate administrative controls exist at all medical facilities providing care for TB patients.
- 2) Maintain proper ventilation in all hospital wards and clinics (which you are doing).
- 3) Ensure proper segregation of different categories of patients (Sm Pos, Sm Neg, MDR, XDR, HIV) both in TB and General hospital.
- 4) Ensure open waiting areas, proper triage of symptomatic presumptive TB patients and a separate entrance and exit for symptomatic patients.
- 5) Ensure the use of PPE (N95 masks) by all hospital staff (MOs, nurses, PHIs, LTs, etc.) during patient care or specimen preparation and the use of surgical masks by patients and attendants and give training for proper use.
- 6) Ensure that LTs working with infectious material have N95 respirator
- 7) Improve quality of sputum collection sites (more space and improve cleanliness).
- 8) Consider use and monitoring of UV light (effectivity and safety) in patient care areas.
- 9) Implement annual Health Care Worker screening (symptom review, CXR).

I. Contact Investigation

Household contact investigation is part of national policy and has been variably implemented in different districts. In Colombo < 40% of contacts complete evaluation. In discussion with the nurses at the Colombo DCC, contacts are very difficult to bring in for evaluation and incentives such as cash or vouchers may be helpful in getting contacts to complete evaluation. Similarly, many districts are not meeting targets for contact evaluation. Completing contact investigation may lead to increased case finding and an increase in pediatric TB notifications.

Household contact investigation can also lead to LTBI diagnosis and management which has not started in Sri Lanka. There was a discussion about the need to implement an LTBI management strategy soon. Certain high risk MDR TB contacts may also benefit from tailored MDR LTBI treatment per WHO recommendations.

Recommendations:

- Integrate the use of MCH staff, other non-TB program staff, community volunteers for TB screening and to strengthen contact evaluation.
- Incorporate latest LTBI recommendations into new LTBI guideline and pilot an LTBI management strategy using latest tools and technologies.

- Strengthen household contact tracing around infectious DR-TB patients and consider MDR LTBI for pediatric and other high-risk contacts.

J. Human resource, Training and Technical support strategy

There has recently been a change in the PMDT coordinator role as all PH physicians must change their position every four years. There is one PMDT coordinator in charge of all PMDT activities and currently no dedicated nurse, epidemiologist or other members of a PMDT team. There is one allocated DTCO, nursing staff, LTs, etc. for each of the 26 districts. Most posts are filled, but it was noted that there were vacancies at all levels in some particularly poorly performing Districts.

It was noted that trainings occur for all HCW staff at regular intervals, but no details on trainings were provided. There was some discussion of training modules that were under development to meet training and education needs for staff. Currently there is no CME provided for trainings. A training was given by the consultant at the National Hospital for Respiratory Diseases on the latest WHO guidelines for DR TB management and a Q&A session was held to answer all questions. MDR/XDR TB patient cases were reviewed, and clinical guidance given for the care and management of complicated DR TB patients.

With the expansion and scale up of PMDT services the strengthening of central PMDT staff and peripheral health staff for DOT and monitoring for ADRs will be essential. There is a continuous need to support the DOT providers to identify side effects and take necessary action. Regular refresher training of DOT providers with close supervision and monitoring will be required to ensure treatment adherence and early diagnosis with management of side effects. This can be done by PMDT staff to the DOT providers.

The other staff in the programme including the Laboratory Technicians, Medical Officers and District TB Control Officers need to be trained and re-trained specially as WHO guidelines have changed considerably.

A separate PMDT team (Medical Officer, Nurse, Epidemiologist, Co-ordinator) at the central level to closely monitor and manage all aspects of PMDT will be very helpful to ensure early identification, proper treatment, ongoing management and treatment success for DR TB patients and for evaluation of their contacts.

Recommendations:

- 1) Establish a PMDT unit at the national level to monitor all PMDT activities and ensure appropriate diagnosis, treatment, monitoring and relapse-free cure for all DR TB patients.
- 2) Fill all vacancies in programme staff (DTCO, MO, nurses, PHI, LT, etc.) on priority.
- 3) Increase number of staff where needed based on workload (examples- PHIs at Colombo DCC, nurses at MDR hospital, LTs at NTRL).
- 4) Training and education on new policies in PMDT for all staff on a regular basis.

K. Supervision of the programme

Regular PMDT field visit and supervision of DCCs where RR/MDR TB patients are managed is done by the PMDT Coordinator, however currently there is a new PMDT coordinator and therefore this role is in flux. The PMDT committees at the National and district levels support the supervision and monitoring of PMDT. The central level focal point for PMDT requires training to gather skill on program related supervision and monitoring of district and site monitoring.

With the expansion of the PMDT services, it is likely that the supervision and monitoring may suffer unless additional human resources (HR) are provided. The NPTCCD needs to assess the requirement for additional HR, especially the PMDT team, and also review and revise the roles of the PMDT committees at various levels.

Recommendations:

- 1) Review and revise the current supervision and monitoring strategy and assess for additional staff need (PMDT unit at central level).
- 2) Review and revise the monitoring checklist to ensure all aspects of PMDT monitoring is covered including HR, case finding, treatment, aDSM, drug management, infection control and Recording & Reporting.
- 3) Frequency of supervision at all levels to be enhanced.

L. PMDT plan including funding source

Country PMDT plan is available as a separate document and the targets include:

Table 6: PMDT plan has following targets for detection and enrolment:

	2018	2019
Number of MDR TB cases expected	50	51
No of Xpert testing for MDR TB case detection	536	699
Number of MDR TB Cases to be detected	40	41
Percentage of MDR TB Cases to be enrolled for treatment	100	100
Percentage of MDR TB Cases to be treated successfully	75	75

Table 7: Budget available for MDR-TB under the GF current funding cycle

	Year 1	Year 2	Year 3	Total
MDR-TB	173,446	183,731	189,522	546,699

The Government budget contributes the majority of the total budget for the program and is supplemented by the component coming from the Global Fund (Table 7).

Recommendations:

- Ensure adequate funding to sustain all TB activities and implement key recommendations to improve PMDT management.
- Process modeling to evaluate the impact, cost effectiveness, and need for implementing these recommendations
- Potential savings in allocated budget should be identified and if needed, reprogrammed for other priority activities
- With PMDT expansion, resource needs must be adequately budgeted

Annexure 2: Agenda of Mission

Date And Time	PLACE/INSTITUTION	PARTICIPANT	DISCUSION
08/07/19 9.15 am To 12 Noon	NPTCCD Auditorium	D/Director ,CP NPTCCD ,DTCO Colombo and Gampaha ,PMDT Coordinator ,SR –Dr Sumudu Awanthi ,Dr Ramachandra ,All medical officers in NPTCCD	A) Health state in Sri Lanka B) TB state in Sri Lanka C) MDR TB state in Sri Lanka D) New WHO recommendations in TB management
2.00 pm To 3.30 pm	WHO Country office	D/Director ,WDR ,CP –NPTCD ,Dr Janakan ,DTCO Gampaha ,PMDT Coordinator	How to improve health strategies To end TB in Sri Lanka
09/07/2019 8.15 am	Colombo Chest Clinic	DTCO Colombo ,Dr.Asha CRP Colombo ,Dr.Ramachandra ,All medical officers in chest clinic Colombo , Nursing staff ,	A) Documentation of TB patients B) About computer base of TB patients C) Counseling and health education D) Screening of health workers E) Contact screening F) Presentation by DTCO Colombo
12.30 pm To 1.30 pm	STD clinic	D/Director ,DTCO Colombo and Gampaha ,PMDT Coordinator ,Dr.Ramachandra ,Dr Shanika Nursing staff	Regarding the maintain of HIV TB co infection register
2.00 pm To 3-30 pm	“Asisri” private hospital	D/Director ,DTCO Colombo and Gampaha ,PMDT Coordinator ,Dr.Ramachandra ,Dr Shanika Nursing staff Two Directors of Asiri hospital	A) Investigations regarding TB diagnosing B) Quality of the laboratory C) Referral system of positive patients D)
10/07/19	NHRD Walisara Director office	Director –NHRD ,D/Director – NHRD ,Dr.Bandu Gunesena VP , Dr. Midzai Kader CCP , Dr	Administrative and operational structure of the hospital

8.30 am		sumudu Awanthi SR Dr. Kaushalya ,Dr.Udula	
9.00am To 10.30 am	Gampaha Chest clinic auditorium	Director and D/Director NHRD ,Dr.Saman Kularathna VP , Dr. Bandu Gunesena VP ,Dr. Bodika Samerasekara VP ,Dr Chana De Silva VP , Dr Dushani Jayawardena Con Micro Biologist , Dr. Midzai Kader CCP Dr sumudu Awanthi SR ,Dr. Kaushalya ,Dr.Udula	Presentation delivered by Dr. Sundari Mase regarding recent advances of TB in WHO and discussion about this
11.00 am To 2.00 pm	WD 15 MDR patients ward	,Dr.Saman Kularathna VP , Dr. Bandu Gunesena VP , , Dr Dushani Jayawardena Con Micro Biologist , Dr. Midzai Kader CCP ,Dr. Kaushalya ,Dr.Udula ,Dr sumudu Awanthi SR	
3.00 pm To 4.30 pm	NTRL	, Dr Dushani Jayawardena Con Micro Biologist , Dr. Midzai Kader CCP Dr sumudu Awanthi SR ,Dr. Kaushalya ,Dr.Udula	
5.00 pm To 6.00 pm	Central drug stores	Dr. Midzai Kader CCP Dr sumudu Awanthi SR ,Dr. Kaushalya ,Dr.Udula Mr. Lasitha Pharmacist	
11/07/19 7.30 am To 8.30 am	Chest clinic Kegalle Peripheral Lab and microscopic center and X ray unit	Dr. Suji Bandara DTCO Kegalle ,Dr Perera MO Dr. Kaushalya ,Dr.Udula OPD medical officers ,Nursing staff, PHLT staff , Assisting staff , PHI staff	Discussed at several points regarding operational system of a peripheral chest clinic
9.00 am To 3.30 pm	Field visit to MDR patient at Dareniyagala MOH area	Dr. Suji Bandara DTCO Kegalle Dr. Kaushalya ,Dr.Udula PHI	
12/07/19 9.30 am To 11.30 am	NPTCCD Auditorium	D/Director ,CP NPTCCD ,DTCO Colombo and Gampaha ,PMDT Coordinator ,SR –Dr Sumudu Awanthi ,Dr Ramachandra ,All medical officers in NPTCCD	DE briefing of the mission
1.0 pm TO 1.30 pm	Ministry of health Sri Lanka	DDG – PHS 1 ,D/Director Nptccd ,CP NPTCCD , DTCO Gampaha ,PMDT Coordinator ,SR –Dr Sumudu Awanthi	DE briefing of the mission

4.00 pm To 6.30 pm	WHO country office	D/Director Nptccd , DTCO Gampaha ,PMDT Coordinator ,	DE briefing of the mission
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