NATIONAL TUBERCULOSIS PROGRAMME

MYANMAR

ANNUAL REPORT

2015

June, 2017

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Abbreviations

ACSM	Advocacy, Communication and Social Mobilization
AD	Assistant Director
AFB	Acid-Fast Bacilli
AIDS	Acquired Immunodeficiency Syndrome
ARTI	Annual Risk of Tuberculosis Infection
BCG	Bacille Calmette Guerin
BHS	Basic Health Staff
CBTC	Community-based TB Care
CDR	Case detection rate
CNR	Case notification rate
DD	Deputy Director
DOH	Department of Health
DOT	Directly Observed Treatment
DOTS	Directly Observed Treatment Short Course
DST	Drug Sensitivity Testing
ELISA	Enzyme-Linked Immuno-solvent Assay
EPI	Expanded Programme of Immunization
ETB	Ethambutol
EQA	External Quality Assessment
FDC	Fixed-dose combination
FLD	First Line Anti-TB Drug
FHI 360	Family Health International 360
FM	Fluorescence Microscope
GDF	Global Drug Facility
GF	Global Fund
GLC	Green Light Committee
GPs	General Practitioners
HIV	Human Immunodeficiency Virus
HA	Health Assistant

HSS	HIV Sentinel Surveillance
HFN	High False Negative
HFP	High False Positive
IEC	Information, Education, Communication
INH	Isoniazid
IOM	International Organization for Migration
IPT	Isoniazid Preventive Therapy
IUALTD	International Union Against Tuberculosis and Lung Disease
JICA	Japan International Cooperation Agency
KAP	Knowledge, Attitude and Practice
LHV	Lady Health Visitor
LQAS	Lot Quality Assurance Sampling
LFN	Low False Negative
LFP	Low False Positive
LPA	Line Probe Assay
MDR-TB	Multidrug- resistant tuberculosis
MDGs	Millennium Development Goals
MGIT	Mycobacterium Growth Indicator Tube
MMA	Myanmar Medical Association
MMCWA	Myanmar Maternal and Child Welfare Association
MO	Medical Officer
MOHS	Ministry of Health and Sports
MHSCC	Myanmar Health Sector Coordinating Committee
MWAF	Myanmar Women's Affair Federation
MRCS	Myanmar Red Cross Society
MSF	Medecins Sans Frontieres
MWs	Midwives
NGOs	Non Governmental Organization
NAP	National AIDS Programme
NHL	National Health Laboratory
NTM	Non-tuberculous Mycobacteria

NTP	National Tuberculosis Programme
NTRL	National Tuberculosis Reference Laboratory
PHS II	Public Health Supervisor II
PSI	Population Services International
QC	Quality Control
RHC	Rural Health Centre
SCC	Short Course Chemotherapy
SOP	Standard Operational Procedure
STLS	Senior Tuberculosis Laboratory Supervisor
SDGs	Sustainable Development Goals
TL	Team leader
TOT	Training of Trainers
TSG	Technical Strategic Group
TMO	Township Medical Officer
TMOs	Township Medical Officers
UTI	Union Tuberculosis Institute
USAID	United States Agency for International Development
WHO	World Health Organization
XDR-TB	Extensively Drug Resistant Tuberculosis
3MDG	Three Millennium Development Goal Fund
3DF	Three Diseases Fund

NATIONAL TUBERCULOSIS PROGRAMME

ANNUAL REPORT (2015)

1. INTRODUCTION

Tuberculosis (TB) is one of the major public health problems in the world including Myanmar. Myanmar is one of the 30 high TB/TB/HIV/MDR-TB burden countries.

Taking the results of a nationwide TB prevalence survey (2009-2010) into account, World Health Organization (WHO) estimated in its Global TB Report 2015 that TB incidence in Myanmar was 369 per 100,000 population and TB prevalence was 457 per 100,000 population in 2014.

National Tuberculosis Programme (NTP) is functioning with 17Regional/State TB centers and 101 vertical TB teams. The NTP covered all 325 townships with DOTS strategy in November 2003 and all 330 townships including five new townships established in NayPyiTaw Union Territory in 2011. "Stop TB Strategy" was introduced in 2007 aiming to achieve the targets linked to the Millennium Development Goals (MDGs) by 2015.

The diagnosis of TB is primarily based on direct sputum smear microscopy. External Quality Assurance System (EQAS) for sputum microscopy has been introduced in Myanmar since 2006. At the end of 2015, 516 public and private laboratories were under EQA. NTP has introduced Fixed Dose Combinations (FDC) of first-line anti-TB drugs since 2004 and started using patient kits in 2010, as per WHO recommended treatment guidelines. Basic Health Staffs (BHS) closely supervise TB patients to take anti-TB drugs.

A pilot project for the management of MDR-TB was begun in July 2009 and has experienced great success. In order to address the high burden of MDR-TB in the country, the pilot project was expanded with the support of the Global Fund to fight AIDS, Tuberculosis and Malaria. By the end of 2015, MDR-TB diagnosis, treatment and care services were scaled up to 108 townships and entire Yangon Region was covered by MDR TB management. The rapid diagnostic test known as Gene-X-pert was introduced in 2011 and by the end of 2015 operational in 48 sites, mainly at Regional/State and District TB centers.

Regarding TB/HIV collaborative activities, the National TB/HIV coordinating body, organized in 2005, was reformed in 2012. TB/HIV collaborative activities were initiated in 7 townships in 2005 and scaled up to 236 townships in 2015. Under the surveillance system of National AIDS Programme (NAP), HIV sentinel surveillance (HSS) among new TB patients has been initiated in 5 townships since 2005. HSS townships are gradually expanded and reached to 28 in 2014. According to 2014 HSS, HIV prevalence among new TB patients was 8.5%. HSS has been planned to carry out once every two year since 2014.

Public-Public Mix DOTS activities have been implemented in four public general hospitals since 2007 with the support of Three Diseases Fund (3DF). NTP gradually scaled up to 24 public hospitals in 2015 with the support of the Global Fund (GF). Public-Private Mix DOTS activities have also been initiated since 2004-2005 in collaboration with NTP, Myanmar Medical Association (MMA) and Population Services International (PSI). Till the end of 2015, PSI implemented PPM DOTS activities with scheme III in 199 townships and MMA in 37 townships across the country.

Community-based TB care (CBTC) activities have been implemented by four local non-governmental organizations (NGOs) and six international NGOs (INGOs) since 2011 with the support of the GF. The Three Millennium Development Goals Fund (3MDG) has funded CBTC activities through 4 INGOs and 2 local NGOs since 2014.

NTP implemented TB control activities in line with the five-year National TB Strategic Plan in order to achieve the global targets and the MDGs. In 2015, NTP achieved a Case Detection Rate (CDR) of 81% and a Treatment Success Rate (TSR) of 85%. Myanmar NTP also achieved the MDG goals of halving TB prevalence and TB mortality in 2015 from 1990 situation.

2. OBJECTIVES OF NTP

General objectives

- To reduce the mortality, morbidity and transmission of TB, until it is no longer a public health problem
- To prevent the development of drug resistant TB
- To have halted by 2015 and begun to reverse incidence of TB

Specific Objectives

The objectives are set towards achieving the MDGs, 2015.

- To reach the interim targets of halving TB deaths and prevalence by 2015 from the 1990 situation. (MDGs, Goal 6, Target 6.c, Indicator 6.9)
- To reach and thereafter sustain the targets - achieving at least 70% case detection and successfully treat at least 85% of detected TB cases under DOTS (MDGs, Goal 6, Target 6.c, Indicator 6.10)

NTP applied the five-year Strategic Plan (2011-2015) according to the National Health Plan and Stop TB Strategy with financial and/or technical support of the government as well as WHO, the Global Drug Facility (GDF), UNITAID, the Global Fund, Japan International Cooperation Agency (JICA), United States Agency for International Development (USAID),the Union and 3MDG.

There are **six components** in the Stop TB strategy:

1. Pursue high quality DOTS expansion and enhancement
2. Address TB/HIV, MDR-TB and the needs of poor and vulnerable populations
3. Contribute to health system strengthening based on primary health care
4. Engage all care providers
5. Empower people with TB and communities through partnership
6. Enable and promote research

The end of 2015 marks the end of the MDG and Stop TB Strategy eras. In 2016, NTP is planning to set up the post 2015 development framework of Sustainable Development Goals (SDGs) and End TB Strategy. Its vision is a world free of TB and goal is to end the global TB epidemic. There are three pillars and 10 components in The End TB Strategy as follow;

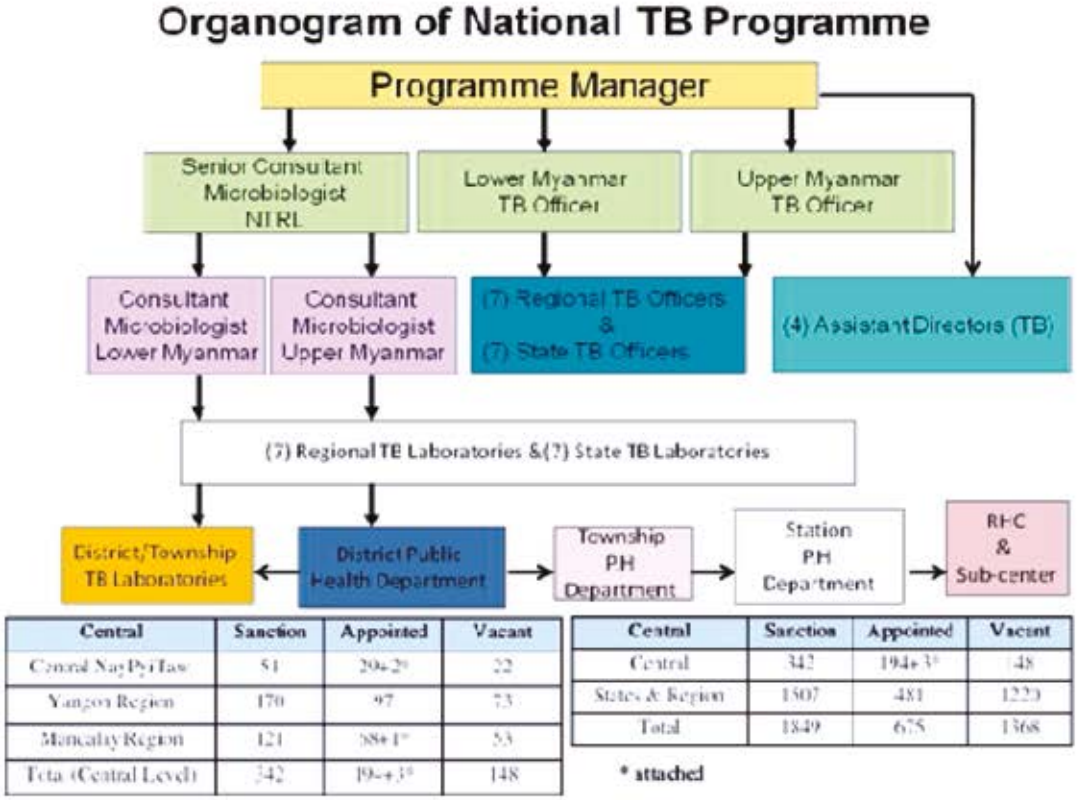
1. **Integrated patient-centered care and prevention**
    A. Early diagnosis of TB including universal drug-susceptibility testing, and systematic screening of contacts and high risk groups
    B. Treatment of all people with TB including drug-resistant TB and patient support
    C. Collaborative TB/HIV activities, and management of co-morbidities
    D. Preventive treatment of persons at high risk, and vaccination against TB

2. **Bold Policies and supportive systems**
    A. Political commitment with adequate resources for TB care and prevention
    B. Engagement of communities, civil society organizations, and public and private care providers
    C. Universal health coverage policy, and regulatory frameworks for case notification, vital registration, quality and rational use of medicines, and infection control
    D. Social protection, poverty alleviation and actions on other determinants of TB

3. **Intensified Research and Innovation**
    A. Discovery, development and rapid update of new tools, interventions and strategies
    B. Research to optimize implementation and impact, and promote innovations

3. HUMAN RESOURCES OF NTP IN MYANMAR

Figure 1; Organization set up of NTP



Central	Sanction	Appointed	Vacant
Central Nay Pyi Taw	51	29+2*	22
Yangon Region	170	97	73
Mandalay Region	121	68+1*	53
Total (Central Level)	342	194+3*	148

Central	Sanction	Appointed	Vacant
Central	342	194+3*	148
States & Region	1507	481	1223
Total	1849	675	1368

* attached

NTP is composed of 17 Region/State TB centers with 101 vertical TB teams, 47 District TB teams (40 led by Medical Doctors and 7 led by Health Assistants) and 54 Township TB teams (all led by Health Assistants).

Human resources situation of TB Laboratories, 2015

Human resources situation of TB Laboratories can be seen in annex-3. Additional laboratory personnel included: two microbiologists (WHO), 22 laboratory technicians (6-WHO & 16 MMA) and 5 STLSs (WHO)).

Table 1: Additional human resources for TB laboratory in 2015

Designation	Number	Duty station	Remark
Microbiologist	2	Yangon, Mandalay	WHO
STLS	5	Yangon, Pathein, Dawei, Lashio, KyaingTong	WHO
Lab technician	6	Yangon, Mandalay, Myeik	WHO
	16	Thingungyun, Kyimyindine, Thaketa, Mingalar Taung Nyunt Lashio, Magway, Taunggyi Maubin, Yaetarshay, Pyay Phyarpon, Pakokku Mawlamyaing, Mingalardon Dagon Seikan, Myitkyina	MMA

4. PROGRESS OF THE STOP TB STRATEGY

NTP always evaluates the programme's performances, achievements, weakness, challenges and constraints; and looks for best possible solutions to solve the problems. The annual evaluation reports have been published since 1999. The programme performances were reviewed according to the WHO-recommended Stop TB strategy to meet the MDG targets at the end of 2015.

4.1 Pursue high quality DOTS expansion and enhancement

4.1.1 Political commitment with increased and sustained financing

Since 2013-2014 budget years, Myanmar government has significantly increased the budget for TB control especially for the procurement of first- and second-line anti-TB drugs.

4.1.2 Early case detection through quality-assured bacteriology

Two sputum samples including one early morning specimen are examined to diagnose pulmonary TB by using binocular microscope with Ziehl-Neelsen stain. However, fluorescence microscopes (FM) using auramine stain have been used in some high workload areas such as Region/State or District TB centres and some township TB centres since 2012. There were 165 centres using FM across the country in 2015.

With regard to the quality assurance of sputum smear microscopy, NTP has covered EQA system in almost all TB laboratories including several private laboratories in the country. In 2015, altogether 482 laboratories were actively participated under EQA system.

Sputum culture and DST have been obtained at the National Tuberculosis Reference Laboratory (NTRL) in Yangon since 2001 and Upper Myanmar Tuberculosis Laboratory in Mandalay since 2008-2009. In 2010, the rapid TB, MDR-TB diagnostic methods such as Line Probe Assay (LPA) and liquid culture using Mycobacterium Growth Indicator Tube (MGIT) were introduced to Myanmar in both laboratories (in 2010). Moreover, a solid culture laboratory was established in Taunggyi, Shan State (South) in 2013. Two more solid culture laboratories will be established in Mawlamyine (Mon State) and Naypyitaw in the near future. Second-line DST has been introduced at NTRL since 2014 and UMTBC in 2015.

Molecular testing such as GeneXpert for rapid diagnostic testing of MDR-TB was introduced in the country since 2011. There were altogether 48 GeneXpert machines installed in the Region/State and District TB centres by the end of 2015. For the quality assurance, all Xpert machines are participated in the Global Laboratory Initiative (GLI) quality assurance verification panels for Xpert MTB/RIF.

Maintenance of quality for sputum AFB microscopy

Two sputum samples are examined for both diagnosis and follow-up in all townships. In each Region/State, one Senior Tuberculosis Laboratory Supervisor (STLS) is assigned for supervision, monitoring and quality control of Township TB laboratories and private TB laboratories within the respective Region/State. Panel testing is prepared by the National Health Laboratory (NHL) and facilitated by the assigned STLSs at Region/State TB centres twice a year. Five-day trainings for newly recruited STLSs and three-day refresher trainings for existing STLSs are provided every year.

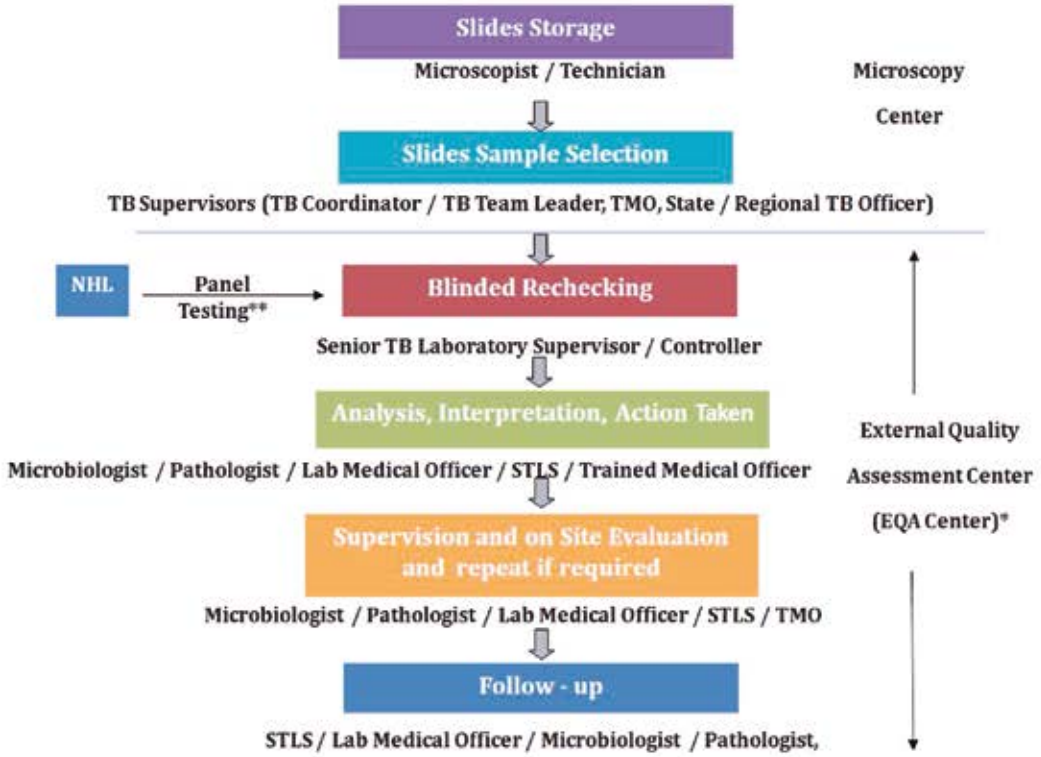
The microbiologists are responsible for supportive supervision and monitoring of Region/State TB laboratories and also for some township laboratories and private laboratories with major errors.

In 1999, NTP developed the framework for the implementation of EQA activities using conventional method in which all positive slides and 10% of the negative slides examined were checked. This method increased the workload of NTRL and Regional and State TB Laboratories.

Therefore, Lot Quality Assurance System (LQAS) was introduced in 2007 for EQA. The National Guideline on EQA-LQAS was developed in October 2007 and orientation training was given in February 2008. The training focused on random selection of slides per month to be sent to Regional and State TB centres for blinded re-checking, timely feedback to peripheral laboratories and corrective actions. Regional and State TB Laboratories became stand-alone quality control centres. Feed-back together with comments was sent back from Regional /State level to the township level. Quarterly EQA reports from all Regional and State TB centres were submitted to central NTP and copied to Consultant Microbiologist of National EQA Management Unit, NTRL.

The laboratories from INGOs (AHRN, International Organization for Migration (IOM), MDM, MAM, MSF-Holland, MSF-CH and PSI; local NGOs (MMA) and one private laboratory (Parami) sent slides either to respective Region/State TB laboratories or Lower or Upper Myanmar TB Laboratories.

Figure 2. Flow Chart of EQA System in Myanmar



The EQA system was successfully established with technical and financial support from JICA (Major Infectious Diseases Control Project) in 2007 at 53 townships, two hospitals, one diagnostic and referral centre of Yangon and at TB laboratories of Ayeyarwaddy, Bago, Magway and Mandalay regions; and Mon/Kayin, Shan (Taunggyi) states. EQA methodology coverage was expanded to 325 townships in 2010 using the National Guidelines on EQA-LQAS for AFB Microscopy. Nowadays, the EQA methodology covered all 330 townships.

Table 2: Laboratories under EQA (2008-2015)

Year	Tsp.	Township Lab.	Decentralized Lab.	Private Lab.	Total	Remark
2008	325	294	51	60*	405	
2009	325	276	31	60*	367	*** 35 labs. Dropped
2010	325	298	60	59#	417	
2011	325	303	77	78$	458	
2012	330	301	85	78ø	464	
2013	330	302	97	87@	486	
2014	330	309	112	93®	514	
2015	330	307	119	90^	516	

*** 35 labs. Dropped (25 expanded labs of Sagaing Region & 10 township labs of Shan State (Kengtong) were dropped due to several reasons)

NGO and private laboratories:

* 43 (PSI), 5 (IOM), 12 (MSF-H) for the whole country in 2009 *(60 labs in total)*

37 (PSI), 4 (IOM), 10 (MSF-H), 3 (MDM) 4 (MMA) and 1 Private Lab (Myodaw) for the whole country in 2010 *(59 labs in total)*

$ 49 (PSI), 4 (IOM), 13 (MSF-H), 1(MSF-CH), 4 (MDM), 1 (Malteser), and 6 (MMA) for the whole country in 2011 *(78 labs in total)*

°44 (PSI), 6 (IOM), 13 (MSF-H), 4 (MDM), 9 (MMA), 1 (AHRN) and 1 (Parami private Lab) for the whole country in 2012 *(78 labs in total)*

@ *47 (PSI)*, 5 (IOM), 14 (MSF-H), 4 (MDM), 13 (MMA), 2 (AHRN) and 1(Parami private Lab) and 1 (MSF-CH) for the whole country in 2013 *(87 labs in total)*

®*51 (PSI)*, 7 (IOM), 14 (MSF-H), 4 (MDM), 13 (MMA), 2 (AHRN) and 1(Parami private Lab) and 1 (MSF-CH) for the whole country in 2014 *(93 labs in total)*

^*40 (PSI)*, 7 (IOM), 12 (MSF-H), 4 (MDM), 17 (MMA), 4 (AHRN) and 1(Parami private Lab), 4 (MAM) and 1 (MSF-CH) for the whole country in 2015 *(90 labs in total)*

Decentralized Labs:

41 station hospitals, 16 PPM hospitals, 3 Diagnostic Centers for the whole country in 2010 *(60 labs in total)*

$ 57 station hospitals, 16 PPM hospitals, 4 Diagnostic Centers for the whole country in 2011 *(77 labs in total)*

° 62 station hospitals, 19 PPM hospitals, 4 Diagnostic Centers for the whole country in 2012 *(85 labs in total)*

@74 station hospitals, 19 PPM hospitals, 4 Diagnostic Centers for the whole country in 2013 *(97 labs in total)*

®85 station hospitals, 23 PPM hospitals, 4 Diagnostic Centers for the whole country in 2014 *(112 labs in total)*

®88 station hospitals, 27 PPM hospitals, 4 Diagnostic Centers for the whole country in 2015 (119 labs in total)

Table 3: EQA Finding in 2015

	Public Labs	NGO/private Labs	Total Labs
EQA Labs	426	90	516
Actively participated EQA Labs.	398 (93%)	84(93%)	482(93%)

In 2015, there were altogether 516 laboratories involved in the EQA network. Among them, 482 (93%) including both public and private laboratories actively participated under EQA network. The number of laboratories actively participated in 2015 was lower than that in 2014 (492 laboratories).

Table 4: Major and Minor errors of public and private Laboratories in 2015

Sr	Region/ State	MCs within R/S	Annual slides for EQA	Major Error		Minor Error			FP	FN	Concordance Rate (%)
				HFP	HFN	LFP	LFN	QE			
1	Mon	23	2156	2	4	0	0	3	2	4	99.58
2	Magway	31	3449	4	3	5	5	1	9	8	99.48
3	Bago	34	2734	4	5	0	6	4	4	11	99.31
4	Rakhine	19	1744	5	3	3	0	1	8	3	99.31
5	Kayin	10	955	4	0	0	0	4	4	0	99.16
6	Chin	10	1190	1	0	0	5	5	1	5	99.08

7	Kayah	7	735	0	0	3	3	1	3	3	99.05
8	Yangon	73	6668	16	50	6	10	3	22	60	98.73
9	Sagaing	62	5896	33	22	11	14	6	44	36	98.54
10	Mandalay	60	5533	18	18	19	15	14	37	33	98.48
11	Shan	69	6395	18	31	9	29	10	27	60	98.48
12	Ayeyarwady	43	3620	2	32	1	29	11	3	61	97.93
13	Kachin	27	2448	8	12	15	10	11	23	22	97.71
14	Tanintharyi	14	1198	1	8	8	8	6	9	16	97.41
Total		**482**	**44,721**	**116**	**188**	**80**	**134**	**80**	**196**	**322**	**98.66**

FP= False Positive (HFP= High False Positive or LFP= Low False Positive)
FN= False Negative (HFN= High False Negative or LFN= Low False Negative)
QE= Quantification Error

In 2015, the concordance rate for quality control of sputum AFB microscopy over the country was 98.66%. Among 518 errors (FP and FN) of all laboratories, there were 196 false positive slides (38%) and 322 false negative slides (62%) in 2015. Likewise in previous years, the number of false negative slides was significantly higher than false positive slides in 2015. The main reasons included that most of the laboratory technicians did not follow the standard operating procedures (SOPs) properly, especially in smear preparation, and did not spend enough time for inspection of slides.

Table 5: Quality control results for Public and Private Laboratories (2010-2015)

Year	Annual slides examined for EQA	FP (HFP+LFP)	FN (HFN+LFN)	Discordance rate
2010	32,515	229	457	2.10%
2011	35,418	113	485	1.70%
2012	36,707	131	494	1.70%
2013	44,367	152	466	1.39%
2014	45,407	160	360	1.14%
2015	44721	196	322	1.33%

The number of slides examined annually was increasing year by year till 2014, however, the number declined in 2015. The number of slides with false positive was increasing but those with false negative were decreasing compared to previous years. The discordance rate was slightly increased in 2015.

Table 6: EQA Achievement (2012-2015)

Year	Targeted MCs	Participated MCs	Annual slides for EQA	FP (HFP+LFP)	FN (HFN+LFN)	Concordance rate
2012	464	447	36707	131	494	98.3%
2013	486	472	44367	152	466	98.6%
2014	514	492	45407	160	360	98.9%
2015	**516**	**482**	**44721**	**196**	**322**	**98.7%**

Total number of microscopy centres to be involved in EQA network was slightly increased in 2015 but the number of private laboratories reduced. The number of laboratories participated in EQA and the number of annual slides check were reduced in 2015 compared to 2014. However, the concordance rate was not much different from previous years.

Table 7: Major errors and minor errors of public laboratories (2015)

Sr.	Category	MCs	Annual slides for EQA	Major Error		Minor Error			FP	FN	Concordance Rate %
				HFP	HFN	LFP	LFN	QE			
1.	TB Diagnostic Centres	4	322	1	0	0	0	1	1	0	99.69
2.	Township Labs.	302	31250	92	102	70	92	56	162	194	98.86
3.	Station Hospital Labs.	65	4689	7	34	2	15	5	9	49	98.76
4.	PPM Hospital Labs.	27	2370	7	21	2	8	2	9	29	98.40
Total		**398**	**38,631**	**107**	**157**	**74**	**115**	**64**	**181**	**272**	**98.83**

Total laboratories under public sector were 398 (302 township/station hospital laboratories, 4 TB diagnostic centres and 27 PPM hospital laboratories) in 2015. The number of township laboratories is reduced than previous year. Among 453 errors, false positive was 181(40%) and false negative was 272 (60%). The number of errors especially high false positive is a bit higher than that in 2014.

Table 8: Major errors and minor errors of private laboratories (2015)

Sr.	Category	MC	Annual slides for EQA	Major Error		Minor Error			FP	FN	Concordance Rate %
				HFP	HFN	LFP	LFN	QE			
1.	Parami	1	72	0	0	0	0	0	0	0	100
2.	MSF-H	9	1178	0	0	0	0	2	0	0	100
3.	IOM	6	378	0	0	0	0	2	0	0	100
4.	MSF-CH	1	96	0	0	0	0	0	0	0	100
5.	MDM	4	466	0	1	0	0	3	0	1	99.79
6.	MAM	4	215	0	0	1	0	0	1	0	99.53
7.	AHRN	4	227	0	1	0	1	1	0	2	99.12
8.	MMA	16	1071	2	12	1	6	2	3	18	98.69
9.	PSI	39	2387	7	17	4	12	6	11	29	98.32
Total		84	6090	9	31	6	19	16	15	50	99.05

NTP received the slides for EQA from 84 out of 90 private laboratories in 2015. The total number of private laboratories is reduced than that in 2014 (93). However, the slide concordance rate is 99.05% which is slightly improved than last year. Among 65 errors, false positive was 15 (23%) and false negative was 50 (73%). The number of errors is reduced in 2015. Among private laboratories, laboratories linked with PSI have more errors than other laboratories.

Table 9: Concordance Rate, major errors and minor errors of Regions and States by FM in 2015

Sr	Region/ State	MCs Conducted EQA	Annual slides for EQA	Major errors		Minor Error			FP	FN	Concordance Rate (%)
				HFP	HFN	LFP	LFN	QE			
1	Mon	5	720	0	0	0	0	0	0	0	100
2	Kayin	4	360	0	0	0	0	0	0	0	100
3	Sagaing	12	988	2	0	0	3	1	2	3	99.49
4	Bago	18	1459	3	2	0	4	0	3	6	99.38
5	Magway	12	1509	2	0	4	2	1	6	2	99.47
6	Yangon	25	2720	8	13	2	1	0	10	14	99.12
7	Kayah	3	539	0	0	3	2	1	3	2	99.07
8	Mandalay	26	3198	7	7	16	9	4	23	16	98.78

9	Shan	19	2118	2	11	2	13	2	4	24	98.68
10	Chin	1	72	1	0	0	0	0	1	0	98.61
11	Rakhine	9	615	5	3	2	0	1	7	3	98.37
12	Ayeyarwady	13	1113	1	8	1	11	6	2	19	98.11
13	Tanintharyi	4	412	1	2	2	3	1	3	5	98.06
14	Kachin	7	680	5	2	12	8	2	17	10	96.03
	Total	**158**	**16503**	**37**	**48**	**44**	**56**	**19**	**81**	**104**	**98.88**

Fluorescence microscopes were used in 158 laboratories during 2015. The concordance rate was 98.88% which was more or less the same as in 2014. Among 185 errors, there were 81 (44%) false positives and 104 (56%) false negatives. Likewise in 2014, Mon and Kayin states had no major error by FM (100% concordance). The highest number of major error was found in Kachin State.

Bio-safety level 3 laboratories and rapid TB diagnostic tests

The NTRL (Yangon) and UMTBL (Mandalay) were upgraded to bio-safety level 3 (BSL-3) with negative air pressure system to introduce newer and faster diagnostic tests for the detection of MDR-TB in July 2010.

Solid culture and DST takes about 10-12 weeks for diagnosing MDR-TB while liquid culture takes about three weeks and molecular testing such as LPA only three days. Thus, liquid culture and LPA techniques have been used in both BSL-3 laboratories to detect MDR-TB early. Since the solid culture is the gold standard, it is still used in some cases which need confirmation.

Liquid culture and drug susceptibility testing

Mycobacterium Growth Indicator Tube (MGIT) system uses liquid medium. **Liquid Culture can be done for both AFB smear positive and negative specimens.** Growth can be detected as early as 4 to 12 days. Negative tubes are discarded on the 42nd day.

Identification of M. tuberculosis

The growth from either solid or liquid media is tested for confirmation of *M. tuberculosis* with the lateral flow assay test strip or device in safety hood. The results are available within two hours.

Drug susceptibility testing (MGIT DST)

The drug susceptibility testing is performed in the same MGIT machine. The drugs tested are isoniazid, streptomycin, rifampicin and ethambutol. Results can be available within three weeks from the start of culture.

Molecular Testing

Genotype MTBDR plus Test (Hain Life sciences) is used. This test determined *M. tuberculosis* positivity and rifampicin/isoniazid resistance by Molecular Genetic Assay for identification of resistance to rifampicin and/or isoniazid of the *M. tuberculosis* Complex. Testing may be performed on DNA isolated from cultures as well as smear positive specimens.

Xpert MTB/RIF

Xpert MTB/RIF (GeneXpert) is aimed for rapid detection of TB and rifampicin resistance. It can be used on both smear-positive and smear-negative samples. A total of 48 machines were installed by NTP at the end of 2015. There were additional seven GeneXpert machines in Myanmar: three by MSF-H, one by MSF-CH (Dawei) and three by military hospitals. Following table shows GeneXpert machines distribution in Regions and States.

Table 10: List of GeneXpert machines in Regions and States (NTP), by year of installation and funding source

In 2011, UNION provided three GeneXpert machines which were installed in Upper Myanmar TB Centre. In 2012, CIDA supported two machines which were installed in Latha Diagnostic Centre and Mingalardon specialist hospital.

No.	Region/ State	2013			2014		2015	
		Global Fund	FHI360	UNITAID	Global Fund	PEFFAR	Global Fund	3 MDG
1.	Yangon (10)	(2) UTI, Latha Dx centre	(1) UTI	(1) North Okkalapa	(2) Thanlyin, Waibargi Specialist Hospital			(2) Latha Dx centre UTI
2.	Mandalay (7)				(3) Myingyan, Patheingyi TB Specialist Hosp, Meikhtila			(1) UMTBC
3.	Naypyitaw (1)					Pyinmana		
4.	Shan (S) (1)			Taunggyi				
	Shan (N) (1)			Lashio				
	Shan (E) (2)					Kengtong	Tarchileik	
5	Ayeyarwaddy (5)	Pathein			Myaungmya, Hinthada, Pyarpon, Maubin			
6.	Mon (2)	Mawlamyaing					Thaton	
7.	Bago (3)	Bago				Pyay	Taungoo	
8.	Rakhine (2)					Sittwe	Thandwe	
9.	Magway (2)			Magway	Pakokku			
10.	Kachin (2)					Myitkyina	Bahmaw	

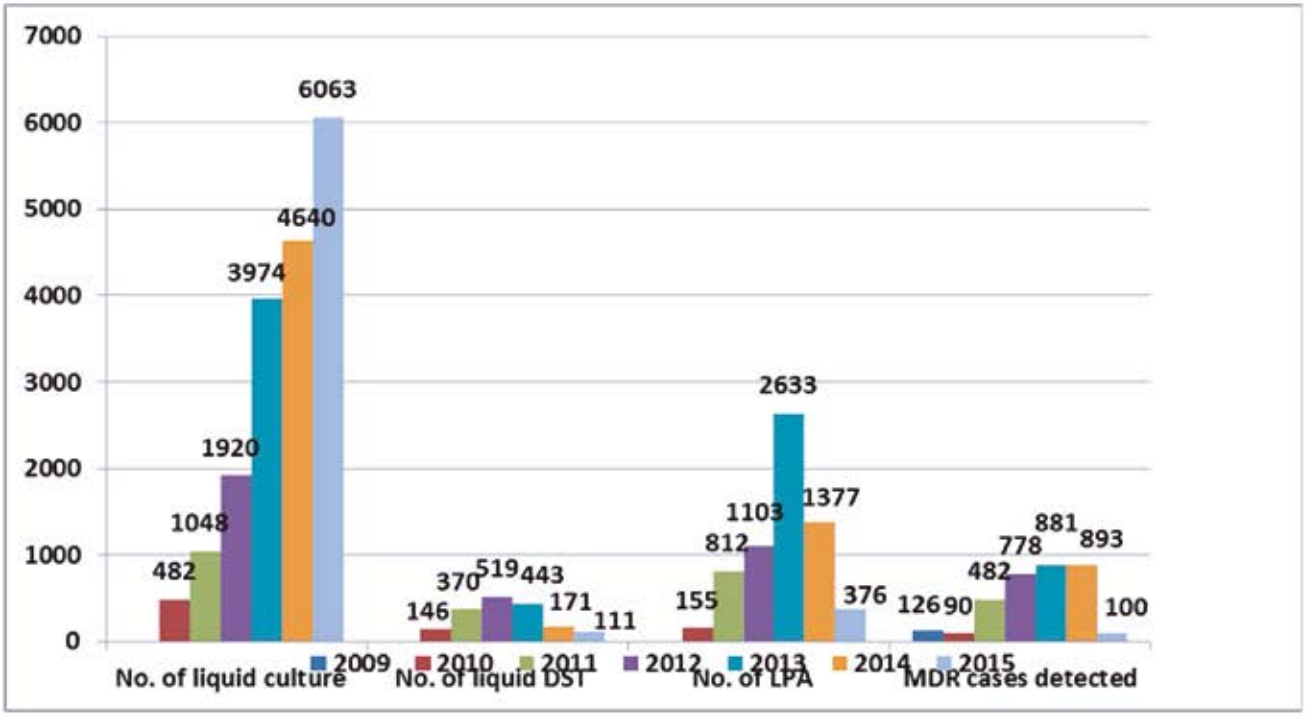
11.	Sagaing (3)	Monywa			Kalay, Shwebo			
12.	Kayin (2)					Hpa an	Myawaddy	
13.	Tanintharyi (3)				Myeik Dawei		Kawthaung	
14.	Kayah (1)				Loikaw			
15.	Chin (1)				Hakha			
Total (48)		**6**	**1**	**4**	**16**	**6**	**7**	**3**

GeneXpert Alert system

The NTP has initiated GeneXpert connectivity system (GxAlert system) with the support of Clinton Health Access Initiative (CHAI) in Myanmar since 2014. This system was aimed to improve monitoring of disease and device; to better manage supply chain performance and to accelerate results reporting,

This system was firstly installed in Latha TB diagnostic centre, Yangon as a pilot area in 2014. Then, the system was gradually scaled up to other sites and a total of 42 machines out of 48 could be expanded till the end of 2015.

Figure 3: Performance of liquid culture, liquid DST & LPA (2009-2015)



The figure shows culture and DST tests by year till 2015. The number of liquid culture increased every year. But, there was a steady increase in liquid DST and LPA till 2013 followed by a significant decrease in 2014 and 2015. The reason for this is the change in the diagnostic algorithm of MDR-TB and initiation of second line treatment for RR cases diagnosed by GeneXpert.

Table 11: Performance of liquid culture, liquid DST & LPA (2010-2015)

Tests	2010	2011	2012	2013	2014	2015
No. of liquid culture	482	1,048	1,920	3,974	4,640	6063
No. of liquid DST	146	370	519	443	171	111
No. of LPA	155	812	1,103	2,633	1,377	376
MDR detected	90	482	778	881	893	100

The number of liquid culture testing was increasing because of scaling up of MDR TB management and its uses in monitoring of patients' culture results. However, the uses of liquid culture, DST and LPA for diagnosis were decreasing because most cases were diagnosed with GeneXpert since 2014.

Table 12: Results of liquid culture (MGIT) in 2015

Quarter	No. of Culture(+)	No. of Culture(-)	No. of Contaminated specimens	Total
1st Q	73	1277	93	1448
2nd Q	100	1106	75	1285
3rd Q	72	1362	72	1514
4th Q	86	1633	64	1787
Total	**331**	**5378**	**304**	**6034**

Remark - remaining 21 specimens' results were non *Tuberculous Mycobacterium (UMTBC)*

Table 13: Among positive liquid cultures, results of liquid DST, 2015

Quarter	All sensitive	Mono-resistant	Poly-resistant	MDR-TB	Total
1st Q	14	7	4	2	27
2nd Q	6	4	2	4	16
3rd Q	22	5	5	7	39
4th Q	15	4	0	8	27
Total	**57**	**20**	**11**	**21**	**109**

Table 14: Line Probe Assay, 2015

Quarter	All sensitive	Resistant			NTM (TUB(-)ve)	Total
		IR	R	I		
1st Q	23	26	12	12	4	68
2nd Q	33	17	7	12	10	79
3rd Q	38	21	11	7	4	81
4th Q	33	44	7	3	6	93
Total	**127**	**108**	**37**	**34**	**24**	**321**

Table 15: Conventional culture and DST results, 2015

Quarter	All sensitive	Mono-resistant	Poly-resistant TB	MDR-TB	Total
1st Q	4	0	0	4	8
2nd Q	4	1	1	6	12
3rd Q	2	0	2	4	8
4th Q	3	1	0	3	7
Total	**13**	**2**	**3**	**17**	**35**

GeneXpert MTB/RIF testing results (2015)

Table 16: GeneXpert results, by age and sex, 2015

Male		Female		Total
< 15 years	> 15 years	< 15 years	> 15 years	
727	27033	640	13436	41836

Table 17: Sputum and GeneXpert results, by treatment history

		New	Retreatment	Unknown	Total
Sputum Microscopy	AFB (+)	5212	4573	279	10064
	AFB (-)	14677	14893	919	30489
	Not done	608	600	75	1283
Xpert MTB/RIF	Negative	11087	12401	770	24258
	TB, No RR	8296	5476	404	14176
	TB, RR	939	1948	91	2978
	TB, Rif indeterminate	175	241	8	424

Table18: Sputum and GeneXpert results, by HIV status

		HIV (+)	HIV (-)	Unknown	Total
Sputum Microscopy	AFB (+)	1364	3942	4758	10064
	AFB (-)	8755	7747	13987	30489
	Not done	416	276	591	1283
XPert MTB/RIF	Negative	7679	5596	10983	24258
	TB, No RR	2501	5135	6540	14176
	TB, RR	265	1093	1620	2978
	TB, Rif indeterminate	90	141	193	424

Table 19: Comparison of GeneXpert and sputum microscopy

	GeneXpert (TB)	GeneXpert (No TB)	Total
Microscopy AFB (+)	9807	257	10064
Microscopy AFB (-)	7347	23142	30489
Microscopy AFB (Not done)	424	859	1283

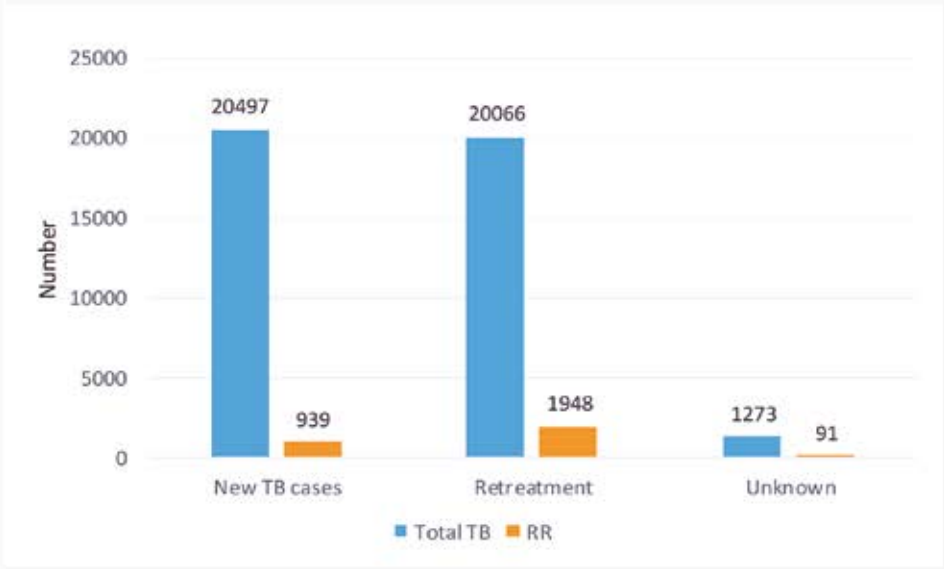
Table 20: Performance of GeneXpert in Myanmar, 2012-2015

	2012	2013	2014	2015	Total
Total cases tested	3,136	14,246	26,240	41836	85,458
No MTB	2,303 (73%)	8,895 (62%)	16,089 (61%)	24258 (58%)	51545 (60%)
MTB present	833 (26%)	5351 (38%)	10,210 (39%)	17578 (42%)	33972 (40%)
TB with RR*	259 (8%)	1,689 (12%)	2,631 (10%)	2719* (7%)	7298 (9%)
TB with no RR	556 (18%)	3,435 (24%)	6,986 (27%)	14176 (39%)	25153 (29%)
TB with Rif Indeterminate	18 (0.1%)	227 (2%)	534 (2%)	424 (1%)	1203 (1%)

- * Head count only, not included recheck RR+ Cases and duplication cases.

The number of GeneXpert tests (41836 samples) was significantly higher in 2015 than previous years. Among them, MTB was detected in 17578 (42%) including sensitive TB, resistant TB and TB with indeterminate RR. MTB with rifampicin resistance (RR) was detected in 2719 patients (7%).

Figure 4: Rifampicin-resistant TB cases detected through GeneXpert by treatment history (2015)



The proportion of RR among new TB patients was 5% (939/20497) which was similar to last year. However, the number of GeneXpert tests among new TB patients was significantly higher in 2015 because of expansion of criterias for GeneXpert testing particularly in Yangon and Mandalay regions (To test all registered TB cases). The proportion of RR among retreatment cases was decreased from 14% to 10% (1948/20066) in 2015.

Second-line drug susceptibility testing

NTRL, Yangon has started to introduce the second-line DST as a trial since January 2014 with injection Kanamycin, Capreomycin, Amikacin and Ofloxacilin. In 2015, both reference laboratories in Yangon and Mandalay performed 106 tests and found 24 pre-XDR TB and 14 XDR-TB cases. Total 24 specimens were sent to Antwerp Supra-national laboratory (Belgium) and found 4 XDR TB cases in 2015.

Case detection

Since Myanmar is one of the 30 high TB burden countries in the world, NTP has introduced innovative methods to accelerate TB case finding complementing routine passive case finding. TB case detection was carried out not only by direct sputum smear microscopy but also by chest radiography.

X-ray facilities are available in all Regional/State TB centres except Kayah state. Portable digital X-ray machines were also available in Yangon, Mandalay and Sagaing Regions as well as Rakhine and Shan (Taunggyi) States for mobile team activities with the support of the Global Fund. With support of 3MDG, six digital X-ray machines (including generators) were procured for NTP and were distributed to Ayeyarwaddy and Yangon Regions and Kayin, Shan (Lashio), Rakhine and Kachin State TB centres in early 2015. One digital X-ray machine has been set up in an IDP camp in Rakhine State since 2014.

The NTP has introduced Active Case Finding (ACF) activities since 2011 with the support of the Global Fund. The ACF activities included mobile team activities sputum collection centres (SCCs), community-based TB care activities and contact tracing.

The mobile teams with digital X-ray visit to hard-to-reach areas, urban poor areas, high case load, low case detection townships as well as prisons, mines and factories. Those teams were led by Region/State TB Officers or District TB team leaders. The teams also included medical doctors, X-ray technicians, laboratory technicians and BHS. Local authorities, community members as well as NGOs such as the Myanmar Maternal and Child Welfare Association (MMCWA) and the Myanmar Women Affairs Federation (MWAF) also aided in these mobile team activities. Each mobile team visit lasted for 3-5 days.

During the visit, people were firstly screened clinically, followed by radiology and sputum microscopy. People with TB symptoms (mainly cough more than two weeks and those with TB contact history) were primarily examined. However, other ailments were also examined, provided treatment and/or referred to secondary or tertiary hospitals. These activities were supported mainly by the Global Fund and 3MDG.

Table 21 shows mobile team activities conducted in the whole country during 2015. A total of 86,764 presumptive TB cases were examined with chest X-ray. Altogether 4,477 all form of TB cases including 788 bacteriologically confirmed cases were detected and given anti-TB treatment. The contribution of mobile team activity to nationwide case detection was 3.2%.

Table 21: Mobile team activities, Myanmar, 2015

Type of setting	Number of settings	No. of missions	No. of bacteriologically confirmed TB cases	No. of TB cases (all forms)	Funding source
Townships	90	53	207	902	Global Fund
Prisons	20	12	29	163	GF/3MDG
Townships	116	149	536	3332	3MDG
Mines	5	3	15	25	3MDG
Factories (NTP+MMA)	1	1	1	55	3MDG
Total		**218**	**788**	**4477**	

In 2015, 50 townships were selected for sputum collection centres. The BHSs from each RHC conducted sputum collection from presumptive TB patients, sent specimens to the township TB laboratory and provided anti-TB treatment as prescribed by TMO or TB team leader. This activity lasted for two weeks in each RHC, then, moved to another RHC within the selected township. The Global Fund supported transportation cost for sputum specimens. In 2015, 7334 presumptive TB cases were examined, among them 342 (all forms of TB) and 298 (bacteriologically confirmed) TB cases were identified through this activity. It contributed up to 3% (all forms) and 6% (bact. Confirmed) in the selected townships.

Initial home visits and contact tracing activities were conducted by BHSs in all townships across the country with Global Fund support. Family members and closed contacts of bacteriologically confirmed index cases were mainly traced. In 2015, more than 43,000 initial home visits were done by BHSs for contact tracing. From that, 10,152 presumptive TB cases were referred for sputum examination. Total 1387 all forms of TB

cases including 451 bacteriologically confirmed cases notified from this activity. It had 1% contribution to country case notification.

Community-based TB care activities (CBTC) were carried out by both international and local NGOs. Local NGOs (MMCWA, MWAF, Myanmar Red Cross Society (MRCS) and MHAA) have carried out this activity since 2011 with support of the Global Fund. Started from 2014 with 3MDG support, 6 NGOs strengthened the CBTC activities in many areas. In 2015, 30,114 presumptive TB cases were referred by the volunteers from local NGOs and gave anti-TB treatment to 5130 all form of cases. The international NGOs also carried out CBTC activities in selected townships. The volunteers referred 73,694 presumptive cases and notified 10,677 all forms of TB cases. This activity contributed 11.2 % to country case notification of the same year.

To intensify the case finding, TB screening among OPD attendees of PPM hospitals has been initiated since end of 2014. Six PPM hospitals (New Yangon General Hospital, Insein General hospital, East Yangon General Hospital, North Okkalapa General Hospital, Mandalay 300 bedded hospital, Hpa-an General Hospital) have being implemented this activity. At the same time, TB screening among diabetic patients were done at diabetic clinics of two PPM hospitals (North Okkalapa General Hospital and Mandalay General Hospital). In 2015, total 950 all forms of TB including 248 bacteriologically confirmed cases were treated for TB.

Under 5 children and pregnant women are high risk for TB. Active TB screening among those risk groups were done by BHS during AN and PN care and attending under 5 clinic. This was done in all townships across the country since January 2015. Total 149 and 4997 TB cases were detected among pregnant, lactating mother and under 5 children during 2015.

217,894 presumptive TB cases were screened for TB through ACF activities. Among them, 28,054 TB cases (all forms) could be detected early and provided anti-TB treatment in 2015. The accelerated case finding activities have contributed the national TB cases detection by 20% (28054/140700) in 2015.

Figure 5: Active case finding activities in 2015

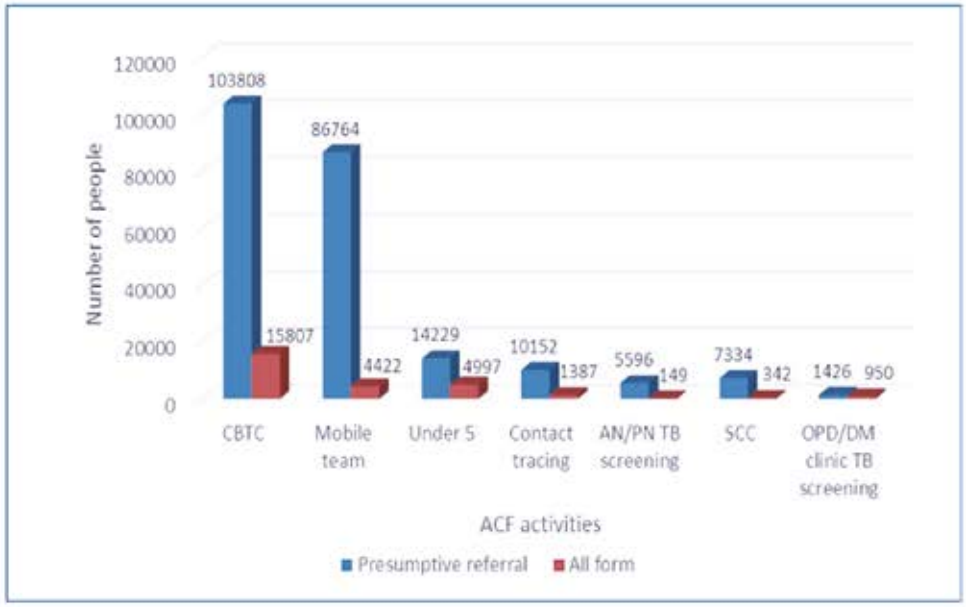
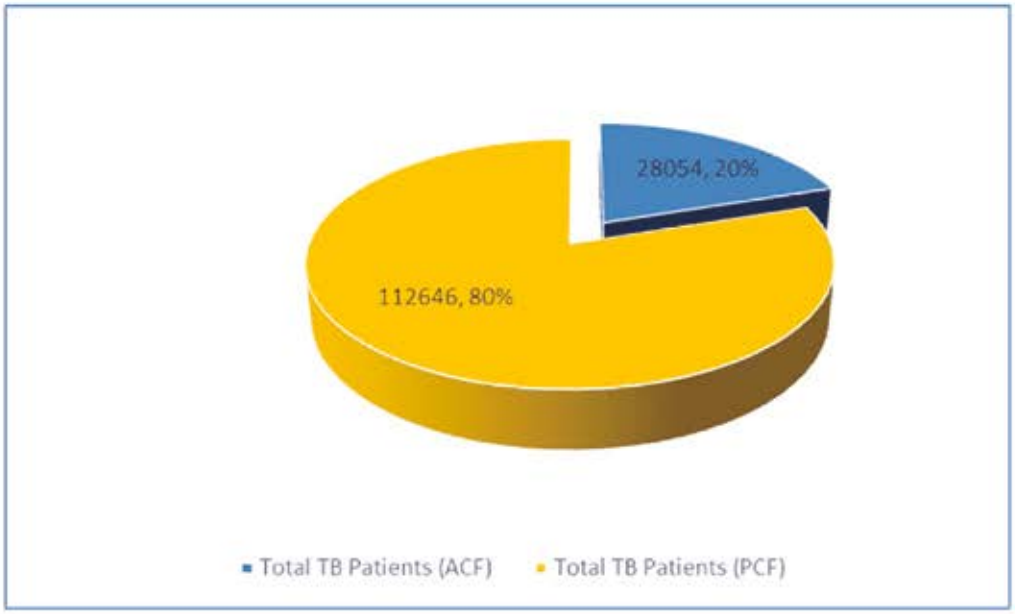


Figure 6: Proportion of TB case detection (ACF and PCF) in 2015



4.1.3 Provide standardized treatment with supervision, and patient support

The NTP has used standardized treatment regimen over the whole country according to WHO guideline. Directly observed treatment (DOT) is provided by a variety of treatment providers who received training. DOT providers are selected from trained volunteers or local BHS or family members of TB patients. The BHS supervises DOT providers and patients. Decentralization of anti-TB drugs to Rural Health Centre was also strengthened.

NGOs also supported NTP with provision of appropriate patient education, including information regarding the regimen, duration and treatment adherence as well as patient support (nutritional and social support) in some townships.

4.1.4 Effective drug supply and management

An uninterrupted supply of quality-assured anti-TB drugs is one of the main components of DOT strategy. Drugs, laboratory supplies and equipment for NTP are mainly supplied by the Government, GDF, the Global Fund and UNITAID . The Standard Operating Procedure (SOP) for drug and supplies management was already developed and distributed up to township level and the trainings were also provided.

NTP supplies anti-TB drugs, laboratory supplies and equipments on a quarterly basis. The Central Medical Store in Yangon distributes drugs and supplies to the Upper and Lower Myanmar stores based on consumption. Upper Myanmar TB Store distributes to (9) Regional/State TB Centres (Mandalay, Magway, Shan(S), Shan(N), Kayah, Chin, Kachin and Sagaing) and Nay Pyi Taw Union Territory. Similarly, Lower Myanmar TB Store distributes to (8) Regional/State TB centres (Yangon, Ayeyarwaddy, Bago, Mon, Kayin, Rakhine, Shan (S) and Tanintharyi). Regional/State TB Centres distribute drugs to respective township quarterly. At township level, Township Health Department distributes monthly to RHC level. Drugs transportation cost has been provided by the GF since 2011.

NTP also supplies drugs to partners on quarterly basis based on their quarterly reports. PSI collects drugs from the Lower Myanmar Store and distributes to their PPM clinics across the country. AHRN, MAM, MDM, MSF-Holland, MSF-CH, PSI, SMRU and MMA collect drugs from the Region/State/Township where they are implementing.

Global Drug Facility (GDF) mission (2015)

The Global Drug Facility Mission (2015) was conducted from 7th to 14th July 2015 by Dr Luis Gustavo do Valle Bastos, Senior Technical Advisor, SIAPS and Dr Kaspars Lunte, Team Leader Sourcing and Special Projects, GDF. Mission visited Yangon, Mandalay and Sagaing Regions NTP sites.

The mission objectives included

- to review GDF support with key officials
- to review adherence to GDF terms and conditions of support
- to do Follow-up on recommendations made by the GDF Technical Review Committee (for grant only) or previous year GDF mission
- to provide hand-on technical support in drug management aspects and determine the areas for further capacity building, technical and/or financial support and
- to estimate drug needs for the next year in a view of ensuring the country has an uninterrupted supply of TB drugs in line with Global Fund grants and concept note as well as domestic funding budget

The mission found the following important findings:

- Significant scale up of MDR TB patient treatment, hiring of dedicated warehouse personnel and successful introduction of pilot phase of the LMIS system (mSupply) in NTP.
- Capacity of the current air conditioning equipment doesn't ensure maintenance of proper temperature in all drug stores visited at regional and state level. The temperatures especially in hot summer months significantly exceed the recommended storage condition of the medicines. Suggested action: to add voltage regulator and/or stabilizer and replace current ACs with ones with higher output capacity.
- The storage space in Central Drugstore is not possible to increase further, therefore outsourcing of the warehousing capacity is required, especially in the light of large incoming shipments in October and November 2015; also the Lower Myanmar drug store capacity would benefit of the outsourcing.
- TB hospital in Mandalay requires connection to power supply (generator exists, but the fuel and connection costs need to be covered).
- Lack of human resource (so many vacancies) in most of the visited sites of National Tuberculosis Program
- Overcrowded workspace and limited storage space in Sagaing regional TB center.

Recommendations include;

- To increase number of PMDT townships
- To finalize national plan for bedaquiline introduction
- Assess infrastructure required for the GeneXpert future expansion sites
- To finalize with partners plan for joint public health medicines warehouse construction and prioritize this, while temporary outsourcing adequate premises
- To scale up m-Supply introduction for inventory management by the end 2015 (with implementation of few earlier mentioned improvements), and interlink it with Quan-TB for the quantification and early stock out, overstock and expiry warning
- To replace current air conditioning system with new more powerful equipment at regional and state stores
- Install backup generator in Upper Myanmar store and ensure fuel and connectivity with available generator in Mandalay TB hospital store
- Additional storage capacity was identified for Upper Myanmar store. Minor renovation and reorganization of keep cool items is required.

4.1.5 Monitoring, supervision and evaluation

In order to measure progress with programme implementation, impact of intervention and to achieve the MDGs target, NTP strengthened monitoring, supervision at all levels and evaluation periodically.

Recording and reporting NTP used standardized recording and reporting format at all levels. The revised recording and reporting framework according to new TB definitions of WHO has been utilized since 1st January 2014 after provision of trainings.

The reports from basic DOTS units were sent to Townships, then to Region/State level. At Region/State level, these reports were checked, verified and entered in an excel worksheet, compiled and sent to central NTP. All the implementing partners also provided required reports to NTP central and respective Regional/State TB centres.

At central level, all the reports received were verified, computerized, and after evaluation of these data, appropriate clarification and feedbacks were given to respective region or state. The performance and impact were also assessed at central level using long term trends on case finding by notified age and sex distribution of patients.

The capacity and skill for proper data management and information management system was improved by providing trainings at all level every year. NTP provided adequate standardized recording and reporting forms to ensure timely reporting of all care providers delivering TB care according to the Stop TB Strategy.

Supervision

The central NTP always monitors the quarterly report of Regional/State TB centres and usually conduct the supported supervisory visits to Regional/State TB centres, MDR-TB project townships, TB/HIV project townships as well as PPM hospitals once a year.

Likewise, the Regional/State TB centres always monitor the quarterly reports of the respective townships. Then, the Regional/State TB officers conduct supervision to all townships once a year and the District TB team leaders supervise once a quarter. The National Technical Officers also conduct supervisory visits to assist the Regional/State TB officers. During the visits, on-the-job training is also provided. TMOs or TB coordinators supervise DOT supervisors at RHC once a month.

The microbiologists from Upper and Lower Myanmar supervise Regional and State TB laboratories at least once a year. Senior TB Laboratory Supervisors (STLSs) also go township laboratories for regular supervision and whenever there is major error.

The detailed supervision visits are shown in the following Table 16.

Table 22: Supervisory visits down to grassroots level (2015)

Level of supervision		No. of townships/hospitals		
		Planned	Supervised	Achievement
Central to	Regional/State/District TB Centres and TB/HIV, MDR-TB townships	63	29	46%
	Border townships	10	3	30%
	PPM hospitals	28	16	57%
Region/State to townships		320	261	82%
Microbiologists supervision		10	19	190%
NTO supervision		229	242	106%
STLS supervision		55	71	129%
CBTBC supervision		78	76	97%

Evaluation

The annual evaluation meetings with stakeholders were held at the Central level and Region/State levels. The quarterly evaluation meetings for low case detection townships and the cohort review meetings for low treatment success rate are carried out every quarter. In 2015, altogether 275 townships held quarterly evaluation meetings and 50 townships carried out quarterly cohort review meetings.

National Annual Tuberculosis Evaluation Meeting, 2015

National annual TB evaluation meeting was held in Nay Pyi Taw from 23-24 May 2016. This meeting was funded by the Global Fund.

The objectives of this meeting were

(1) to evaluate fulfillment of recommendations of previous annual evaluation 2014
(2) to evaluate strength and weakness of TB control activities in Regions/States and townships during 2015
(3) to review the situation of TB control activities by implementing partners (NGOs & INGOs)
(4) to set up the future plan for TB control


Figure 7: Deputy Director General, Department of Public Health delivering the opening speech at the 2015 National Annual TB Evaluation Meeting

The opening speech was delivered by Dr. Yin Thandar Lwin, Deputy Director General, Department of Public Health, Ministry of Health and Sports. She highlighted the current TB situation, implementation conditions, human resource development and funding availability. Moreover, she urged to consider appropriate ways forwards of TB control programme and try hard to achieve the targets.

Dr. Si Thu Aung, Deputy Director, National Tuberculosis Programme, presented the accomplishments against the recommendations of the 2014 Annual Evaluation Meeting, objectives of NTP, targets, strategies and activities, human resource situation especially vacant posts, NTP's achievements including partners' contribution in 2015, challenges and future plan including National Strategic Plan (2016-2020).

Dr. Yin Thandar Lwin, Deputy Director General, Dept. of Public Health discussed about Universal Health Coverage (UHC) in Myanmar and Sustainable Development Goals . After that, Regional/State TB officers presented about achievements and challenges of TB control activities in their respective Regions/States.

After the presentations, Dr. Thandar Lwin highlighted infection control measures to be implemented together by both medical care and public health services especially for MDR TB cases to be admitted in an isolated ward. She also emphasized about counseling for treatment adherence. Then, Dr. Si Thu Aung discussed vacant laboratory technicians to be filled by NHL and to detect more adult TB cases in townships where childhood TB cases increased. He also urged to assess carefully on TB/HIV patients for ART. Dr. Hla Hla Kyi, Director, Department of Public Health, Nay Pyi Taw council area highlighted to include local authorities in MDR TB committee to get political commitment. Professor Tint Tint Kyi, Nay Pyi Taw (1000) bedded hospital pointed out to detect more TB cases among PLHIV, Diabetics and Alcoholics. Dr. Thandar Hmun, Medical Superintendent, Aungsan TB hospital, discussed to set up policy and law enforcement for refusal of DR TB treatment despite repeated counseling by health staffs.

The discussion was followed by the presentations of NGOs on community based TB care activities. Then, Dr. Thandar Lwin pointed out to avoid overlapping in some townships

for active case finding; to use community volunteers effectively in an integrated approach for three diseases (TB, HIV and malaria); to conduct operational research and to provide proper training for school health team because of high childhood TB cases among above five children.

On Day 2, Daw Aye Aye Sein, Deputy Director General (Administration and Finance), Department of Public health presented about e-Health. Then, Dr. Thuzar Chit Tin, Director (Health Promotion), Department of Public Health discussed a review on vital registration. Dr. Thandar Lwin pointed out to avoid under reporting despite an improved recording and reporting system. She also urged the Global Fund to support on improving e-Health and Vital registration system.

Then, representatives from PSI and MMA presented public private mix (PPM) DOTS activity. Dr. Si Thu Aung also presented the summary of achievement on PPM DOTS within 2015. He described to expand PPM DOTS according to National Strategic Plan.

After that, the panel discussion on PPM was made with the following topics.

1. How to strengthen infection control measures in clinics
2. How to reduce lost-to-follow up and not evaluated cases in PPM
3. How to improve HIV counseling and testing (HCT) and strengthen referral for TB/HIV patients
4. How to strengthen referral for MDR TB patients
5. How to introduce mandatory case notification from private and public sector
6. How to engage more GPs to involve in PPM

For topic (1), Dr. Thandar Hmun discussed to organize a committee for infection control in every hospital, having plan and guideline for systematic implementation, daily inspection, proper waste disposal and provision of training to hospital staff according to infection control guideline or SOP.

For topic (2), Dr Phyu Phyu Swe (PSI), mentioned the current PSI activities which were emphasized on case holding rather than case finding; expansion of community based TB care activities; support for sputum transportation cost and sending short message (SMS) whenever TB patients take anti-TB drugs through mobile phone for treatment adherence.

For topic (3), Dr. Thet Naing Maung (MMA), mentioned TB control activities of MMA including HIV testing and counseling among all registered TB patients andreporting system.

For topic (4), Dr. Tin Mi Mi Khaing pointed out the gap to meet the target for GeneXpert testing and expansion of GeneXpert testing criteria in order to diagnose more MDR TB cases.

For topics (5) and (6), Dr. Si Thu Aung discussed mandatory reporting on TB and MDR-TB patients by both public and private sectors; enforcement of communicable disease law; framework for training to private sectors and to follow national guideline.

Group discussion was made on challenges, possible solutions and ways for improvement regarding MDR-TB, TB/HIV, Childhood TB, Accelerated Case Finding (ACF) and Community Based TB Care (CBTBC). Dr. Hla Hla Kyi discussed the importance of infection control, involvement of general practitioners, training ofvolunteers for DOT provision to improve case holding. Dr. Thandar Lwin also highlighted availability of GeneXpert machines at all district level and manpower necessity especially laboratory technicians. .

Then, in the afternoon, group work discussion was done on Active Case Finding, MDR-TB management, TB/HIV collaboration and Childhood TB management.

Recommendations were agreed as follows:

1) To fill vacant posts; Regional/State TB Officers/ Assistant Director (TB/Leprosy), District Team leader(TB/Leprosy), Deputy township public health officer (Disease control), Township Team leader (Disease Control) , and Lab technicians.
2) To initiate mandatory notification on drug sensitive and drug resistant TB cases from both private and public sectors in the communicable disease law
3) To strengthen MDR-TB case detection by conducting GeneXpert advocacy meeting and training
4) To strengthen systematic sputum transportation system
5) To develop infection control plan and intervention according to SOP at all health care facilities To conduct TB screening among all health care providers annually
6) To expand GeneXpert diagnostic centers up to all districts and high HIV burden townships based on TB/PLHIV caseload
7) To strengthen ACF & Health Education activities through **integrated mobile teams** at urban slum areas, hard to reach areas, mines, prisons, migrants population etc. To conduct national review and effective planning for ACF (action to be taken by NTP)
8) To assign focal person on both NTP & NAP at township level to strengthen referral and feedback mechanism for ART services
9) To establish MDR-TB case based e-Recording & Reporting (Open MRS) link with National e-Health System
10) To strengthen collaboration with Department of Medical Research (DMR) and implementing partners to conduct operational and implementation research according to prioritized research agenda
11) To strengthen the joint supervision and monitoring to partners' implementation sites
12) To improve the Childhood TB management by providing training on revised Childhood TB guideline and Chest X Ray interpretation for Medical officers including school health team, PPM hospital/clinic
13) To adopt the WHO recommendation concerning on second line drugs LPA & Shorter MDR-TB treatment regimen after consulting with national DR-TB expert committee

14) To establish Nay Pyi Taw Union Territory TB Center, Yangon Regional TB Center & Mandalay Regional TB center according to the new organization setup

15) To conduct review meeting on CBTBC activities

Regional and State TB evaluation meetings

Annual Regional/State TB evaluation meetings were carried out at all Regions and States with support of the Global Fund.

Table 23. TB Annual Evaluation meetings at Regional/State level (2015)

Regional/State	Date	No. of participants	Funding
ShanState (Taunggyi)	21.3.16	49	GF
Kachin State	26.2.16	55	GF
Yangon Region	5.4.16 to 7.4.16	155	GF
Shan State (Lashio)	26.3.16	82	GF
Kayah State	10.3.16	25	GF
Taninthayi Region	26.3.16	24	GF
Mandalay Region	16.3.16	40	GF
Shan State (Kengtong)	13.3.16	45	GF
Naypyitaw Council Area	15.3.16	42	GF
Mon State	2.4.16	32	GF
Kayin State	26.3.16	19	GF
Bago Region	6.5.16	58	GF
Magway Region	22.3.16	54	GF
Ayeyarwaddy Region	25.3.16	52	GF
Sagaing Region	29.3.16	80	GF
Rakhine State	22.3.16	37	GF
Nay Pyi Taw (Central)	23.5.16 to 24.5.16	100	GF

Table 24: Quarterly TB Evaluation Meetings and Cohort Review Meetings held in townships, by state/region (2015)

Region/State	Townships held Quarterly TB Evaluation Meetings	Townships held Cohort Review Meetings
Kachin State	9	4
Kayah State	5	3
Shan State (South)	10	4
Shan State (East)	5	4
Shan State (North)	8	4
Mon State	6	4
Kayin State	6	4
Rakhine State	9	4
Mandalay Region	9	8
Yangon Region	9	8
Sagaing Region	14	5
Magway Region	9	4
Bago Region	13	3
Ayeyarwaddy Region	13	8
Tanintharyi Region	9	4
Nay Pyi Taw Union territory	1	-
Total	**135**	**71**

4.2 Addressing TB/HIV, MDR-TB and other challenges

4.2.1 TB/HIV collaborative activities

The central coordinating body for collaborative TB/HIV activities was established in 2005 and strengthened it in 2012. This coordinating body was also established at Region/State, District and Township levels to be functioning according to the scale-up plan every year.

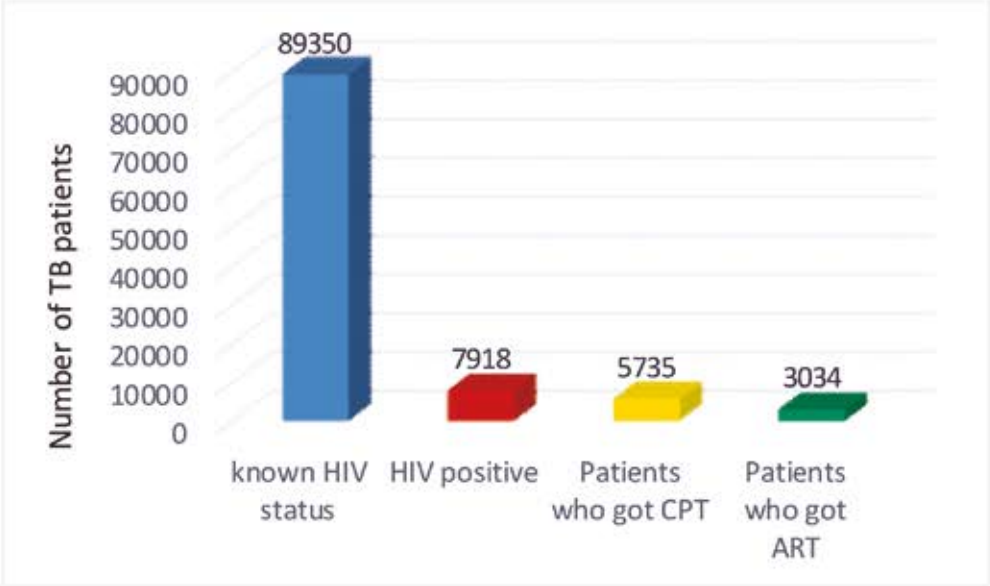
In order to reduce the burden of TB in people living with HIV (PLHIV) ;initiating early anti-retroviral treatment (ART), intensifying TB case finding among PLHIV patients t, initiating TB prevention with Isoniazid Preventive Therapy (IPT) and ensuring infection control in health-care facilities are carried out in all project townships.

To reduce the burden of HIV in diagnosed TB patients, Provider Initiated HIV Counseling and Testing (PICT), provision of HIV preventive interventions, treatment and care, provision of co-trimoxazole preventive therapy (CPT) and ART for HIV-positive TB patients were also conducted.

To determine the HIV prevalence among TB patients, HIV testing among new TB patients has been conducted under the HIV Sentinel Surveillance System of the National AIDS Programme since 2005. Cross referral system between NTP and NAP has been developed and the recording and reporting framework was also standardized.

Through these above approaches, up to 236 townships could be scaled up for TB/HIV collaborative activities in 2015. Among the 118,335 TB patients registered in these project townships (including partners), 89,350 (76%) had their HIV status recorded. Of them7,918 (9%) were HIV sero-positive. Out of all TB/HIV co-infected patients, 5,735 (73%) received CPT and 3,034 (38%) received ART in 2015.

Figure 8: TB/HIV collaborative activities in (236) project townships (2015)



The annual evaluation meeting TB/HIV collaborative activities was held in Nay Pyi Taw on 28 December 2016. The objectives of this annual meeting were:

1) To assess the fulfillment on recommendation of previous annual TB-HIV evaluation meeting
2) To evaluate strength and weakness of TB-HIV collaborative activities
3) To set future plan for TB-HIV control activities

During this meeting, the opening speech was delivered by Dr. Than Win, Deputy Director General (Disease Control). At first, both programme managers of NTP and NAP presented the overall view of TB/HIV collaborative activities. Since 2013, NTP provided Isoniazid for IPT; related recording and reporting forms and registers were distributed to all TB/HIV implementing townships. In 2015, NAP procured Isoniazid for IPT and NTP contributed forms and registers for recording and reporting. After that, one representative from both programmes of regions/states and implementing partners presented the TB/HIV collaborative activities' achievements, challenges, possible solutions and future plans. After thorough discussions, the following recommendations were formulated:

1. To have more ART coverage for TB/HIV patients
2. To strengthen referral and feedback mechanism between TB and HIV clinics
3. To fill up the staff vacancies at all levels according to new organization set up
4. To support capacity building of NTP/NAP staff and all health care providers including implementing partners (IPs) who care TB/HIV patients
5. To improve the infection control measures in health care facilities
6. To conduct advocacy meeting with clinicians & implementing partners for early initiation of ART during TB treatment
7. To organize central level Monitoring and Evaluation meeting to review & revise existing TB/HIV R & R forms during January 2017
8. To review and develop TB/HIV new IEC materials
9. To initiate electronic medical recording system to strengthen tracking TB-HIV patients between NTP, NAP and all IPs
10. To conduct operational and implementation research on factors influencing ART treatment initiation of TB/HIV patients in townships with low ART coverage among TB/HIV patients
11. To report on TB/HIV activities to NTP and NAP by all IPs who care TB/HIV patients

HIV Sentinel Surveillance (HSS)

Since 2005, the routine HIV Sentinel Surveillance (HSS) was conducted by NAP. The new TB patients have been included since 2005; 10 sites in 2006, 2007 and 2008; 15 sites in 2009, 20 sites in 2010 and 2011, 25 sites in 2012 and 28 sites in 2013 and 2014, but skipped in 2015. However, the survey will be conducted every two years starting from 2016.

Figure 9. Trend of HIV prevalence among new TB patients (2005-2014)

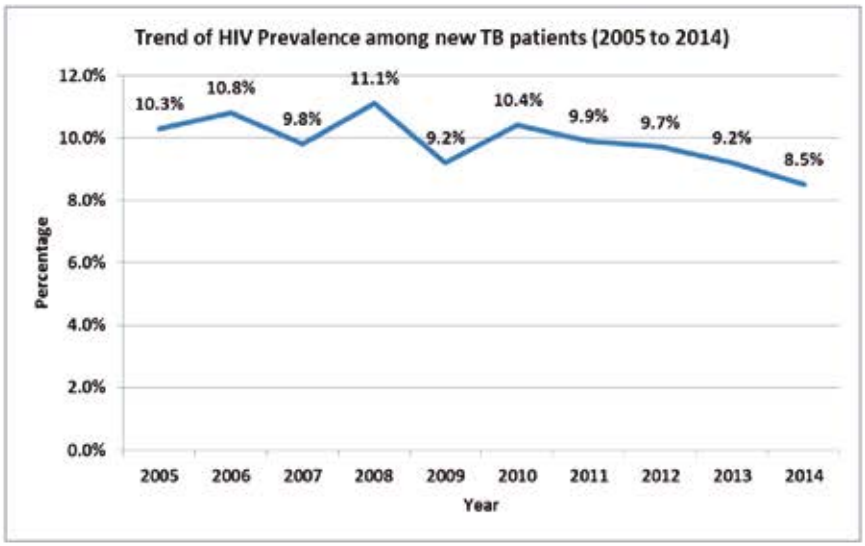


Table 25: HIV prevalence among new TB patients, Myanmar HSS (2005- 2014)

No.	Sentinel site	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Yangon	11.30%	8.70%	8.70%	4.67%	5.30%	6.70%	8%	12.80%	8.70%	4.00%
2	Pyay	16.70%	10.70%	3.30%	16.67%	11.30%	14.00%	10%	8.70%	16.00%	19.30%
3	Bago		11%	10.70%	9.33%	8.70%	11.30%	6%	7.30%	8.00%	6.00%
4	Hpa-an	3.30%	3.30%	6.70%	8.67%	4%	8.00%	7.30%	12%	9.30%	2.00%
5	Nyaung U	9%	9%	7.30%	6.67%	10.20%	7.50%	4.70%	7.30%	4.70%	3.30%
6	Magway		1%	6%	8.67%	9.30%	0.70%	6.70%	4.70%	10.30%	5.30%
7	Monywa		23%	16.10%	28.77%	26.10%	27.90%	12.70%	12.60%	10.30%	4.80%
8	Myeik			15.30%	7.33%	5.30%	8.00%	10%	6.70%	4.70%	4.00%
9	Pathein		6%	9.30%	7.33%	4.70%	4.00%	12%	12%	6.00%	5.30%
10	Mawlamyine		15%	14.70%	13.33%	14.70%	16.00%	14%	10.70%	12.70%	13.30%
11	Tachileik					14.70%	8.70%	8.50%	10.30%	5.20%	15.60%
12	Sittway					3.30%	2.00%	2%	9%	3.70%	
13	Loikaw					2%	10.70%	8.70%	13.60%	11.70%	3.50%
14	Hinthada					6.80%	6.00%	10%	10%	10.00%	6.00%
15	Pyinmana					13.40%	8.00%	12%	9.60%	0.00%	20.60%
16	Dawei						5.20%	7.50%	2.70%	2.20%	9.90%
17	Myingyan						11.00%	15.30%	18.70%	14.70%	10.70%
18	Taungoo						14.20%	12.70%	5.50%	7.30%	9.30%
19	Meikhtila						20.70%	11.30%	6%	9.30%	8.70%
20	Bahmo						24.10%	19.10%	19%	22.10%	22.50%
21	Myaungmya								7.30%	8.00%	8.00%
22	Shwebo								8.70%	17.30%	8.20%
23	Pyinoolwin								10.40%	28.90%	8.00%
24	Kengton								10.60%	28.90%	1.40%
25	Maubin								11.30%	13.80%	6.70%
26	Myawaddy									10.40%	11.00%
27	Kalay									3.30%	6.10%
Total		**10.30%**	**10.90%**	**9.80%**	**11.10%**	**9.15%**	**10.40%**	**9.90%**	**9.70%**	**9.20%**	**8.50%**

Isoniazid Preventive Therapy (IPT)

Isoniazid Preventive Therapy project was started in June 2009 in (9) townships and expanded to 15 townships in 2012, 28 townships in 2013 and 136 townships in 2014. IPT became a national policy in Myanmar in 2013. In order to carry out IPT for PLHIV by NAP teams, NTP previously provides logistics such as Isoniazid, recording and reporting forms to NAP and implementing partners through TB teams. Starting from 2015, Isnoiazid was procured by NAP. The monitoring and evaluation of TB/HIV collaborative activities including IPT was carried out jointly by NTP and NAP, but still weak. The whole country will be covered in 2016.

During 2015, 35 townships sent quarterly IPT reports. A total of 10,345 PLHIV were enrolled under care of NAP in these townships; of them, 8,781 (85%) received TB screening. To 1,515 PLHIV (out of 8,781; 17%), IPT was given.

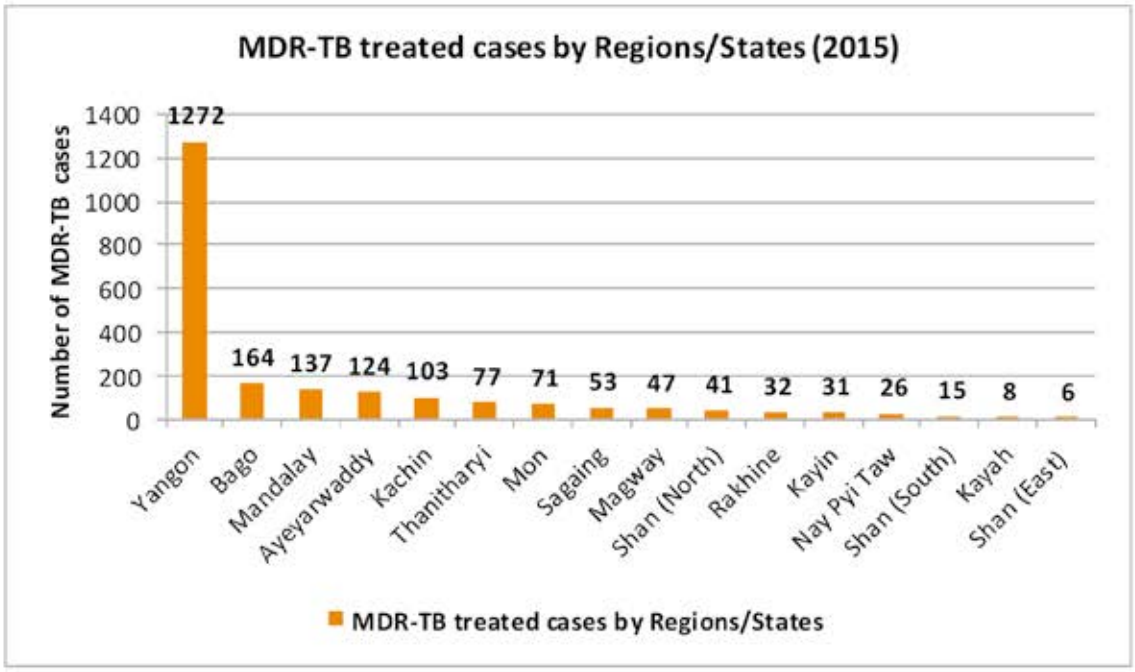
4.2.2 Prevention and care of MDR-TB

Programmatic Management of Drug Resistant Tuberculosis (PMDT) is an integral part of the Five-Year National Strategic Plan (2011-2015). National Guideline for Programmatic Management of MDR-TB was published in 2013. The Management of MDR-TB for BHS (Myanmar version) was also revised and distributed in 2014.

PMDT began with 22 townships (including existing 10 DOTS-Plus Pilot Project townships) in Yangon and Mandalay Regions in 2011. Since then, scale-up took place according to the National Strategic Plan. In 2015, there were altogether 108 PMDT townships over the whole country. In December 2015, these project townships became treatment initiation centres and the remaining townships were decentralized in order to get second line drugs in all townships.

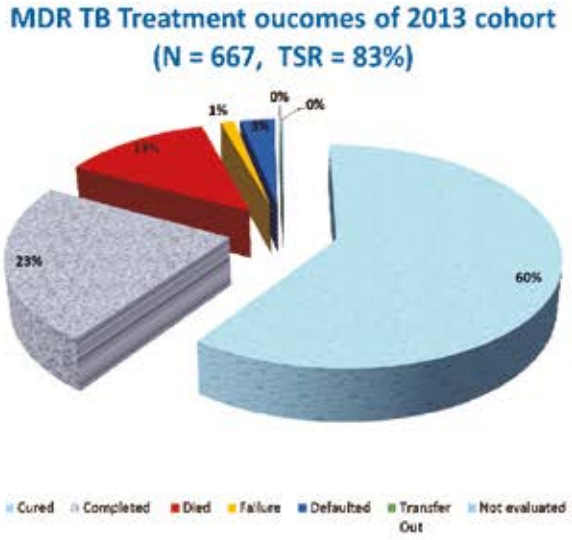
During 2015, a total of 2,793 MDR-TB cases were notified. Among them, 2,207 cases were treated with second-line anti-TB drugs in 17 Regional/State TB Centers. Yangon Region enrolled the highest number of MDR-TB cases (1272), followed by Bago (164) and Mandalay (137). The following graph shows the number of MDR-TB treated by Regions/States.

Figure 10: MDR-TB treatments initiated in 2015, by Region/State



Altogether 667 MDR-TB patients were enrolled in 12 regions/states during 2013. The outcome results of this cohort show satisfactory results: the TSR was 83%. However, the death rate was still high (13%) while the failure rate and loss-to-follow-up rate were 1% and 3%, respectively.

Figure 11: MDR-TB treatment outcomes of 2013 cohort



The Government increased its commitment for second-line anti-TB drugs: a total cost for 1600 regimens were paid from government budget during 2014-2015. The Global Fund and 3MDG are the other two main sources of financial support for MDR-TB management. During 2014-2015, in addition to the Government budget, the Global Fund supported budget for 2308 regimens and 3MDG provided for 1000 regimens.

NTP changed the duration of MDR-TB treatment from 24 months to 20 months starting from July 2014 for all newly diagnosed MDR-TB patients. Likewise, the diagnostic algorithm was also modified not using confirmation test for high risk patients who were found RR on GeneXpert testing. The high risk groups included all retreatment cases, TB/HIV co-infected patients and MDR-TB contacts regardless of previous treatment history.

4.2.3 Address the needs of prisoners, refugees and other high-risk groups and special situations

Many prisons all over the world are overcrowded well beyond their official capacity. Overcrowding, poor ventilation due to inadequate infrastructure (lack of windows) and prolonged confinement inside cells are all factors conducive of transmission of airborne diseases. Furthermore, many prisoners are heavy smokers, adding to the unhealthy atmosphere in overcrowded cells, and standards of hygiene are often poor. Living together in cramped quarters, with little or no ventilation, is another major factor for contracting TB.

TB is a major cause of sickness and death along with HIV, malnutrition, mental illness, etc., in prisons. Thus, NTP initiated TB control activities among prisoners in collaboration with the Ministry of Home Affairs (MoHA). A coordinating mechanism for TB in prisons was developed in 2012 between MOH and MoHA. As an output, referral/transfer mechanism for continuation of treatment after release and policies were developed.

NTP also implemented ACF activities in 11 prisons during 2015 with support of the Global Fund and 3MDG Fund. The prisons included Myitkyina, Insein, MyaungMya, Dawei, Bamaw, Thandwe, Sittwe, Kengton, Taunglaylone (Shan Taunggyi), Tharyarwaddy and Pakokku prisons. Mobile teams visited to Insein prison for two times. MDR-TB treatment was also provided at Insein prison.

Miners are also at high risk for TB. Studies showed that mining production was significantly associated with higher TB incidence rates. In 2015, NTP carried out TB screening with digital X-ray among miners, their families and communities. Bawsai (Shan Taunggyi), Yadana Theingi (Shan Lashio), Heinda and Hermyingyi (Thanithayi) mines were visited in 2015 with 3MDG support.

As Diabetes is associated with higher risks of TB, NTP has done TB screening among diabetic patients at diabetic clinics of 2 General hospitals (North Okkalapa Hospital and Mandalay General Hospital).

NTP strengthened community-based TB care activities in six border townships (Kawthaung, Maungdaw, Muse, Myawaddy, Tachileik and Tamu) with Global Fund support. Most of the work on this issue was related to equitable access to TB treatment and care for migrants. This activity was also intended to overcome geographical, social and cultural barriers to health care. Special interventions were done in hard-to-reach areas with low case detection rates.

Strengthen infection control in health services, other congregate settings and households

An Infection Control Manual (English) was published and distributed in 2014. In addition, infection control measures were strengthened at all health centers especially where MDR-TB and TB/HIV patients were taking treatment.

Myanmar-Thailand Border Meeting

Because of the mobile population, TB treatment in some border townships got unfavorable outcomes. It affected the national TB control targets set at 85% treatment success rate and 70% case detection rate. The situation could lead to the most dreadful situation of emerging MDR-TB and XDR-TB. Furthermore, HIV co-infection among TB patients may serve as one of the main constraints in TB control.

Thus, coordination mechanism between Myanmar and neighboring countries is needed to be strengthened. Therefore, a meeting for strengthening of health collaboration

along the Myanmar-Thailand border was held at Chiang Rai, Thailand in 23-24 July 2015 with the following objectives:

1) To evaluate the TB control collaborative activities at the Myanmar-Thailand border areas supported by the Global Fund.
2) To explain the new updates on TB control activities in border areas
3) To identify the problems and solutions

The following outputs were achieved from each group discussion, target areas, target population and time frame in respective border townships:

1) Stronger collaboration between two countries for improving border health
2) Develop 2015-2016 and 2016-2017 action plans and agreed upon scaling up
3) Sharing information, update focal point, develop an effective cross-referral system and organize regular coordination meeting bi-annually at the local level
4) Conduct a TB awareness campaign and develop IEC materials to strengthen community awareness and social mobilization
5) Train human resources and establish a joint surveillance program

Childhood TB

National Guidelines for the Management of TB in Children was developed in 2007 and revised in 2012 according to the Rapid Advice of WHO. The workshop on childhood TB management was conducted in August 2013 and followed by revision of guideline and dissemination to all regions/states as well as to the Myanmar Paediatric Society in 2014. Whenever the development and revision of guideline, it was followed by advocacy and trainings at region/state and township levels.

Although IPT for children was set as a national policy, paediatricians were generally reluctant to implement this. According to the recommendations, the children with high dose regimen were regularly monitored for the adverse effects by the health care workers. However, no significant adverse reactions were reported in 2014.

Figure 12: Number of Childhood TB cases (2015) by Region/State (NTP only)

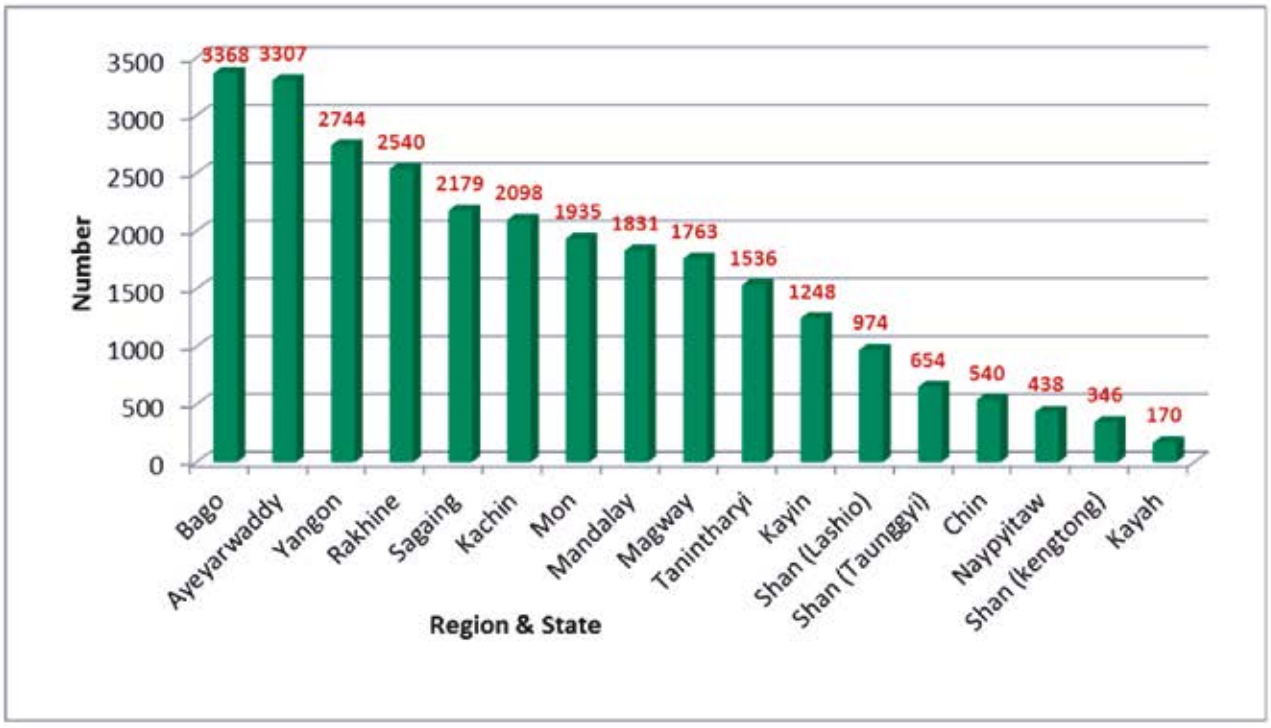
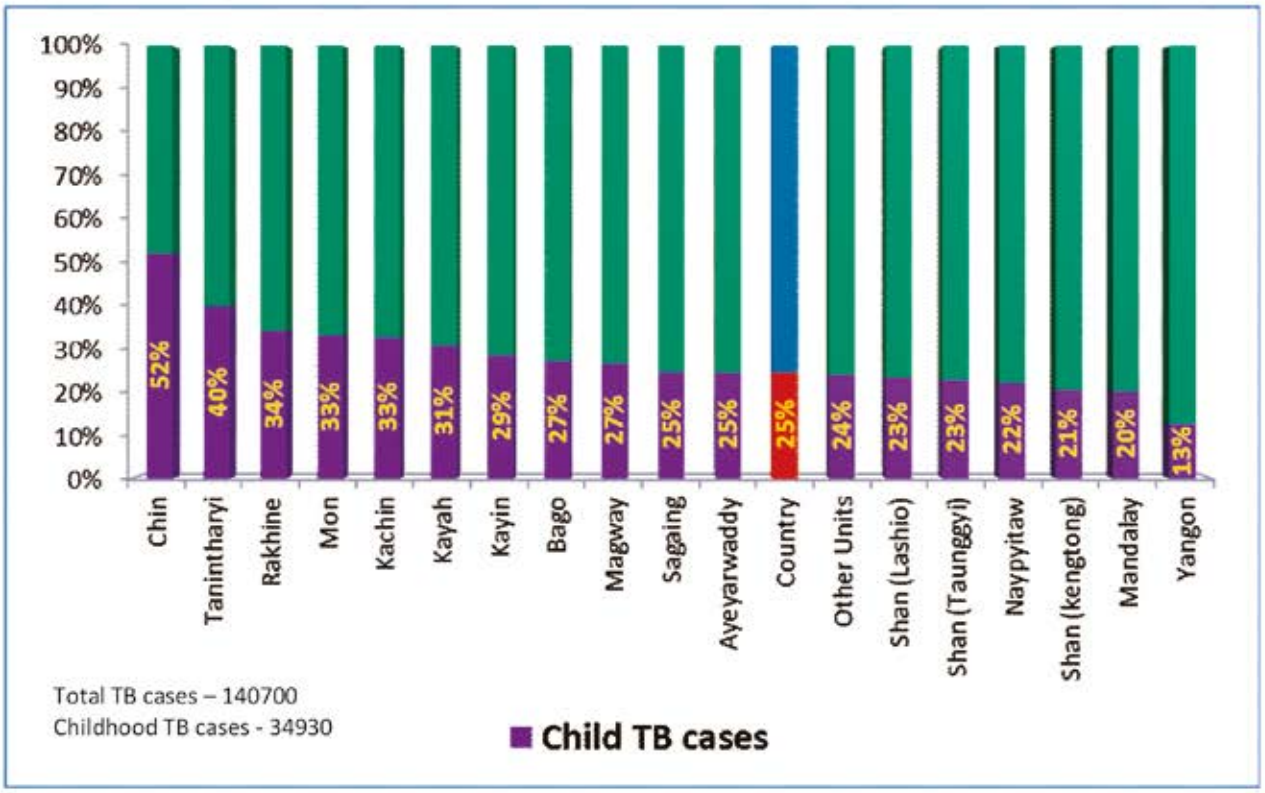


Figure 13: Proportion of childhood TB cases in States & Regions (2015)



In 2015, 25% (34,930/140,700) of all notified cases were childhood TB cases. Bago, Ayeyarwaddy and Yangon Regions showed the highest case load of childhood TB. On the other hand, Chin State has the highest proportion of childhood TB cases (52%) among all Regions/States. It was followed by Tanintharyi, Rakhine, Mon, Kachin and Kayah. Yangon Region has the lowest proportion of childhood TB cases (13%) in 2015.

Figure 14: Proportion of (0-4) and (5-14) year among total Childhood TB cases (2015)

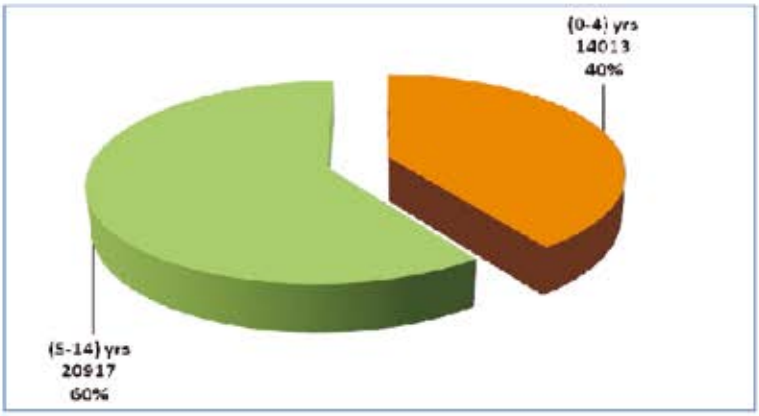
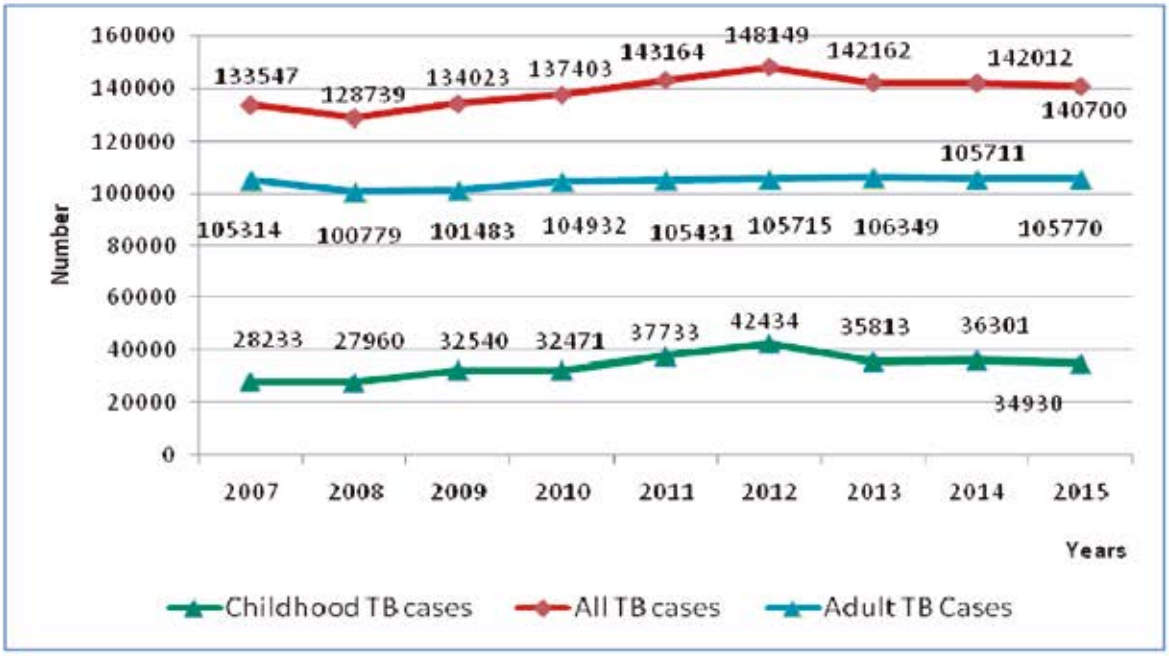


Figure 15: Trend of Childhood TB cases (National Figure)



The figure (14) shows the age proportion of childhood TB cases. 0-4 year group occupied 40% and the rest 60% in 5-15 year group.

The figure (15) shows the trend of childhood and adult TB notifications since 2007. Childhood TB notification showed an increasing trend till 2012. Then, it significantly decreased in 2013 and showed decreasing trend up to 2015.

4.3 Contribute to health system strengthening

Myanmar Country Coordinating Mechanism (M-CCM) was established in October 2008 to oversee the national response related to the three diseases of HIV, TB and Malaria as well as related health issues such as maternal, newborn and child health and other health-related MDGs. This Governance Manual sets out the guidelines for the M-CCM members to oversee the implementation of national responses for AIDS, TB and Malaria and related health issues including the implementation of the Global Fund grants in Myanmar. The scope of the body was broadened and its name changed to the Myanmar Health Sector Coordinating Committee (MHSCC) in 2013.

The Tuberculosis Technical and Strategy Group (TSG-TB) coordinates with all implementing partners in monitoring and evaluation of programme implementation every quarter. The NTP coordinated with MHSCC, is contributing to health system development in a number of ways.

Capacity Building

Human resource development is essential for achieving NTP's goals. Trainings and workshops were held within the country for all levels of staffs and also sent to international workshops and training according to their areas. In 2015, NTP organized several HRD-related trainings.

Table 26: Training activities conducted in 2015

Training Topic	No. of trainings	Funding source
Training on cohort review	12	GF
Training for Tuberculin Testing	1	GF
Training of NTP/NAP staff from TB/HIV expansion township	11	GF
Training on TB counseling	9	GF
Training for PPM	1	GF
Training on Management of TB at township	5	GF
Training on Management of TB at District Level	2	GF
Training on Management of TB for Health Facility Staff	4	GF
Training on BHS for management of Health facility staff	4	GF
Training on BHS for Management of TB	10	GF
Training on Management of Childhood TB	3	GF
Training for Childhood TB advocacy	1	GF
ToT training for Management of MDR-TB	7	GF
Training on BHS for MDR-TB Management	7	GF

Training on Management of MDR-TB at township	33	GF
Training on MDR-TB counseling	1	GF
Refresher Training on PPM DOTS	1	GF
Refresher Training of EQA on TB microscopy for STLS	1	GF
Refresher training on BHS for management of TB	2	GF
Refresher training for Lab Technician	3	GF
Refresher training on florescent microscopy for Lab technician	1	GF
Training on AFB microscopy for New Recruit Lab Technician	1	GF
Training on Second Line DST with Liquid culture	1	GF
Training on Gene X pert	4	GF
Training on Evidence-Based Programme Management	1	WHO (USAID)/GF
Training on TB ACF in MNCH to BHS at township	3	3MDG
Refresher training on BHS for management of TB	6	3MDG
Training of TB screening at MNCH services	1	3MDG
ToT training for MDR-TB management	2	3MDG
Training on MDR-TB management	1	3MDG
Training on MDR-TB management	1	The Union
Msupply Scale up Training for Regional and State TB center	2	CHAI
mSupply on job training	10	CHAI
QuanTB Training	1	
Chest X-ray interpretation training for TB specialists (Multiplier courses)	2	FEI/Initiative 5%

Table 27: International Trainings, Meetings & Workshops attended by NTP staff (2015)

Sr.	Name and Designation	Duration	Country	Attended Training/ Workshop/ Meeting
1.	Dr. Si Thu Aung Deputy Director (TB)	23.7.15 to 24.7.15	Thailand	2nd Myanmar Thai Ministry Health Collaboration Meeting
2.	Dr. Si Thu Aung Deputy Director (TB) Dr. Tin Tin Mar (Sr. consultant Microbiologist) Dr. Thyn Lei Swe (Consultant Microbiologist)	4.11.15 to 6.11.15	Thailand	Expand TB Project Meeting

3.	Dr. Si Thu Aung Deputy Director (TB) Dr. Tin Mg Swe Regional TB Officer (Magway) Dr. Khaing Sandar Aung Regional TB Officer , Shan (N)	2.12.15 to 6.12.15	South Africa	46th The Union Conference on Lung Health
4.	Dr. Cho Cho San Assistant Director Dr. Thandar Thwin TB specialist, Mandalay	7.10.15 to 9.10.15	Vietnam	Time Modeling Training
5.	Dr. Saw Thein Regional TB Officer, Mandalay Dr. Htet Myet Win Mg Assistant Director (TB) Dr. Win Win Mar State TB Officer, Rakhine	25.10.15 to 31.10.15	Sri Lanka	Regional TB Programme Meeting
6.	Dr. Tin Mi Mi Khine Regional TB Officer, Yangon Dr. Tun Oo TB Team Leader, Pyay	9.12.15 to 10.12.15	Italy	WHO Sondalo Training Courses on STOP TB Strategy
7.	Dr. Thyn Lei Swe Microbiologist, Mandalay	1.9.15 to 28.9.15	Thailand	Thailand for Advance Diagnosis of TB
8.	Dr. Thein Myint TB Team Leader, Yangon Dr. Thant Zin TB Team Leader, Bago	16.11.15 to 20.11.15	Thailand	Clinical Management of MDR TB
9.	Dr. Tun Kyaw Soe TB Team Leader, Pyinmana U Nay Oo, Grade I, Lashio TB team Daw Cho Wai Lin, Grade 2, Bago Region TB DawThida Win, Grade 2, Rakhine TB U Tay Zar, Grade 2, Taunggyi TB Team	6.9.15 to 15.9.15	Japan	RIT Training Centre (Japan Anti Tuberculosis Lab. Course)
10.	Daw YaminTun Med. Technician NTRL, Yangon Regional	7.12.15 to 8.3.16	Korea	Bio Medical Researcher Course

4.4 Engaging all care providers

4.4.1 Public-Public and Public-Private Mix (PPM) approaches

There are many formal and informal providers in public and private sectors who were giving TB management. NTP tried to engage those providers with PPM approach; Public-Public and Public-Private Mix to reinforce TB control activities in Myanmar. Operational guideline for PPM DOTS was developed in 2005. Engagement of private providers (through PSI and MMA), private laboratories (EQA) and public hospitals were carried out under PPM.

4.4.2 Public-Public

With the support of 3DF Bridge Fund, Public-Public Mix DOTS was launched in four hospitals (New YGH, East and West YGH, Thingungyun Sanpya General Hospital) in Yangon during May 2007. It was subsequently expanded to Insein General Hospital, 1000-bedded Hospital (Nay Pyi Taw), Mingalardon Specialist Hospital, Aung San TB Hospital and Patheingyi TB Hospital. In 2015, the number of PPM hospitals became twenty four. These PPM hospitals contributed 4% (all forms) and 3% (bacteriologically confirmed) cases.

There were four options of PPM-DOTS hospitals:

Option 1: Diagnosis of TB cases + prescription of treatment regimen in hospital followed by referral to Health Centre for DOT, with clinical follow-up at hospital

Option 2: Same as Option 1 without clinical follow-up at hospital

Option 3: Diagnosis of TB cases + starting Directly Observed Treatment (DOT) in hospital followed by referral to Health Centre during treatment

Option 4: Diagnosis of TB cases + providing full treatment (DOT) at hospital

Currently all hospitals are practicing either option 3 or 4. Joint monitoring and supervision visits were done by NTP and WHO to strengthen the PPM hospitals engagement.

Table 28: TB Case Notification from PPM DOTS Hospitals (2015)

No.	PPM hospitals	Bacteriologically confirmed TB	All forms of TB
1.	Aung San TB Hospital	71	110
2.	Patheingyi TB Hospital	25	46
3.	East YGH	12	92
4.	Mingalardon Hospital	259	1428
5.	No.1 MBH (PyinOoLwin)	27	61
6.	1000 bedded hospital (Naypyitaw)	87	408
7.	Thingangyun Sanpya Hospital	8	25
8.	New YGH	22	94
9.	West YGH	14	31
10.	Tharketa HIV hospital	134	943
11.	Insein general hospital	13	96
12.	No.1MBH 500bedded (Meikthilar)	15	83
13.	Pathein General Hospital	63	265
14.	No(1) MBH (Mandalay Nantwin)	3	49
15.	300 bedded teaching hospital, Mandalay	42	126
16.	North Okkalapa General Hospital	56	334

17.	550 bedded child hospital, Mandalay	3	10
18.	Hpa-an General Hospital	91	742
19.	Myeik general hospital	45	91
20.	Mawlamyine general hospital	1	4
21.	Yangon Children Hospital (option 3)	0	0
22.	Waibargi Specialist Hospital	134	395
23.	Mandalay central prison hospital	87	109
24.	Mandalay Sanga Hospital	9	19
Total		**1221**	**5561**

Table 29: Treatment Outcome of Bacteriologically Confirmed (New & Relapse) TB Cases in PPM-DOTS Hospitals implementing Option 4 (2014 cohort)

No.	PPM hospitals	TSR	Failed	Died	LFU	Not evaluated
1	Aung San TB Hospital	30%	0%	19%	7%	12%
2	Patheingyi TB Hospital	71%	0%	14%	8%	4%
3	East YGH	90%	0%	5%	5%	0%
4	Mingalardon infectious hospital	59%	3%	23%	7%	6%
5	No.1 MBH (PyinOoLwin)	65%	0%	8%	3%	8%
6	1000 bedded hospital, Naypyitaw	89%	1%	1%	6%	1%
9	West YGH	70%	0%	26%	0%	4%
10	Tharketa HIV hospital	61%	3%	9%	5%	13%
11	Insein general hospital	76%	0%	12%	12%	0%
13	Pathein General Hospital	62%	2%	13%	22%	2%
15	300 bedded teaching hospital, Mandalay	75%	0%	19%	6%	0%
16	North Okkalapa General Hospital	90%	0%	7%	2%	0%
19	Myeik general hospital	74%	5%	18%	3%	0%
20	Mawlamying general hospital	69%	3%	8%	5%	13%
22	Waibargi Specialist hospital	70%	0%	19%	4%	3%
24	Mandalay Sanga hospital	50%	0%	0%	36%	14%

Annual evaluation meeting for PPM DOTS activity (2015) was conducted on 16th December 2016 in Yangon. Altogether 65 participants attended the meeting. The presentations included fulfillment of the recommendations of the 2014 annual evaluation meeting and achievement, challenges and possible solutions of each PPM hospital. Then, the general discussion was followed and the following recommendations were made.

1. To provide orientation and refresher training including training for laboratory and revised recording and reporting
2. To conduct GeneXpert, TB/HIV activity and MDR-TB advocacy meeting at PPM Hospitals
3. To conduct joint supervision (NTP & WHO) on PPM Activities
4. To support infection control measures (N-95 for all health care workers, surgical masks for patients) by NTP and at the same time importance of administrative and managerial measures should be emphasized by Department of Medical Services.
5. To strengthen the proper referral system and feedback mechanism between PPM hospitals and township health department (Option 3)
6. To streamline the diagnosis of childhood TB in PPM hospitals

4.4.3 Public-Private

Public-Private Mix (PPM) DOTS has been implemented with MMA and PSI since 2004-2005. The engaged private practitioners in PPM DOTS usually practice either one or two or all of the following schemes.

Scheme 1: health education and presumptive referral

Scheme 2: health education, presumptive referral, DOT

Scheme 3: referral, diagnosis, treatment, DOT

Some Private Practitioners (PPs) involve scheme (I) in which they explain about TB and refer presumptive TB cases to township TB centers. Myanmar Medical Association (MMA) performed PPM-DOTS activities, mainly Scheme I at 125 townships. Among them, 37 townships were implementing Scheme III during 2015. Total 1,356 private practitioners are involved with MMA. In addition, MMA also implement TB/HIV collaborative activity, community-based TB care and treatment support for both drug sensitive and drug resistant TB. MMA involved private hospitals under PPM network since 2015.

PSI worked to improve TB diagnosis & treatment through clinical social franchise network of Sun Quality Health private clinics (SQH clinics) at 199 townships with 826 Sun Quality Health Providers (SQHP). PSI also implements ACF activities through 987 Sun Primary Health Providers (SPHP) at 48 townships and by 39 Interpersonal communicators (IPC) at 29 townships. PSI also implements TB/HIV activities, MDR-TB activities, and ACSM activities.

The following table shows the implementing partners, their activities and area coverage.

Table 30: Implementing Partners and activities

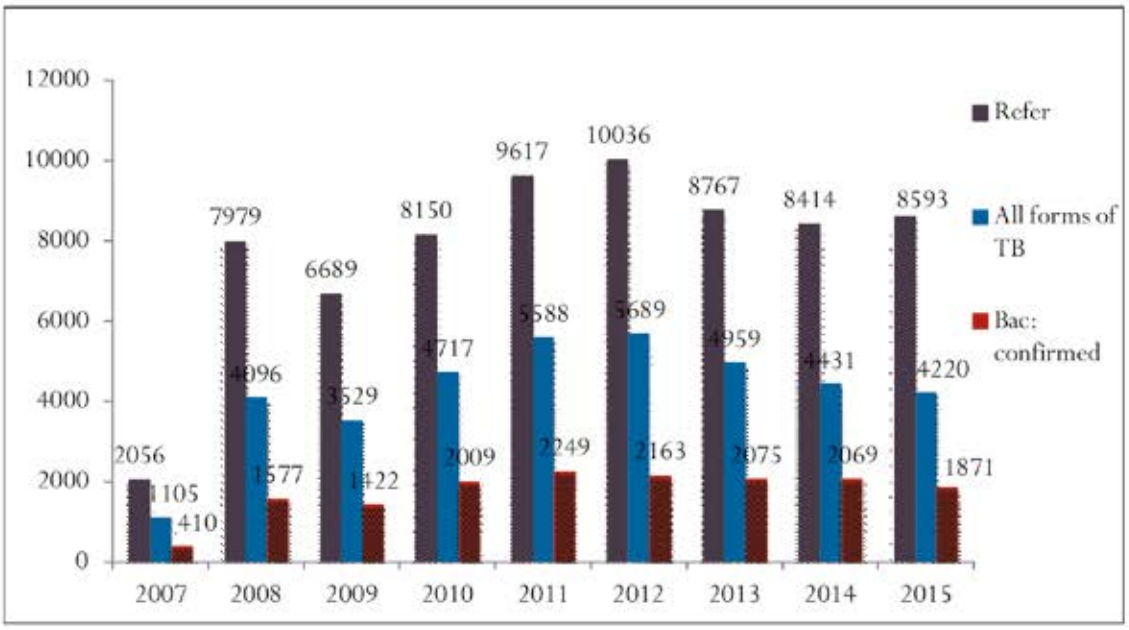
NGOs	Area Coverage and activities
MMCWA	Community-based TB care in ten townships in Mon State, 27 townships in Bago Region (except Kyaukgyi township), 26 townships in Mandalay Region, three townships (Pyinmana, Tatkone & lewei) in NayPyiTaw, two townships (Pha-an & Hlaingbwe) in Kayin State & one township (Twantay) in Yangon Region. Total – 69 townships coverage
MWAF	Community-based TB care in all 26 townships of Ayeyarwaddy Region, nine townships in Shan (East) State, two townships in Kayah Region, 16 in Shan (North) State, 12 in Shan (South) State and nine townships in Tanintharyi Region. Total – 74 townships coverage
MMA	PPM DOTS activity, mainly Scheme I at 125 townships. Among them, 37 townships were implementing Scheme III during 2015. Total 1,356 private practitioners are involved with MMA. In addition, MMA also implement community-based TB care and treatment support for both drug sensitive and drug resistant TB.
MRCS	Multiplier training (Peer Education) for Red Cross Volunteers, health education about TB to community, patients and family members. Presumptive TB case detection and referral, sputum transportation, initial home visits, contact tracing and referral, DOT provision. MRCS supported five townships (Kungyangon, Kawhmu, Twantay, Thonegwa & Kyauktan) in Yangon Region, two townships (Lewei & Takone) in NayPyiTaw Council Area, four townships (Yamethin, Pyawbwe, Sintgaing and Taungtha) in Mandalay Region, four townships (Depeyin, Yinmarbin, YeU, Shwebo) in Sagaing Region, one township (Yesagyo) in Magway Region & three townships (NaungCho, Kyaukme, Hsipaw) in Shan (North) State. Total – 19 townships coverage
MHAA	Community mobilization and empowerment, presumptive TB referral, provide nutritional support and care to reduce the burden of TB at 48 townships in Yangon, Mandalay, Bago, Sagaing, Magway, and Rakhine.
Pyigyikhin	Provide MDR TB care and support at 14 townships (Hlaing, Mayangone, Mingalardon, North Dagon, North Okkalapa, Shwepyithar, Ahlone, Bohtadaung, Seikkan, Dagon, Dagon Seikkan, Kyauktada, Latha, Yankin) in Yangon and technical assistance in Kyeemyindaing and Sanchaung in Yangon region with funding from USAID and 3MDG.

INGOs	Area Coverage and activities
PSI	TB diagnosis & treatment through Sun Quality Health Clinics (SQHC) in 199 townships with 826 Sun Quality Health Providers (SQHP). PSI also implements ACF through 987 Sun Primary Health Providers (SPHP) at 48 townships, by 39 Interpersonal communicators (IPC) at 29 townships and 1, 041 drug sellers in 23 townships. PSI provides MDR-TB patients support by 45 supporters in 6 townships. PSI also implements TB/HIV activities and ACSM activities.
MSF-Holland	TB program started since 1998 and MDR-TB program started since 2009. Nine TB/HIV clinics currently running, (Insein, Tharketa) in Yangon Region, (Myitkyina, Bahmo, Moegaung, Pharkant, Laiza) in Kachin State, (Lashio, Muse) in Shan (North) State. MDR-TB management in Yangon Region, Kachin and Shan (North) States.
MSF-Switzerland	TB/HIV control at all townships of Tanintharyi Region, Dawei District (four townships) for TB diagnosis and HIV testing.
World Vision Myanmar	Train community volunteers, refer presumptive TB cases, provide care and support, TB/HIV collaborative interventions and ACSM to improve case finding in Hlaingthayar (Yangon Region), Loikaw (Kayah State), Thanphyuzayat (Mon State), Dawei, Myeik, Thayetchaung, Longlon & Kawthaung (Tanintharyi Region).
The Union	Community based activities (awareness raising, SCC, Mobile CXR activities, engaging GPs and CBOs, contact tracing (Extended), DOT support and defaulter tracing) and health system strengthening(training, infection control measure, TB/HIV collaborative activities, support for TB diagnosis using additional TB diagnostic tools and methodologies) at 8 Townships in Mandalay Region, two townships in Magway Region (Myaing, Yesagyo), two townships in Shan (South) State (Taunggyi, Kalaw), one township in Shan (North) State (Lashio)and two townships in Sagaing Region (Monywa, Sagaing)
IOM	Presumptive TB identification, referral, DOTS supervision, TB/HIV collaborative activities, community empowerment, MDR-TB care and support, provide nutritional support in collaboration with WFP at seven townships (Mawlamyaing, Mudon, Kyikmayaw, Thanphyuzayat, Ye, Belin and Thaton) in Mon State; at one township (Myawaddy) in Kayin State and three townships (North Okkalapa, Mingalardon and Shwe Pyi Thar) in Yangon.
Malteser	TB case finding, supporting diagnostic facilities, proper DOT service, patient support and health education to TB patients at Maungdaw & Buthidaung townships in northern Rakhine State and Tarchileik and Kyaingtong in Shan East State.

Pact Myanmar	Community mobilization, train community selected volunteers, presumptive TB referral, and health education session at targeted villages of Madaya and Pyinoolwin townships in Mandalay and Kawlin township in Sagaing Region.
AHRN	Comprehensive harm reduction services for PWID/PWUD through DICs, Outreach Programmes and Integrated Mobile Services; Medical interventions (TB/HIV/Malaria/STI screening and treatment, PHC, overdose prevention, withdrawal management, HBV screening and vaccination); Counselling and patient support; Mutual referral for MMT, ART and specialized health care; 24 hours care centres (Better Shade Peer Support Group) at Lashio & Laukkai in Shan (North), Pharkant, Waingmaw & Bamaw townships in Kachin State.
CESVI	Sensitization and Health education on TB at 605 villages of eight townships (Kyaukme, Namtu, Mong Mit, Mabein, Nawnghkio, Namhsan, Manton and Hsipaw) of Shan (North) and Madaya, in Mandalay Region, Bhamo, Moemauk and Mansi in Kachin state for TB control by awareness raising and helath education, promoting case finding and referral by trained Voluntary Health Workers and support to DOTS.
MDM	HIV/TB/STI prevention and treatment and harm reduction activities among PWIDs at Myitkyina, Moegaung, Hopin at Kachin State. At Hlaing Township, Yangon Region, HIV/TB/STI prevention and treatment activities among FSW, MSM and their partners.
FHI360	CAP TB approach provides technical assistance in close collaboration with NTP, building a patient-centered community driven model through implementing partners and capacity development for partners both technical and organizational. Provide PMDT trainings to physicians, TMOs and GPs. For TB case finding and referral, community volunteers and outreach workers' training were given. Support package of TB/MDR-TB services in 18 townships and MDR TB DOT for evening dose in South Okkalapa, Chan Mya Tharzi and Tingangyun Townships.
MAM	Improved access to TB Diagnosis & Treatment for people in hard to reach areas and mobile/migrant people by linking CHWs in remote villages to NTP services at Myitkyina, Waingmaw, Bahmaw, Moemauk, Chibway, Mansi and Putao townships in Kachin state, Kyarinnseikkyi, Kaukarate and Thantaung townships in Kayin, Hphasaung, Phruso and Demawsoe townships in Kayar state and Yephyu in Tanintharyi Region.

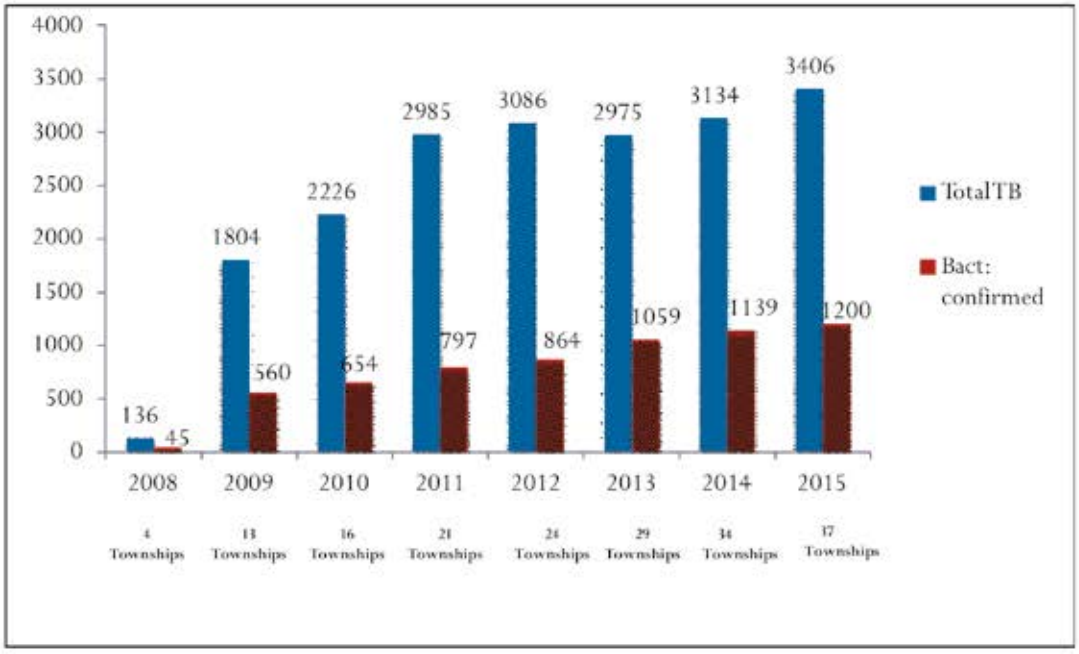
HPA	Implements community-based TB and HIV control pilot activities at seven townships in Wa special region and three townships in Shan special region 4 in shan state.

Figure 16: Total Case Detection of MMA PPM Scheme I Townships (2007 to 2015)



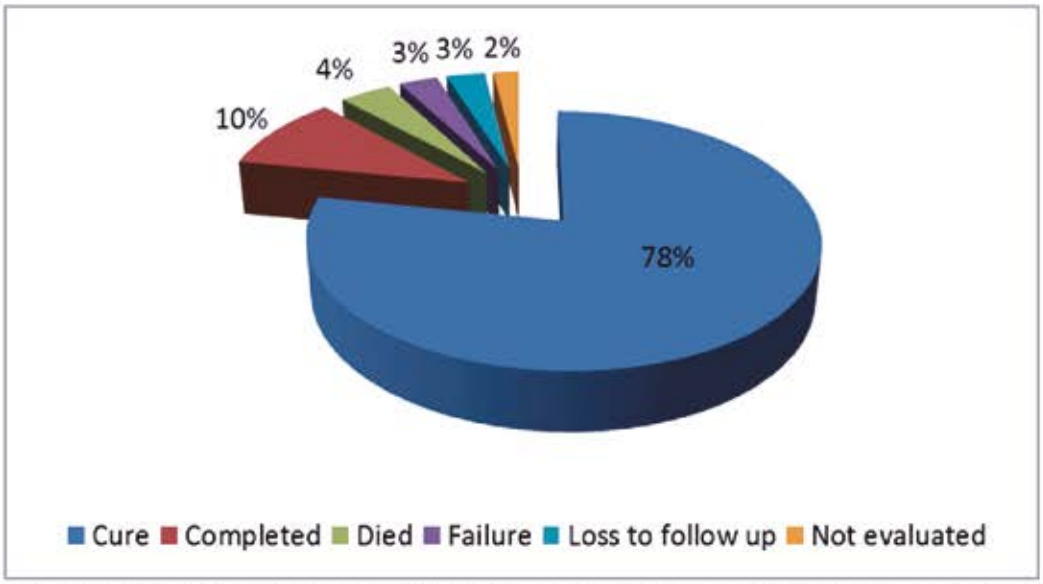
MMA-affiliated PPs implemented Scheme I in 125 townships during 2015. The above figure shows their achievements since 2007. The number of presumptive TB cases referred to NTP steadily increased till 2012, during 2013-2014, the trend was decreasing , consistent with the national TB case finding.In 2015, the referral cases increased again. Out of 8,593 cases referred in 2015, 4220 patients (all forms) were diagnosed including 1,871 were classified as new bacteriologically confirmed.

Figure 17: Total Case Holding of MMA PPM Scheme III Townships (2008 to 2015)



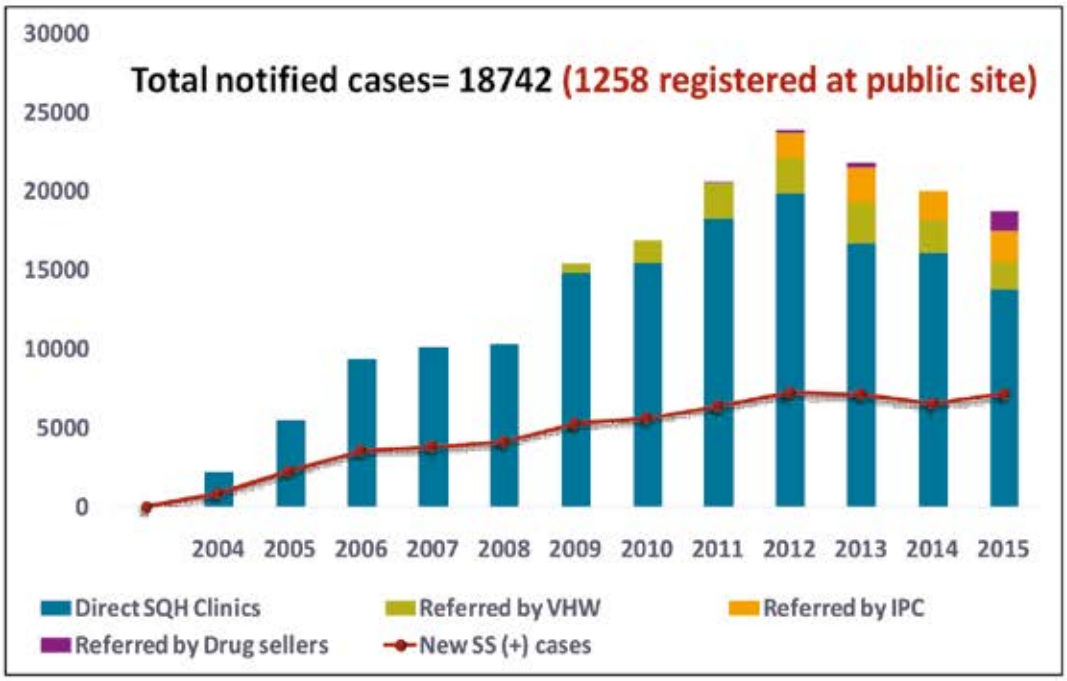
MMA-affiliated PPs implemented Scheme III in 37 townships during 2015. Sputum of presumptive TB cases was examined not only in MMA (private) laboratories but also in public laboratories. Along with yearly expansion of project townships, notification of all forms and bacteriologically confirmed TB cases showed increasing trends. The number of notified bacteriologically confirmed cases was 1,200 in 2015.

Figure 18: Treatment outcome of MMA notified New Bacteriologically Confirmed TB cases (2014 cohort)



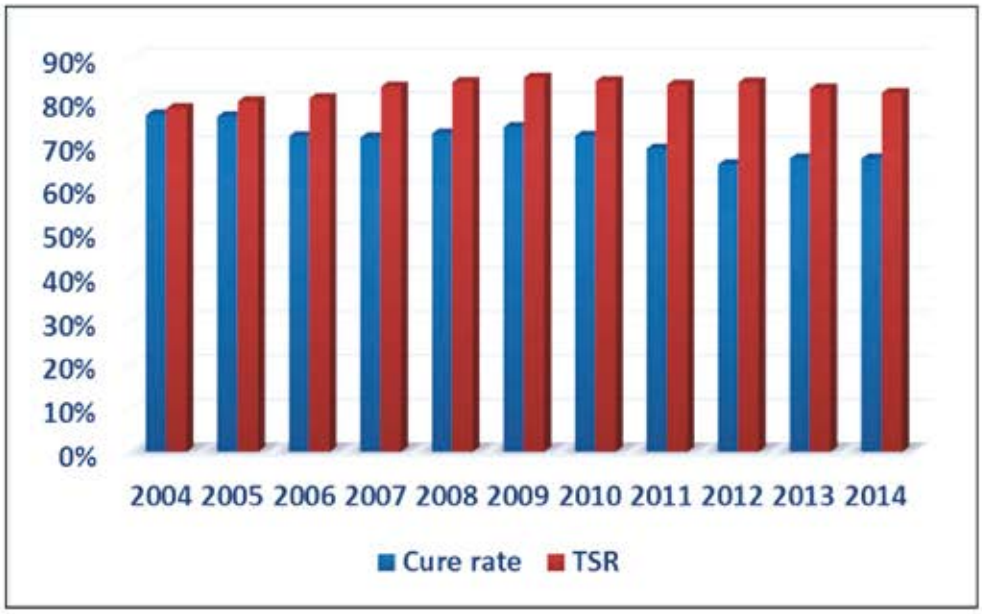
In the 2014 cohort, MMA achieved a cured rate of 78% and TSR of 88%. Failure and loss to follow up rate were 3% respectively.

Figure 19: TB Cases Notified by PSI PPM-DOTS Program (2004 - 2015)



PSI provides diagnosis and treatment of TB by SQH clinics through GPs in 200 townships. It also implements ACF activities and referral of presumptive TB cases through SPH providers in rural areas and Interpersonal communicators in urban poor areas. Moreover, PSI offers TB/HIV collaborative activities, ACSM activities and MDR-TB activities. In 2015, PSI provided TB treatment to 20,004 patients (all forms).

Figure 20: Treatment outcome of PSI notified Bacteriologically Confirmed TB cases (2004 – 2014)



According to 2014 cohort, PSI achieved a TSR of 83%.

Figure 21: Proportion of Bacteriologically Confirmed TB Patients contributed by NTP and Partners (2015)

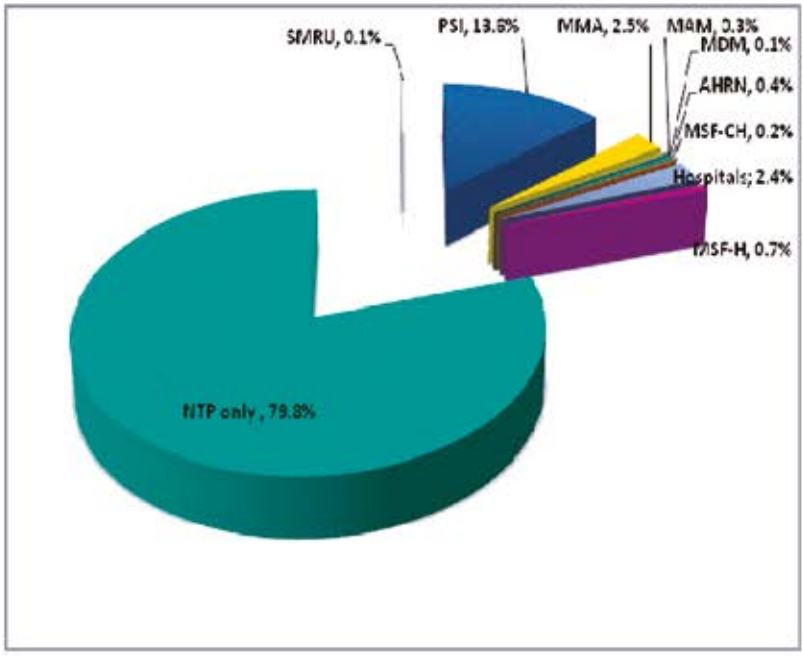
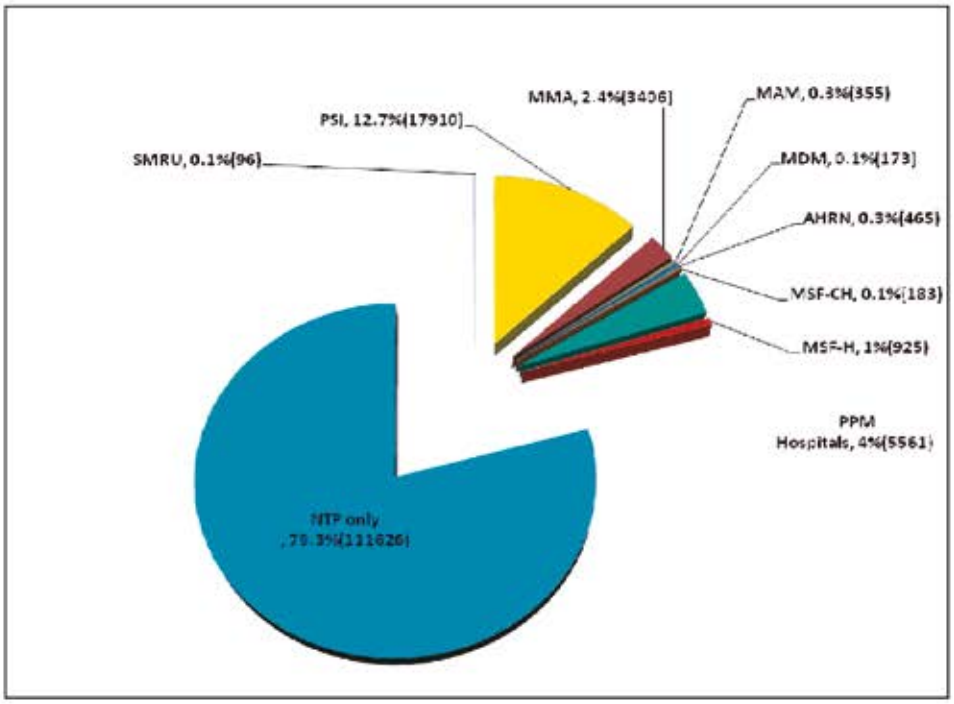


Figure 22: Proportion of All forms of TB Patients contributed by NTP and Partners (2015)



4.5 Empowering patients and communities

4.5.1 *Advocacy, communication and social mobilization*

In the context of TB control, the objective of the ACSM is to scale up advocacy, communication and social mobilization for all DOTS components to achieve the targets enshrined in the MDGs.

Based on the findings from the nationwide Knowledge, Attitude and Practice (KAP) Survey (2009), NTP together with the Health Education Bureau of DOH developed ACSM materials so that ACSM activities could be implemented at different levels.

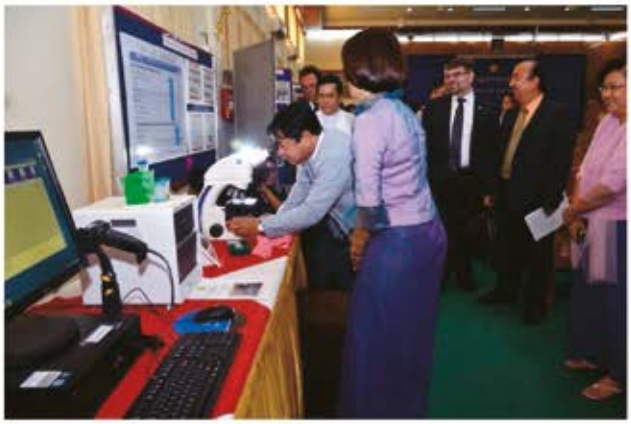
World TB Day is an opportunity to raise awareness about the burden of TB worldwide and draw attention to the status of TB prevention and control efforts. The Day is also an occasion to mobilize political and social commitment for further progress. Therefore, NTP has commemorated World TB Day/Week ceremony and activities every year since 1996.

World TB Day, 2015

World TB Day commemoration was held on 24 March 2015 at Central and all Regions and States over the country. The Central level World TB Day commemoration ceremony was held at the Assembly Hall of the Ministry of Health, Nay Pyi Taw. The Slogan for the year 2015 was "**Reach, Treat, Cure Everyone**" and it was translated as "တီဘီရောဂါကင်းဝေးဖို့၊ စုပေါင်းရှာဖွေကုသစို့" in Myanmar language. H.E Dr.Than Aung, Union Minister for Health, acted as Chairperson of the ceremony and delivered the opening speech.

In his speech, H.E. Minister stressed to promote TB case detection and treatment; to expand TB/HIV and MDR-TB management as Myanmar is one of the high TB, TB/HIV and MDR TB burden countries. NTP needs to do Accelerated Case Finding. When implementing ACF, it is important to emphasize on high risk groups such as people living in hard-to-reach areas, migrant workers, marginalized people, prisoners, miners, PLHIV, Diabetics and under 5 children. He also urged to organize more private practitioners to involve in TB control. He highlighted to strengthen the collaboration and cooperation of TB & HIV program including ART and Isoniazid Preventive Therapy (IPT). Moreover, he expressed to improve the MDR-TB management by using GeneXpert for diagnosis and by increasing government budget to procure second line drugs for treatment.

The Minister for Ministry of Health delivering the opening speech in commemoration ceremony of World TB Day (2015)



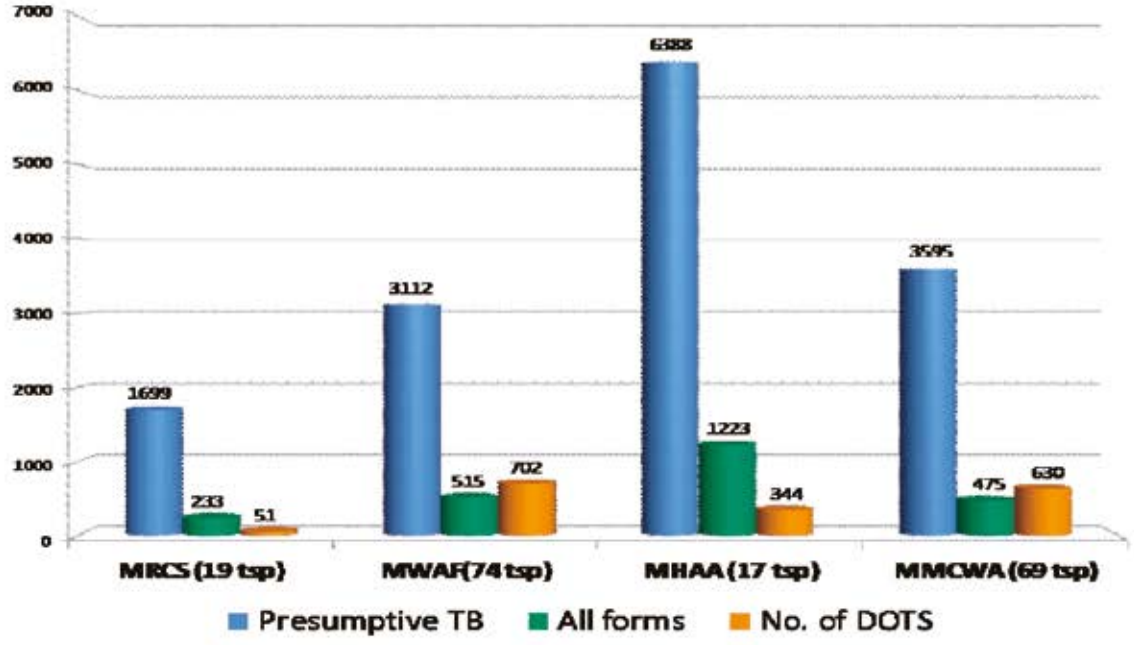
The Minister and invited guests viewing the World TB Day mini exhibitions

Then, Dr. Jorge M. Luna, WHO Country Representative to Myanmar read out the formal message from Regional Director of WHO Southeast Asia Region. H.E. Minister for Health and invited guests viewed the World TB Day mini exhibition presented by NTP and partners. The representatives from the Ministry of Health, other Ministries, UN Agencies and implementing partners attended the ceremony. Materials such as pamphlets, posters, bags, T-shirts, handkerchiefs were also distributed at the ceremony.

4.5.2 Community participation in TB care

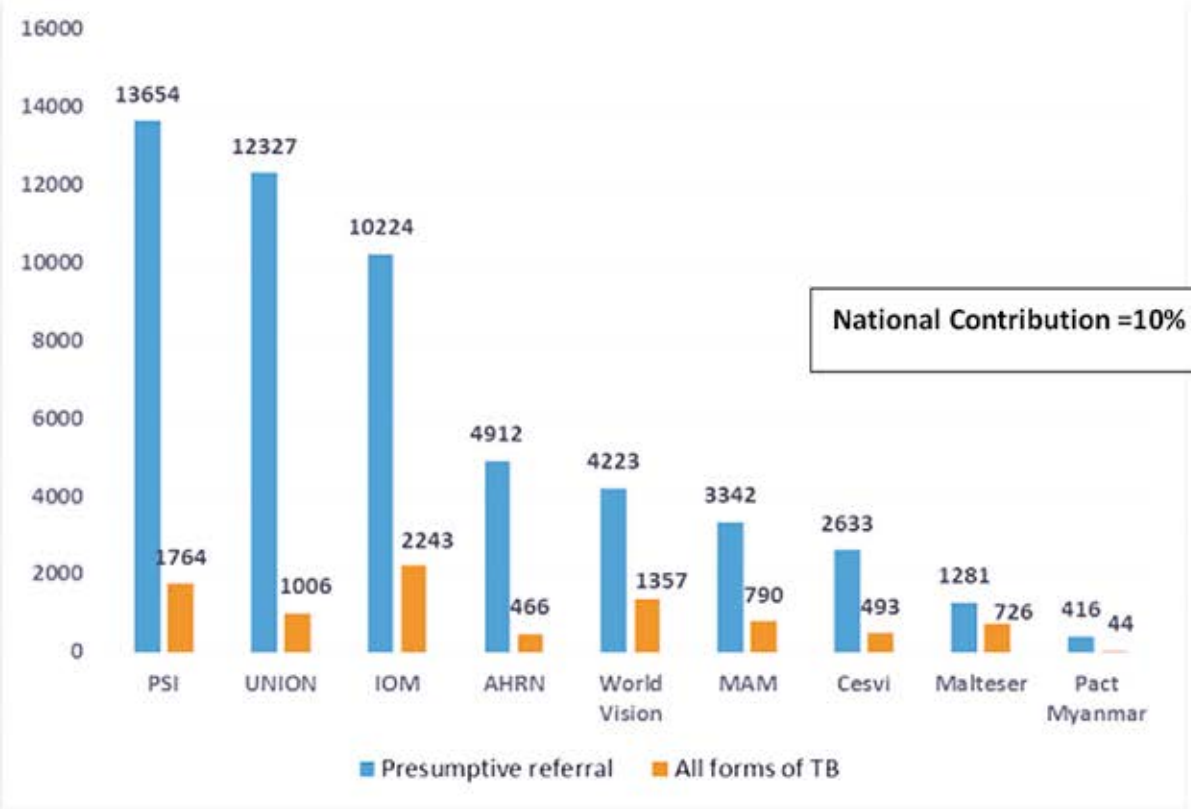
Community-based TB care is an essential component of NTP.Community-based TB care activities have been introduced since 2011 and were implemented by all local NGOs and some INGOs under the guidance and support of NTP.

Figure 23, TB cases finding by CBTC activities of local NGOs, 2015



Four local NGOs (MMCWA, MRCS, MHAA and MWAF) conducted community-based TB care activities in selected townships with support of the Global Fund. Their volunteers were provided training in each twonship. They carried out TB health talks in the community; identified and referred presumptive TB cases, traced contacts and provided DOT for TB patients. In 2015, altogether 14,794 presumptive TB cases were referred by these volunteers. and Of them, 2,446TB cases were diagnosed and treated. With support of 3MDG, MMA established a ACF project and conducted CBTC activities in 12 urban poor and hard-to-reach townships since mid-2014. It resulted in a total of 7995 presumptive cases being referred; and among them 1316TB cases (all forms) being diagnosed and treated.

Figure 24: TB cases finding by CBTC activities of INGOs (2015)



In 2015, 9 INGOs (PSI, UNION, IOM, AHRN, World Vision, MAM, CESVI, Malteser, Pact Myanmar) carried out CBTC activities in selected townships with support of the Global Fund and 3MDG. In total, 53,012 presumptive TB cases were referred by trained volunteers of these INGOs. Among them, 8889 TB cases were detected and treated.

4.6

4.6 Enabling and promoting research: Programme-based operational research

At the global level, one of the three pillars of WHO's End TB Strategy is ***intensified research and innovation*** to overcome the inadequacy of current tools and strategies to achieve global TB control. NTP together with Department of Medical Research, Lower Myanmar (DMR-LM), Burnet Institute and WHO held a workshop in 2014 to develop a

National TB research agenda for 2015-2020. A previous workshop was conducted in 2009 and 10 topics were generated. The top 20 TB research priorities could be identified from this workshop. Among them,

(1) Integrated approaches for utilization of community volunteers in TB, HIV and MNCH
(2) Effectiveness of community-based MDR-TB care by community supporters and BHS
(3) Health-seeking behaviour and patients' barriers to diagnosis and treatment of MDR-TB
(4) Cost-effectiveness of ACF for TB
(5) Assessment of patient satisfaction in community-based TB care
(6) Factors for sustainability of community volunteers for TB control
(7) Economic analysis of community-based MDR-TB programme
(8) Establishment of screening for TB in border areas
(9) Role and effectiveness of voluntary health workers in community-based TB care
(10) Barriers for accessing TB screening and diagnosis
(11) Role of community involvement in treatment adherence of TB patients
(12) Causes of compliance in standard MDR-TB regimens
(13) Accessibility to services related to diagnosis and treatment of TB
(14) Effective ways of communication to improve TB knowledge among community
(15) Social determinants of TB transmission among people living in hilly regions
(16) Factors influencing treatment of TB among migrant populations
(17) Factors influencing delays in treatment of MDR-TB
(18) Prevalence and resistance patterns of MDR-TB among migrant populations
(19) TB treatment outcomes among diabetic patients
(20) Risk factors for DR TB: with special emphasis on MDR among new patients

Research Capacity Strengthening

1. Structured Operational Research and training Initiative (SORT IT) Module 1 and 2 for TB and Malaria (27th July- 7th August 2015) at DMR, Collaborative activity of DMR and NTP with funding support form WHO/TDR)

2. Training Workshop on Molecular and Liquid Drug Susceptibility Testing Methods for Detection of Pyrazinamide and Second Line Anti-TB Drug Resistance (23-25 November 2015 at AMRC, DMR and NTRL, Aung San)

TB research papers and poster presented at national and international conference

1. Active case-finding for tuberculosis by mobile teams in Myanmar: yield and treatment outcomes

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Background/Introduction

Since 2005, the Myanmar National Tuberculosis Programme (NTP) has been implementing active case finding (ACF) activities involving mobile teams in hard-to-reach areas. This study revealed the contribution of mobile team activities to total tuberculosis (TB) case detection, characteristics of TB patients detected by mobile teams and their treatment outcomes.

Objective

The aim of this study was to describe the contribution of the ACF strategy through mobile team activities, including screening with digital chest X-rays, on detection of TB cases, characteristics of patients and treatment outcomes from October – December 2014.

Methods

This study was a descriptive study using routine programme data between October 2014 and December 2014. Mobile team activities were performed by teams using a portable digital CXR and sputum microscopy for two sputum samples in one stop service. The algorithm of the case detection included screening patients by symptoms, then by CXR followed by sputum microscopy for confirmation. Diagnosed patients were started on treatment and followed until a final outcome was ascertained.

Results

A total of 9349 people with symptoms suggestive of TB were screened by CXR, with an uptake of 96.6%. Of those who were meant to undergo sputum smear microscopy, 51.6% had sputum examinations. Finally, 504 TB patients were identified by the mobile teams and the overall contribution to total TB case detection in the respective townships was 25.3%. Treatment

success rate (TSR) was high as 91.8% in study townships compared to national rate 85% (2014 cohort).

Conclusions

This study confirmed the feasibility, acceptability and effectiveness of ACF by mobile teams in hard-to-reach contexts, especially when equipped with portable, digital CXR machines that provided immediate results. However, the follow-up process of sputum examination created a significant barrier to confirmation of the diagnosis. In order to optimize the ACF through mobile team activity, future ACF activities were needed to be strengthened one stop service including molecular diagnostics.

(* Output of Structured Operational Research and Training Initiative (2015-2016) and Paper submitted to Infectious Disease of Poverty Journal)

2. The contribution of a non-governmental organisation's Community Based Tuberculosis Care Programme to case finding in Myanmar: trend over time

Htet Myet Win Maung[1], Saw Saw[2], Petros Isaakidis[3], Mohammed Khogali[3], Anthony Reid[3], Nguyen Binh Hoa[4], Ko Ko Zaw[2], Saw Thein[1] and Si Thu Aung[1]*

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Background/Introduction

It is estimated that the standard, passive case finding (PCF) strategy for detecting cases of tuberculosis (TB) patients in Myanmar has not been successful: 26% of cases are missing. Therefore, alternative strategies, such as active case finding (ACF) by community volunteers, have been initiated since 2011. This study aimed to assess the contribution of a Community Based TB Care Programme (CBTC) by local non-government organizations (NGOs) to TB case finding in Myanmar.

Objective

The aim of this study was to assess the contribution of a CBTC programme by local NGOs to TB case-finding in five Regions and three States in Myanmar between 2011 and 2014.

Methods

This was a descriptive study using routine, monitoring data. Original data from the NGOs was sent to a central registry within the National TB Programme. Data for this study were extracted

from that database. Data from all 84 project townships in five regions and three states in Myanmar, which were launched in 2011, were used.

Results

Over time, the number of referred presumptive TB cases decreased, although in some areas, the numbers fluctuated. At the same time, there was a trend for the proportion of cases treated, compared to those referred, that decreased over time (p=0.051). Overall, among 84 townships, the contribution of CBTC to total case detection deceased from 6% to 4% over time (p<0.001).

Conclusions

Contrary to expectations and evidence from previous studies in other countries, a concerning reduction in TB case finding by local NGO volunteer networks in several areas in Myanmar was recorded over four years. This suggests that measures to support the volunteer network and improve its performance are needed. They may include discussion with local NGOs responsible personals, incentives for the volunteers, closer supervision and improved monitoring and evaluation tools.

(* Output of Structured Operational Research and Training Initiative (2015-2016) and Paper submitted to Infectious Disease of Poverty Journal)

3. Contribution of community-based tuberculosis care of hard to reach populations by international non-governmental organizations in Myanmar 2013-2014

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Background/Introduction

National tuberculosis (TB) programs increasingly engage with international nongovernmental organizations (INGOs), particularly to provide TB care in complex settings where community involvement might be required. There is however limited data on how such INGO community-based programs are organized and how effective they are.

Objectives

In this study, we describe four INGO strategies for community-based TB care for hard to reach populations in Myanmar, and assess their contribution in TB case detection.

Methods

We conducted a descriptive study using program data from four INGOs and the national TB program (NTP) in 2013-2014. For each INGO, we extracted information on their approach and key activities, the number of presumptive TB cases referred for and undergoing TB testing, the number diagnosed with TB and their treatment outcomes. The INGO contribution to TB diagnosis in their selected townships was calculated as the proportion of INGO-diagnosed new TB cases to the total of NTP-diagnosed new TB cases in the same townships.

Results

All four INGOs implemented community-based TB care in challenging contexts, targeting migrants, post-conflict areas, urban poor and other vulnerable populations. Two recruited community volunteers via existing community health volunteers or health structures, one via existing community leaderships, while one directly involved TB infected/affected individuals. Two compensated volunteers via performance-based financing, two provided financial and in-kind initiatives. All relied on NTP laboratories for diagnosis and TB drugs, but provided DOT support and treatment follow-up.

A total of 21.995 presumptive TB cases were referred for TB diagnosis, with 7383 (34%) new TB cases diagnosed and almost all (97.5%) successfully treated. The four INGOs combined contributed 36% (7383/20663) of the total new TB cases detected in their respective townships, ranging from 15% to 52%.

Conclusion

INGOs supported community-based TB care successfully achieves high TB case detection in hard to reach and vulnerable populations, which is required to achieve the End TB strategy targets. Strategies to ensure sustainability of the programs should be explored, including the need of longer-term commitment of INGOs.

(* Output of Structured Operational Research and Training Initiative (2015-2016) and Paper submitted to Infectious Disease of Poverty Journal)

4. Different challenges, different approaches and related expenditures of community-based tuberculosis activities by international non-governmental organizations in Myanmar

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Background/Introduction

International non-governmental organizations (INGOs) have been implementing community based tuberculosis (TB) care (CBTBC) in Myanmar since 2011. Although the National TB Programme (NTP) ultimately plans to take over CBTBC, there have been no evaluations of the models of care or of the costs of providing CBTBC in Myanmar by INGOs.

Objectives

The aim of this study is to describe the differences in provision of CBTBC and associated costs by four INGOS in Myanmar over the period of 2013 and 2014.

Methods

This was a descriptive study using routinely-collected programmatic and financial data from four INGOs relating to 2013 and 2014, adjusted for inflation. Data analysis was performed from the provider perspective. Costs for sputum examination was not included as it was provided free of charge by NTP to the TB patients and the procedures were similar for each model of care. We calculated the average cost per year of each programme and cost per patient completing treatment.

Results

Four INGOs assisted the NTP by providing CBTBC in areas where access to TB services was challenging. Each INGO faced different issues in their contexts and responded with a diversity of strategies; with the total costs ranging from US$ 140,754 to US$ 550,221 during the study period. The cost per patient completing treatment ranged from US$ 215 to US$ 1,076 for new cases and US$ 354 to US$ 1215 for retreatment cases depending on the targeted area and the package of services offered.

Table (1) Average number of TB cases detected, number of patients completing treatment and cost per patient completing treatment through community based TB care by four INGOs in Myanmar, 2013 and 2014

Variables	INGO			
	(A)	(B)	(C)	(D)
Number of TB cases detected per year	2605	206	514	1490
Number of TB patients that completed treatment per year	1936	134	371	1242
Cost per patient that completed treatment (new case)*	306	1076	874	215
Cost per patient that completed treatment (retreatment)*	445	1215	1013	354

*Cost in US$

Discussion

Total costs were found to be the highest for INGO (A) were the highest and the lowest for INGO (B). However, the cost per patient completing treatment was found to be relatively higher for INGOs (B) and (C) than INGOs (A) and (D). Based on the study assessing involvement of community volunteers in TB control, the socio-demographic characteristics of the target population and population size of coverage areas of INGO (A) and INGO (D) are quite similar. But, INGO (D) spent less than INGO (A) per patient to complete treatment. Thus, INGO (D) appeared to show the allocation of their financial resources more patient-oriented. Again, based on previous qualitative and mixed methods studies conducted in Myanmar, CBTBC model used by INGO (D) seemed more sustainable.

Conclusions

This study revealed a wide variety of models of care and associated costs for implementing CBTBC in diverse and challenging populations and contexts in Myanmar and in similar settings. Consequently, we recommend a more comprehensive evaluation, including development of cost model to estimate the costs of scaling up CBTBC country-wide and cost-effectiveness studies, to best inform the NTP as it prepares to takeover CBTBC activities from INGOs. While awaiting evidence from these studies, models of CBTBC that have higher sustainability potential and allocate more resources to patient-centered care should be supported.

(* Output of Structured Operational Research and Training Initiative (2015-2016) and Paper submitted to Infectious Disease of Poverty Journal)

5. Engagement of public and private medical facilities in tuberculosis care in Myanmar: contributions and trends over an 8-year period

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Background/Introduction

Tuberculosis (TB) remains one of the major global health problems, with a total of 9.6 million TB cases and 1.4 million TB deaths reported in 2014. In response to this, the international community has engaged in ambitious global initiatives. In 2015, the World Health Organization (WHO) related the End TB strategy, which aims to reduce TB deaths by 95% and new cases by 90% between 2015 and 2035. The strategy comprises of three pillars with a total of ten components.

Enhanced case detection and case holding, engagement of all public and private TB providers, and operational research to assess progress and identify barriers and gaps.

TB elimination is unlikely to be achieved without effective partnerships between all TB care providers, supported by operational research evaluating the joined efforts and identifying shared or specific program challenges. There is a gap in this aspect till now, and this study attempted to make evaluation at the national level and over a long-term period, of the activities and contributions of all non-NTP providers to TB case detection and treatment.

Objectives

Using routine programme data collected by the NTP, public-public and public-private actors between 2007 and 2014, we report on 1) the number of TB cases diagnosed and their relative contribution to the national case load; 2) the demographic characteristics and type of TB cases diagnosed; 3) their treatment outcomes.

Methods

Study design: a retrospective analysis using routinely collected data

The public-private mix (PPM) strategy

The public-public mix

This collaboration aims to strengthen the link between the public TB center and the public hospitals within the framework of the DOTS strategy. In 2007, linkage of TB activities in these public hospitals to NTP was piloted in six hospitals, with gradual scaling-up since then. Currently, 24 hospitals are involved. While originally four options with different degrees of involvement were proposed, all PPM hospitals are currently implementing option 3 and option 4. Option 3 refers to patients diagnosed and started on TB treatment in the hospital followed by referral to the NTP health center during treatment. Under option 4, patients are diagnosed, treated and have their outcome ascertained in the hospital, with reporting to the NTP.

The public-private mix

The public-private mix entails the involvement of national and international NGOs, and private practitioners. The first initiatives date back to 2004. Currently a total of one national and six international NGOs are involved in the public-private mix. Most international NGOs provide TB care as part of their direct program activities, for example integrated in HIV care programs.

The engagement of private practitioners in TB care is mainly organized via one international (Population Services International - PSI) and one national NGO (Myanmar Medical Association - MMA).

Most private general practitioners have their own private clinic, few are organized in poly-clinics or special clinics. For sputum examination, private doctors refer TB suspects to NTP labs and PSI or MMA affiliated private labs, accredited by the NTP and monitored under an external quality assurance system (EQA). The key contributions of the NGOs are provision of TB drugs – provided by the NTP – and support in reporting to NTP on the TB activities. Supervision is conducted jointly by the NTP, WHO and the respective NGO.

Private practitioners can engage into TB care according to three schemes, with increasing involvement. Scheme 1 consists of health education and referral of presumptive TB cases. In scheme 2, they additionally function as DOT providers. Scheme 3 refers to NTP affiliated DOTS centers/clinics, which often have an NTP accredited private laboratory.

Study participants: all TB cases diagnosed between 2007 and 2014 by the public-public mix according to option 4, the public-private mix and the NTP in Myanmar.

Results

The total number of cases detected per year ranged from 133.547 in 2007, to 137,403 in 2010 and 142,587 in 2014, with a peak in 2012 (Figure 1A). The contribution of private practitioners increased from 11% in 2007 to 18% in 2014, and from 1.8% to 4.6% for public hospitals. The contribution of NTP in national TB case detection decreased from 87% in 2007 to 77% in 2014.

A similar pattern was seen in the number of new smear(+) TB cases (Figure 1B) and retreatment cases (Figure 1C), with as main difference that the absolute numbers of new smear(+) TB cases detected by NTP decreased over time, but the numbers of retreatment cases increased.

The demographics of the new smear (+) TB cases are shown in Table 1. Most (65%) were male and between 25 to 44 years old. No clear differences were noted between the three different providers.

Over the eight year period, the contribution of non-NTP actors to TB detection at the national level increased from 13% in 2007 to 23% in 2014, with the largest contribution by private practitioners involved in PPM. Treatment outcomes by private practitioners were generally good, although the reasons behind the higher default rate in the private sector remain unclear. Treatment outcomes were less satisfactory in the public hospital, particularly for retreatment cases.

Discussion

Over the eight year period, the contribution of non-NTP actors to TB detection at the national level increased from 13% in 2007 to 23% in 2014, with the largest contribution by private practitioners involved in PPM. Treatment outcomes by private practitioners were generally good, although the reasons behind the higher default rate in the private sector remain unclear. Treatment outcomes were less satisfactory in the public hospital, particularly for retreatment cases.

The contribution of the public-public mix remained small, with only 24 tertiary level hospitals involved. However, as information on the activities of the public hospitals referring TB cases for treatment to NTP – ie working under option 3 – was not available, their contribution is underestimated in our study. Specialty hospitals with a high TB burden such as ENT hospitals should be preferentially be targeted as well, besides hospitals falling under other ministries than the MoH (eg military and railway hospitals). Strengthened partnership with all public actors would further help to ensure completeness of reporting of national TB case detection, and alignment of TB care with national TB guidelines. The higher mortality rate in TB cases in the public hospitals, compared to the NTP, is likely explained by disease stage or co-morbidities. Follow-up studies would be of value to assess opportunities for further reducing the case fatality rate. The reasons for the high proportion of default and patients without outcome evaluation, particularly amongst retreatment cases, should be determined as well.

There are a number of important limitations to acknowledge. The use of aggregated data program data precluded more in depth analysis. As per NTP reporting guidelines, demographic information was only available for new smear (+) TB cases.

Conclusion

In between 2007 and 2014, the PPM model contributed substantially and increasingly to TB case detection. While the contribution of the public-private mix reached 18% in 2014, this remained at 4.5% for the public-public mix. Treatment outcomes were generally fair, although the higher default rate in the private sector and the overall poorer outcomes in retreatment cases in public hospitals need attention. Further scaling-up of the PPM model will require finding ways to engage

the relatively large group of general practitioners not yet involved in PPM, and integration of all hospitals in TB care.

(* Output of Structured Operational Research and Training Initiative (2015-2016) and Paper submitted to Infectious Disease of Poverty Journal)

6. Accelerated case finding for TB through mobile teams and community involvement: a process evaluation

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Background

Nationwide TB prevalence survey in Myanmar in 2010 revealed many TB cases were asymptomatic and remained undiagnosed. Therefore, there is a urgency to improve TB case detection and accelerated case finding (ACF) has been recommended. Previous studies on mobile team activities in Myanmar were quantitative in nature examining mainly on outcomes (TB cases detected) of mobile team activities rather than the process. In order to identify the best ACF delivery model in Myanmar, these would have to be evaluated with regard to process of actual implementation, strengths and challenges.

Objectives

1. To describes process, strengths and challenges of mobile team activities for ACF
2. To find out community involvement in mobile team activities
3. To elicit opinions and suggestions of key stakeholders on ACF through mobile teams

Methods

It was a process evaluation which included record review and qualitative methods. Focus Group Discussion (FGD) with regional TB Officers nine in depth interviews (IDIs) with TB team leaders and TB focal persons appointed by NGOs were conducted. Observation of mobile team activities was done in rural and urban areas.

Results: Most of the mobile team followed the procedure according to guideline. However, some did not carry out microscope alongside with their visit and only sputum collection was done. Usually, treatment was prescribed by team leader of mobile team but provision of TB drugs was given through BHS of that area.

Strengths of mobile team were early case detection and awareness raising. Some stated that it is not only for treating TB but also prevention spread of infection. The main **Challenges** related to logistics problems and poor compliance of asymptomatic TB cases. **Community involvement** in mobile team activities were recruiting people, arranging venue and seating, providing information to local community prior to the day of mobile team activity, helping in carrying machines and other necessary tasks. **Most common Suggestions** are related to logistics such as providing vehicle/Xray van, functioning X ray machine and human resources especially microscopist. Few suggested training for Medical Officers of mobile team which could enhance to diagnose and decide treatment as one stop service.

Discussion

The aim of ACF by mobile team is for early case detection of TB. Thus the effectiveness of mobile team cannot be measured only by number of cases detected. Other benefits of mobile team such as awareness raising and opportunity for health education should also be taken into account. The main challenges were treatment adherence, logistic supply and sustainability of this activity. Inability to provide one-stop service especially sputum examination and limited counseling could lead to loss of presumptive TB cases. The success of mobile team depends on pre-visit and collaboration of local authorities, community and BHS.

Conclusion

This operational research highlights some practical issues which need to be considered in planning of ACF. It is necessary to strengthen one stop service which will enhance prompt diagnosis and treatment of cases detected.

7 Factors for sustainability of community health volunteers for TB control in Tanintharyi Region, Myanmar

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This operational research was conducted in collaboration with Department of Medical Research (DMR), World Vision Myanmar and National Tuberculosis Programme (NTP), Department of Public Health with funding support of Global Fund. Community awareness and participation plays a key role in Tuberculosis (TB) control. Various International non-governmental organizations (INGOs) including World Vision International Myanmar (WVM) has been implementing Community based TB care projects in Myanmar. These projects recruited, trained and assisted Community Volunteers to provide health education, referral of presumptive TB, provide

community-based DOT and support TB patients and their family members in various ways. Previous study conducted in two townships in 2012 in Myanmar on assessing involvement of community volunteers in TB control activities initiated by INGO highlighted sustainability of volunteers is questionable. Thus this operational research was conducted to identify the factors for sustainability of these community volunteers.

Cross-sectional descriptive study was conducted in three townships out of five townships of WVM in Tanintharyi Region based on volunteers' retention, floating and attrition. All community Health Volunteers (59) were interviewed by using questionnaire. Free listing and ranking were conducted during five Focus Group Discussions (FGD). Six key informant interviews (KII) were done with focal persons from NTP and WVM and three in depth interviews (IDI) with volunteers who have left their jobs. Record review of volunteers' data at WVM Office was also carried out.

The age of respondents ranged from 16 to 53 years (mean age=30.1yr), 94.9% were females and 44.1% are married, 54.2% are singles. About 59.3% had other source of income. Monthly family income of volunteers ranged from 30,000 to 1,000,000 kyats and 79% earned between 100,000 and 300,000 kyats. Twenty two percent are volunteering in other sectors such as maternal and child health, nutrition, child development and 78% work only on TB activities. About 37% were recruited by WVM staff, 24% by Community based organizations (CBOs) and 20 % by community leaders. Almost all (98.3%) got training after joining as volunteers.

The main reasons for volunteering are gaining opportunity to help people (100%), learning opportunity (75%) and use of time wisely (63%). Majority responded benefits of being a volunteer as receiving merit (91.5%), improved health knowledge (86.4%), extend social network (72.9%) and gaining trust by community (62.7%).

Duration of being volunteers ranged from zero to 10 years (mean=4.67yrs). Number of days for volunteer work ranged from 1-25 days per month with average of 13.4 days. Main activities of volunteers were health education (98.3%), referral (98.3%), remind to take anti-TB drugs (88.1%) and take anti-TB drugs for patients from health centre (86.4%).

Majority (91.5%) received performance-based cash incentive and the rest received fixed amount of cash as an incentive. About 66.1% of respondents mentioned that fixed amount of cash is the most useful type of incentive for volunteers. Number of volunteers drop-out in those townships during the previous year ranged from 0 to 20. Mean is 3.9. Dropout rate of volunteers in three townships was 34%. Reasons for leaving volunteer work were not having free time (70%), need income (51%) and got married (49%). Among 146 volunteers, 70(47.9%) of volunteers sustained for more than one year.

Among the factors for sustainability of community volunteers for TB control, the respondents mentioned that increasing the incentives (90%), providing adequate training (81%), providing recreation trips (73%), getting recognition (71%) and providing transportation costs (70%) were the top factors necessary to sustain the volunteers. Qualitative findings also support quantitative findings regarding factors for sustainability. Most respondents (both volunteers and key

informants) mentioned about incentives in terms of cash or in kind. Some volunteers stated that there should be an opportunity for their future career by working as volunteer. Few pointed out support for medical cost of the volunteers when they are ill. Most key informants value role of volunteers in TB prevention and control activities.

The study highlighted that sustainability of community health volunteers depends on several factors. There are two schools of thoughts in providing incentives for volunteers. For volunteers who had to struggle for their living had basic needs and thus the main reasons for drop out or attrition was to get earning for their living. Providing basic needs/payment combination with performance based incentives and other supports such as supervision, cover medical cost for volunteers would pave the way for sustainability of volunteers. This study was conducted in community health volunteers of WVM and therefore the findings cannot be generalized to other volunteers in different organizations. Community health volunteers in different NGOs have different kinds of incentives and supports. To capture complete picture of sustainability of community health volunteers for TB control, it is necessary to conduct operational research including community health volunteers from INGOs and local NGOs involve in TB control activities in Myanmar.

Building a strong coalition with civil society and community is one of the principles in Post 2015 Global TB strategy. Therefore the role of community health volunteers in TB control is essential. Sustainability of community health volunteers is multi factorial. Not only monetary incentives to support their living but also other factors—technical guidance and training; supportive supervision; and recognition of their works—were crucial in maintaining volunteers spirit of community health volunteers in TB control activities.

8 Assessing Patient Satisfaction in Community Based TB care

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Background/Introduction

Observing the quality of health services from patient's perspective such as patient satisfaction is critically important to make services more responsive to patients. Moreover, patient satisfaction influences case detection, treatment uptake, adherence and success, and eventually to National TB control program outcome. However, limited information is available about the patient satisfaction on community based TB care in nation-wide scale although it has been implemented in Myanmar since 2011.

Objectives

The objectives of the study is i) to describe the patient satisfaction towards community based TB care and ii) to identify the factors associated with patient satisfaction in community based TB care

Methods

A cross sectional community based study was conducted on TB patients from five townships in Myanmar where community based TB care has been implemented by INGOs. A validated patient satisfaction questionnaire was adapted from (PSQ-3). The question included 21 items and each item is measured by a five-point Likert scale. The scale ranges from 1 (highly unsatisfied) to 5 (highly satisfied) and denoted 4 as "satisfied". Six focus-group-discussions and four in-depth-interviews with TB patients were also conducted. Free listing and ranking method was applied to explore factors of satisfaction on community based TB care among TB patients.

Results

A total of 234 TB patients from five townships participated in this study. The mean age was 44±14.7 years. Male (132, 56.4%), married (162, 69.2%), Burma (114, 48.7%) and rural residents (151, 64.5%) were the majority.

Table (1) Mean scores of patient satisfaction

Scale	No. of items	Scoring	Median	Range
Health education about TB	3	3.3±1.1	3.7	1-5
Communication of TB volunteers	3	4.3±0.6	4.3	1-5
Communication of TB staff	3	3.5±1.4	4	1-5
Facilitation for TB diagnosis	2	4.3±0.9	4.5	1.5-5
Facilitation for TB treatment	4	4±0.8	4	1-5
Social support	1	4.1±1.1	4	1-5
Facilitation for side effect management	2	4±0.9	4	1-5
TB treatment service	3	4.3±0.6	4.3	2-5
Mean overall satisfaction	21	3.9±0.5	3.9	1.5-5

Patients satisfaction was significantly higher among patients with high education status (p=0.03), urban residents (p=0.001), who received 1) home delivery of anti-TB medicines by the volunteers (p<0.0001), 2) more frequent health education (p=0.004), 3) DOTS provision by the volunteers (p<0.0001) and 4) transportation fees for patients' health facility visits (p=0.04). Qualitative findings also pointed out that patient satisfaction was determined by home delivery of anti-TB medicines by the volunteers, volunteers' psychological support and care on TB patients and getting anti-TB medicine free of charge.

"Participants (2) (5) and (7): Bringing anti-TB medicines to our home is much more important. Participant (7): Then we don't need to go to health facilities by ourselves and do not lose our daily wages." (FGD with TB patients)

"Participant (6): As the volunteers are taking care of us with all of their heart, we appreciate them so much and we feel like we are encouraged." (FGD with TB patients)

Discussion

Patients' satisfaction with TB care is a crucial issue in TB control and it affects utilization of services and use of anti-tuberculosis drugs. To our knowledge, this is the first study describing the satisfaction of patients on community based TB care in Myanmar. The overall patient satisfaction was just about to be satisfactory. Patients were highly satisfied with communication with volunteers, volunteers' facilitation for TB diagnosis and TB treatment services. But the least satisfaction was reported for health education about TB. Factors determining patient satisfaction on community based TB care included home delivery of anti-TB medicine by the volunteers, frequent health education, obtaining DOT provision by the community volunteers and receiving

transportation fees. Home delivery of anti-TB medicines was revealed from both quantitative and qualitative assessment as a factor for satisfaction on community based TB care.

Conclusion

From the present study we captured the need for improvements in delivery of community based TB care services. As satisfaction is highly associated with home delivery of anti-TB medicines by the volunteers, volunteers' provision of DOT and supporting transportation fees and volunteers' psychological support and care, these performances should be maintained and enhanced. Satisfaction on health education about TB was low but overall satisfaction was high among patients having more frequent health education. Therefore, health education activities of community volunteers should be strengthened.

9 A monthly package of support delivered through a patient-centered, community-driven model yields high MDR-TB treatment success in Myanmar

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Background: In 2013, over 600 patients with multidrug-resistant tuberculosis (MDR-TB) in Myanmar were initiated on treatment with second line drugs by the National Tuberculosis Program (NTP). The USAID Control and Prevention of Tuberculosis (CAP-TB) project developed a patient-centered model for MDR-TB management, supporting the NTP´s usual care.

Intervention: This was a retrospective cohort study of 619 MDR-TB patients enrolled on CAP-TB support from April 2013 - January 2014. Some patients were supported for the full 20-24 month treatment and others for a portion of treatment, in the following groups: (1) Minimal support (occasional home visits); (2) Monthly package of support (POS; home visits for psychosocial and adherence counseling, infection control and side effect monitoring; travel allowances; food supplements); (3) Daily evening directly observed therapy (DOT) by community volunteers; and (4) Monthly POS plus daily DOT.

Results: Of the 619 patients, 60.3% were male with a mean age of 37.5 ± 12.4; 1.5% HIV positivity; 29.2% treated with Para-Aminosalicylic acid (PAS); and 92.9% were retreatment cases. Treatment success for the overall cohort was 84.5%. Due to sample size limitations by level of support, multivariable analysis was conducted for DOT (Groups 3, 4) or no DOT (Groups 1, 2). Younger age, PAS treatment, and receipt of the package of support >12 months were significantly associated with treatment success.

Patient groups by level of support N = 619	n (%)	Treatment failure (Loss to follow-up, Death, Failure, and Not evaluated)	Treatment success (Completion or Cure)
Group 1: Minimal support	26 (4.2%)	16 (61.5%)	10 (38.5%)
Group 2: Monthly POS	485 (78.4%)	71 (14.6%)	414 (85.4%)
Group 3: DOT alone	14 (2.3%)	2 (14.3%)	12 (85.7%)
Group 4: DOT plus Monthly POS	94 (15.2%)	7 (7.5%)	87 (92.6%)

Variables	Crude odds ratio (95% CI) N = 619	P value	Adjusted odds ratio (95% CI) N = 570	P value
Age ≤34 versus ≥ 55 years old	3.96 (2.00 – 7.84)	0.000	3.02 (1.27 – 7.18)	0.012
With PAS versus without PAS	1.40 (0.84 – 2.34)	0.201	2.12 (1.13 – 3.99)	0.019
Monthly POS 13-25 times versus 1-12 times	12.58 (6.99 – 22.62)	0.000	13.52 (7.29 – 25.06)	0.000
With DOT versus without DOT	2.26 (1.10 – 4.64)	0.027	1.24 (0.50-3.08)	0.637

Conclusions: A monthly package of psychosocial, nutrition, and transportation support for MDR-TB patients in Myanmar yields high treatment success. A patient-centered package of support delivered monthly and consistently may be an effective strategy for successful MDR-TB outcomes.

10 Cost-effectiveness Analysis of CAP-TB Patient-centered Package of Support

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Background: The cost-effectiveness and sustainability of the USAID CAP-TB project's patient-centered approach to MDR-TB management is critical with rapid PMDT scale-up in process for

Myanmar. We analyzed the cost and effectiveness of alternative combinations of patient support to determine how they vary as the level of support increases.

Design: This was a retrospective cohort study of 983 MDR-TB patients enrolled on CAP-TB interventions from April 2013 until January 2014. Of the total cohort, 619 MDR-TB patients had treatment outcomes available at the end of the project (September 2015). Data for the full cohort of 983 patients were used to compute the total patient-specific costs and average cost per patient; while the effectiveness (treatment success) was computed using data for the 619 patients who had final outcomes.

Results:

Total Patient-Specific Costs and Average Cost per Patient:

Cost by Level of Support

Level of Support	**Total Cost (USD) †**	**Avg. Cost Per Patient**
Minimal Support	$ 73,402	$ 223.11
Monthly Package of Support	$ 431,728	$ 846.52
Daily evening DOT	$ 64,678	$ 1,902.30
Monthly Package of Support + daily evening DOT	$ 275,966	$ 2,508.78

† Aggregation of patient-specific costs based upon volume of services received by each CAP-TB partner

Effectiveness by Level of Support: To estimate the effectiveness of the different levels of support, the patient level outcome data was aggregated across the different groups. Effectiveness was measured as the percentage of patients within each group who had successful treatment outcomes (treatment completion or microbiological cure). Treatment failure was also defined using WHO criteria: loss to follow-up, death, treatment failure, or "not evaluated".

Treatment Success Rates by Level of Support

Level of Support	**# Patients with Outcome Data †**	**# Treatment Success**	**Success Rate**
Minimal Support	26	10	38.5%
Monthly Package of Support	485	414	85.4%
Daily evening DOT	14	12	85.7%
Monthly Package of Support + DOT	94	87	92.6%

† Not all patients had been enrolled in care long enough to have outcome data at time of analysis

Cost-Effectiveness Analysis: In order to assess the relative cost-effectiveness of different levels of support, the results on cost per patient and success rates were used to estimate the

costs and expected outcomes for a hypothetical cohort of 1,000 patients. This allows for a comparison of costs and outcomes across groups without distortions due to varying group sizes. The groups were sorted in order of increasing intensity (cost per 1,000 patients) and the average and incremental cost-effectiveness ratio (change in total cost divided by change in number of patients cured) associated with increasing levels of cost were calculated. The average cost-effectiveness ratio is a measure of the productivity or efficiency of resource use while the incremental cost-effectiveness ratio reflects the relative gain per additional dollar spent on increasing the intensity of support.

Cost-Effectiveness Analysis of Alternative Levels of Support

Level of Support	Costs for 1,000 Patients	Expected # with Treatment Success	Average Cost-Effectiveness Ratio	Incremental Cost-Effectiveness Ratio
Minimal Support	$ 223,105	385	$ 579.49	$ 579.49 †
Monthly Package of Support	$ 846,525	854	$ 991.25	$ 1,329.25
Daily DOT	$ 1,902,300	857	$ 2,219.72	$ 3,557,62
Monthly Package of Support + DOT	$ 2,508,781	926	$ 2,709.27	$ 8,789.58

† This level of support with the lowest cost per 1,000 patients implicitly assumes an option of "no support" with zero costs and zero treatment success

Conclusions: The most cost-effective option (least costly per additional patient cured) is the minimal level of support (occasional home visits) with a cost of approximately ~$580 per patient cured. However, if affordable, the addition of the monthly package of support is associated with a dramatic increase in the treatment success rate (from 38.5% to 85.4%) and could be considered an attractive option. This highlights the issue that cost-effectiveness is not a guarantee of affordability and this information is only one piece of evidence to be used by program stakeholders when making decisions about how best to support the needs of MDR-TB patients.

Limitations: The ***outcome estimates*** for the Minimal Support and Daily evening DOT groups are based upon very few patients so must be interpreted with caution. However, the ***cost estimates*** are based upon more than 30 patients in each group so the estimates of the incremental cost of moving from minimal support to alternative levels of support should be reliable.

Because the in-country support costs of FHI 360 were applied as a fixed percentage on top of all the implementing partner costs, the total cost estimates may be artificially high. To the extent that international NGO costs are substantially higher than costs of local organizations (due to higher operating costs or more intensive program support) this introduces an upward bias in the cost estimates. However, as this was applied at the same rate across all implementing partners, this is a consistent bias.

11 Factors driving the emergence of multidrug resistant tuberculosis in a transitioning health system: results from the first case-control study on tuberculosis in Myanmar.

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Background

Antibiotic resistance is a growing challenge to controlling infectious diseases worldwide, including tuberculosis (TB), which has approximately 480,000 drug resistant cases emerging annually. Countries whose health systems are least equipped to manage drug resistant infections are also those where drivers of resistance are most likely to operate. We investigate patient and health system related factors driving the emergence of multidrug resistant tuberculosis (MDR-TB) in Myanmar, a setting where investment and reform are ongoing to reduce the burden of both drug-sensitive and MDR-TB. The aim of the study is to identify specific factors that promote acquisition of resistance during TB treatment.

Methods

We conducted a multi-centre retrospective case-control study in ten townships across Yangon. Cases were 202 GeneXpert-confirmed drug resistant TB patients with a history of prior treatment for TB. Controls were 404 smear-positive TB patients, with no known drug resistance, diagnosed in the same month and township as cases.

Findings

Multivariable logistic regression analysis identified the following risk factors for development of MDR-TB: being diabetic, missing TB treatment more than once weekly, having a household member diagnosed with MDR-TB or dying from TB, and higher socioeconomic status or education.

Interpretation

Coinciding with a surge in funding to improve health in Myanmar, this study provides new information about programmatic factors that can be addressed, and high-risk tuberculosis patient groups that can be prioritised for enhanced treatment support and monitoring in order to prevent further generation of drug resistance.

Funding

USAID's Control and Prevention – Tuberculosis Project

12 Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeat (MIRU-VNTR) genotyping of *Mycobacterium tuberculosis* clinical isolates in Myanmar

Wah Wah Aung[1], Phyu Win Ei[1], Jong Seok Lee[2], Ji-Im Lee[2], Wint Wint Nyunt[3], Thyn Lei Swe[3], Si Thu Aung[3], Mi Mi Htwe[1], Su Mon Win[1]and Chulhun L. Chang[4]

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Background: Myanmar is one of the 22 high tuberculosis (TB) burden countries and one of the 27 high multidrug resistant TB (MDR-TB) burden countries. Limited information is available on the genotypic pattern of *Mycobacterium tuberculosis* (MTB) in Myanmar. Mycobacterial interspersed repetitive unit-variable number tandem repeat (MIRU-VNTR) typing is a fast and promising method to discriminate MTB strains in many countries but its usefulness and discriminatory ability are needed to be evaluated in local settings. In the present study, we genotyped the clinical MTB strains collected from two major cities in Myanmar and evaluated the discriminatory ability of internationally recommended 15 loci and 24 loci MIRU-VNTR methods.

Method: A total of 100 MTB strains isolated from pulmonary TB patients in Yangon and Mandalay Regions were studied. Anti-TB dug susceptibility was determined using both proportion method and commercial line-probe assay. Standard 15-loci and 24 loci MIRU-VNTR typing were applied for genotyping and the results were analyzed by the MIRU-VNTR plus web application. The Hunter-Gaston discriminatory index (HGDI) was used as numerical index to describe the discriminatory power.

Results: All tested 100 MTB isolates showed unique patterns and did not clustered. They distributed to five major lineages including unidentified strains. The most prevalent lineages were Beijing followed by East-African-Indian. Any anti-TB drug resistance was found in 26% (n=26) including 19% (n=19) MDR-TB cases of tested strains. Of MDR-TB isolates, 57.9% (n=11) were belong to Beijing and Beijing-like lineage. Both 15 and 24 loci MIRU-VNTR were found to be

highly discriminatory (HGDI= 0.9834 and 0.9878 respectively). For unidentified strains, PCR based typing method will be applied to distinguish lineages where they belong.

Conclusion: MIRU-VNTR method was found to be a useful genotyping tool to discriminate MTB strains from Myanmar. As both 15 and 24 loci MIRU-VNTR genotyping showed similar high discriminatory power, 15 loci method could be more preferable in terms of cost efficiency. The most prevalent genotype was Beijing genotype which was found to be associated with multi-drug resistant tuberculosis. A large scale of molecular epidemiology study should be conducted to find out and characterize the representative Myanmar MTB strains.

(Published in .*Ann Lab Med* 2015;35:Supplement1: S1)

13 Genetic diversity of clinical *Mycobacterium tuberculosis* strains from Yangon and Mandalay Regions, Myanmar

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Determining the genetic diversity of *Mycobacterium tuberculosis* (MTB) strains allows identification of the distinct MTB genotypes in different regions and also provides an invaluable tool for the study of epidemiology of tuberculosis (TB). Mycobacterial interspersed repetitive unit-variable number tandem repeat (MIRU-VNTR) typing is a fast and promising method to discriminate MTB strains in many countries. The present study was carried out to determine the genetic diversity of MTB strains isolated from pulmonary tuberculosis patients in Myanmar. A total of 210 clinical MTB strains isolates from Yangon (n=117) and Mandalay Regions (n=93) during 2012-2015 were studied. The isolates included 129 MDR/MDR+, 4 any drug resistance other than MDR and 77 sensitive strains. PCR-based typing method described by Warren *et al* 2004 was used to identify Beijing and Non-Beijing strains. Internationally standardized 15-loci and 24 loci MIRU-VNTR typing were applied for genotyping and the results were analysed by the MIRU-VNTR plus web application. The Hunter-Gaston discriminatory index (HGDI) was used as numerical index to describe the discriminatory power. All tested 210 MTB isolates showed unique patterns and did not clustered. They distributed to six lineages; Beijing (70%), East-African-Indian (4.8%), NEW1 (1.05%), LAM,CAS/Delhi and Uganda 1(0.48% each) and unknown strains (22.3%). Ten strains (7 from Yangon and 3 from Mandalay) showed both Beijing and non-Beijing characteristics and comprised as co-infected cases. Of 147 Bejing strains (75 from Yangon and 72 from Mandalay), 77.55% (n=114) were belong to Beijing Lineage. HGDI of 15 and 24 loci MIRU-VNTR were 0.9834 and 0.9878 respectively. The most prevalent genotype was Beijing

genotype which was found to be significantly associated with MDR-TB (P<0.0001). As both 15 and 24 loci MIRU-VNTR genotyping showed similar high discriminatory power, 15 loci method could be more preferable in terms of cost efficiency. The wide diversity of strains observed may be due to low transmissibility of indigenous strains, the consequence of reactivation of latent MTB infection rather than re-infection and diversity in host genetics.

(Paper Presentation in 44th Myanmar Health Research Congress)

14 Detection of gene mutations conferring resistance to pyrazinamide and second line anti-TB drugs in *Mycobacterium tuberculosis* strains by DNA sequencing in Myanmar: Method establishment and preliminary findings

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Myanmar is a high tuberculosis (TB) burden country with high rates of multi-drug resistant TB (MDR-TB). MDR-TB does not respond to first line anti-TB drugs and has to be treated with second line anti-TB drugs (SLDs) which are less effective and more toxic. Extensively drug resistant TB (XDR-TB), which is caused by MDR-TB strains that are also resistant to at least one of fluoroquinolones (FQ) and any of the injectable SLDs, amikacin (AMK), kanamycin (KM) and capreomycin (CAP), is associated with poor treatment outcomes. Pyrazinamide (PZA) is an important drug for the treatment of both MDR and XDR-TB. Mutations in several genetic loci have been implicated in the development of resistance to PZA and SLDs. Compared to conventional liquid medium-based drug susceptibility testing, which still takes about 4 to 21 days, the detection of genetic variants which mediate resistance to certain antimicrobial agents represents a more rapid alternative. The objectives of this study were to establish DNA sequencing method to detect gene mutations conferring PZA and SLDs resistance in Myanmar and to apply direct sequencing method for identification of gene mutations for PZA (*pncA*), FQs (*gyrA* and *gyrB*) and KM/AMK and CAP (*rrs,eis*) resistance in MDR *Mycobacterium tuberculosis (MTB) isolates. Mycobacterial DNA extraction, amplification of resistant determining regions of specific genes, PCR purification, cycle sequencing and conventional DNA sequencing (capillary electrophoresis using ABI 3500 analyser, Applied Biosystems) method was established at Advanced Molecular Research Centre, Department of Medical Research during 2015. Liquid drug susceptibility testing using MGIT 960 automatic system was performed as standard phenotypic PZA and SLDs assay. Of initially tested 30 MDR MTB isolates, mutations in pncA gene were found in 5 PZA resistant strains.* Most of FQ resistant mutations were found in *codon 94 of gyrA gene and AMK resistant* strains carried mutations in A1401G in *rrs*. There were 3 pre-

XDR and 1 XDR-TB+PZA resistant cases among tested strains. The rapid detection of PZA and SLDs resistance prior to and during treatment is important for treatment success, early detection of XDR and implementation of increased infection control measures to prevent further transmission.

Ongoing and future research in 2016

1. Molecular typing and detection of drug resistant mutations conferring second line rug resistance in *Mycobacterium tuberculosis* strains from Yangon and Mandalay Region, Myanmar (KOICA funded project, collaborative project of DMR, NTP, Pusan National University Yangsan Hospital and International TB Research Institute, ITRC, Korea)
2. Detection of extensively drug-resistant tuberculosis (XDR-TB) among *Mycobacterium tuberculosis* clinical isolates in Myanmar (DMR Grant, DMR-NTP-ITRC, Korea)
3. Molecular study on *Mycobacterium tuberculosis* isolated in Mawlamyaing, Myanmar: phenotypic and genotypic analysis of pyrazinamide resistant tuberculosis and characterization of multidrug resistant Beijing strains for ethical clearance (DMR-NTP-Hokkaido University, Japan)
4. Barriers for health seeking and adherence of TB treatment among migrants at border township, Myawaddy Contact Tracing Activities For Tuberculosis By Midwives In Mandalay Region (Thesis For MPTM. Dr. Ko Ko Htwe)
5. Accessibility To Tuberculosis Diagnosis And Treatment Services Among Tb Patients From Rural Areas Of Mandalay Region (Collaborative research DMR, NTP)

5. EXTERNAL TECHNICAL SUPPORT

Technical support was provided by or through WHO, GDF and JICA

Table 31: International Visitors during 2015

No.	Name and Designation	Duration	Remark
1.	Dr. Rohit Sarin Chair of MDR Advisory Committee, WHO	10.8.15	7th r- GLC Meeting (Mandalay)
2.	Mr. KasparsLunte Team Leader,GDF, Mr. Luis Gustavo Do Valle Bastos Senior Technical Advisor, SIAPS	8.7.15 to10.7.15	GDF Mission
3.	Prof. Amie De Muynck Consultant, WHO	31.3.15to 13.4.15	Evidenced- based Programe Management Training
4.	Ms. Akiko FUJIKI Expert on TB Control, JICA	20.1.15to 5.2.15	EQA

5.	Dr. Norio YAMADA Expert on TB Control, JICA	20.1.15to 5.2.15	Epidemology Assessment
6.	Dr. Kosuke OKADA Expert on TB Control, JICA	20.1.15to 5.2.15	CBTBC
7.	Dr. Nobukatsu ISHIKAWA Expert on TB Control, JICA	20.1.15to 5.2.15	CBTBC

5.1 Global Fund Round 9, New Funding Model

The Global Fund supports programs run by local experts in countries and communities most in need. As a partnership between governments, civil society, the private sector and people affected by the diseases, the Global Fund is accelerating the end of AIDS, TB and Malaria as epidemics.

CCMs are central to the Global Fund's commitment to local ownership and participatory decision-making. Myanmar's CCM submitted an application with the title of "Scaling up of Tuberculosis control in Myanmar" to Global Fund round 9 grant in June, 2009. The concept note for New Funding Model (NFM) was submitted in April 2013.

The grant agreement under NFM was signed between two Principal Recipients (UNOPS and STC) and the Global Fund in June 2013 and NFM was implemented in July 2013, covering 319 out of 330 townships. Global Fund offers performance-based funding which ensures that funding decisions must be based on a transparent assessment of results along with time-bound targets. The total approved fund was US$ 108.3 million for NFM.

A total of 140699TB cases were reported to the Global Fund including 48825 bacteriologically confirmed cases. Treatment success rate of 2014 cohort was85%. There were 447 laboratories under EQA and laboratories showed adequate performance on EQA was above 92% in every quarter of 2015. All 344 units (319 townships, 23 hospitals and 2 partners, viz. PSI and MSF-H) reported no stock-out of first-line anti-TB drugs on the last day of the quarter. All 236 TB/HIV townships and partners (AHRN, MAM, MDM, MSF-CH, MSF-H, PSI and Union) reported number of TB patients with known HIV status and this HCT indicator achieved more than 100%. A total of 2793RR-TB/MDR-TB cases were notified and among them, 2207 cases were enrolled and treated with second-line anti-TB treatment.

Table 32: TB control activities with the support of Global Fund (2015)

Service Delivery Area : Improving Diagnosis					
Activity	***Measurement unit***	***Planned***	***Completed***	***Achievement***	***Remark***
ACF using mobile team (periurban and high case load areas)	No. of mobile team missions	49	44	90%	
Cross Sectional TB Screening for Prisoners at 18 Prisons	No. of missions conducted ACF	9	9	100%	
Volunteer incentive for X ray operation	No. of townships	9	8	89%	
Transport of sputum samples to Culture labs (NTRL & Upper Myanmar TB Lab) from Regions/States	No. of R/S transporting sputum samples to culture labs	961	783	81%	
Sputum collection centres	No. of townships conducting rotatory sputum collection centres at all RHC	50	50	100%	
Initial home visit and Contact tracing done by Basic Health Staff	No. of townships conducting contact tracing	321	311	97%	
Technical Strategic Group (TSG) Meeting	No. of meetings conducted	4	4	100%	
Annual Laboratory Evaluation Meeting (National)	No. of meetings conducted	1	1	100%	
Annual TB Evaluation Meeting (National)	No. of meetings conducted	1	1	100%	
State and Regional annual evaluation meeting	No. of meetings conducted	17	17	100%	
Quarterly TB Evaluation meeting at township level (100 selected townships)	No. of meetings conducted	142	137	96%	
Quarterly cohort review meeting at low	No. of meetings conducted	79	75	95%	

performance townships					
Advocacy meeting on GeneXpert	No. of meetings conducted	19	10	53%	
Installation, demonstration of on job training for GeneX pert	No. of trainings conducted	19	10	53%	
Supervision from Central to state & regional level and 3 districts including TB/HIV and MDR townships	No. of supervision visits conducted	42	29	69%	
Supervision to border DOTS townships (once a year)	No. of supervision visits conducted	6	3	50%	
Supervision of Microbiologist to States/Regions and districts	No. of supervision visits conducted	21	14	67%	
Supervision from Central to PPM DOTS hospitals (quarterly)	No. of supervision visits conducted	18	16	89%	
Supervision from Region and State to township (1 time/township) including 22 MDR-TB townships, and Lab. supervision	No. of supervision visits conducted	311	268	86%	
Training on 'management of TB at district level'	No. of training sessions conducted	2	2	100%	
Training for BHS on 'Management of TB for health facility staff'	No. of training sessions conducted	30	30	100%	
Training on cohort review meeting	No. of training sessions conducted	20	20	100%	
Training on TB Counseling	No. of training sessions conducted	18	17	94%	
Training on tuberculin testing	No. of training sessions conducted	1	1	100%	

Training on sputum microscopy for lab. Technicians	No. of training sessions conducted	7	7	100%	
Training of NTP/NAP staff on TB/HIV from newly expanded townships	No. of training sessions conducted	9	9	100%	
Training for new project area of MRCS volunteers	No. of training sessions conducted	1	1	100%	
Training for MRCS volunteers in existing implementing townships	No. of training sessions conducted	2	2	100%	
Advocacy and Training on PPM DOTS for new expanded hospitals	No. of training sessions conducted	1	1	100%	
Township TB/HIV committee meeting	No. of meetings conducted	642	609	95%	
TB/HIV Sentinel surveillance	No. of sentinel sites				Not conduct in 2015.
Advocacy meeting on TB/HIV activities for newly expanded townships	No. of meetings conducted	72	68	94%	
MDRTB Patients enrolled in second-line treatment	No. of patients	2988	2204	74%	
Border Health Committee bi-annual meeting	No. of meetings conducted	6	6	100%	
Quarterly evaluation meeting at border townships	No. of meetings conducted	24	24	100%	
Health talk at RHC	No. of townships conducted health talks	24	24	100%	
Annual national level meetings (Public-public mix)	No. of meetings conducted	1	1	100%	
Initial home visit of PPM hospital staff	No. of hospitals	20	20	100%	

World TB Day Ceremony at central level	No. of events	1	1	100%	
World TB Day Ceremony at Regional/State levels	No. of events	17	17	100%	
World TB Day Ceremony at district level	No. of events	47	47	100%	
Health talks at RHC level and urban health center (18 times/ quarter/township)	No. of health talks (times)	46	45	98%	
Annual Evaluation Meeting for CBTC	No. of meetings conducted	1	1	100%	
Evaluation meeting on CBTC activities using MRCS in Mandalay	No. of meetings conducted	1	1	100%	

5.2 Three Millennium Development Goals Fund (3MDGs)

The NTP has promoted active TB case finding activities in hard-to-reach areas, peri-urban slum areas, mines and prisons with the support of 3MDG since 2014. These activities were carried out by NTP and six implementing partners (AHRN, MAM, MHAA, MMA, PSI and Union). The NTP has also conducted active screening of TB among pregnant women, lactating mothers and under-5 children in all Maternal, Newborn and Child Health services over the country and among most vulnerable population including diabetes patients in seven PPM hospitals in Yangon region, Mandalay region and Kayin State.

Since NTP had limited human resources to do ACF activities, the six implementing partners recruited mobile team members and organized nine mobile teams with the support of 3MDG. The six NGOs also implemented CBTC activities by using community volunteers to promote TB case finding in selected townships. Not only CBTC, PSI also implemented TB case finding at MNCH services. The partners carried out ACF activities in the following townships in 2015.

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Table 33: Townships for CBTC activities by implementing partners with 3MDG support (2015)

Sr.	Name of Partner	No. of townships	Region/State	Name of Townships
1.	AHRN	9	Kachin State	Waingmaw, Hpakant, Shwegu
			Sagaing Region	Katha, Kale, Tamu
			Shan (North) State	Lashio, Laukkaing, Konkyan
2.	MAM	12	Kayin State	Hpapun, Thandaung, Kyarinseikkyi
			Kayah State	Demoso, Hpruso, Hparsaung
			Kachin State	Myitkyina, Chipwe, Bhamo, Momauk, Mansi, PutaO
3.	MHAA	16	Sagaing Region	Shwebo, Khin-U, Wetlet, Kanbalu, Kyunhla, Ayadaw, Chaung-U, Salgingyi, Katha
			Bago Region	Thanatpin, Shwekyin, Kyaukkyi
			Rakhine State	Ponnagyun, Kyauktaw, Myaebon, Ann
4.	MMA	11	Magway Region	Magway
			Mandalay Region	PyinOoLwin, Sintgaing, Myittha, Taungtha, Natogyi, Yamethin, Pyawbwe
			Yangon Region	Shwepyithar, Kyauktan, Kayan
			Shan (North) State	Muse
			Ayeyarwaddy Region	Kangyidaunt
5.	PSI	46	Yangon Region	East Dagon, North Dagon, Dagon Seikkan, South Dagon, Dalla, Dawbon, Hlaing, Hlaingtharyar, Hmawbi, Insein, Kyeemyindine, Mayangone,Tarmwe, Mingalardon, North Okkalapa, Twantay, Shwepyithar, South Okkalapa,Taikkyi, Tharketa, Thanlyin, Thingangyun,
			Ayeyarwaddy Region	Bogalay, Dedaye, Laputta,Ngapudaw, Mawlamyaingyun, Pyapon,
			Kayah State	Loikaw, Demoso, Hpruso
			Chin	Falam, Hakha, Htantalang, Tiddim
			Bago Region	Bago, Taungoo
			Magway Region	Ngape, Myaing, Seikphyu, Gangaw
			Mandalay Region	Madaya, Meikhtilar, Kyaukpadaung, Myingyan, Mogyoke
6.	The Union	6	Sagaing	Sagaing, Monywa
			Magway	Yesagyo, Myaing
			Shan (South) State	Taunggyi, Kalaw

Constraints

1. **Pursuing high-quality DOTS expansion and enhancement**
    - Human resource necessity and staff motivation
    - Limitation in reaching to the un-reach
    - Huge disease burden and co-infection
2. **Addressing TB/HIV, MDR-TB and other challenges**
    - Rapid scaling up of TB/HIV causes weak coordination at Regional/State level and below
    - Utilization of IPT was low
    - Emerging Drug-resistant TB
    - Limited funding for Infection Control for health facilities and congregate settings
3. **Contributing to health system strengthening**
    - Limitation in health financing and health work force
    - Limited service delivery in hard to reach area
4. **Engaging all care providers**
    - Limitation to scale up PPM-DOTS
    - Weak mechanism in reporting of PPM-DOTS
    - Case holding was one of the challenges in PPM-DOTS
5. **Empowering people with TB, and communities**
    - Low community awareness
    - No sustainability in community participation
    - Limited in appropriate materials for ACSM
6. **Enabling and promoting research**
    - Limited funding for operational research

6. BCG IMMUNIZATION

BCG immunization started in 1951 to those who were tuberculin test negative. In 1963, freeze-dried BCG vaccine was introduced. Direct BCG vaccination was implemented in 1969. BCG vaccination has become part of the Expanded Programme on Immunization (EPI) and the BCG team of NTP has been integrated into Regional and State Health Department since 1978.

Table 34: BCG coverage (2005-2015)

Sr.	States &Regions	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)
1	Ayeyarwaddy	64	85	84	92	92	89	89	90	96	98
2	Bago (East)	81	89	94	95	94	92	93	94		96
3	Bago (West)	90	94	86	95	96	94	91	92	95	95
4	Chin	119	93	63	79	84	84	60	93	90	94
5	Kachin	108	95	89	95	92	77	74	82	89	94
6	Kayah	83	83	96	94	96	80	91	100	96	98
7	Kayin	63	85	85	82	80	91	79	81	82	86
8	Magway	89	90	92	93	95	110	81	95	93	100
9	Mandalay	75	86	77	94	94	94	94	90	94	97
10	NayPyiTaw							91	91	89	100
11	Mon	80	94	92	96	97	96	93	92	97	97
12	Rakhine	76	92	107	96	94	97	70	66	85	85
13	Sagaing	83	91	94	94	98	90	89	97	95	95
14	Shan (East)	38	85	83	89	82	54	60	61	91	70
15	Shan(North)	68	70	75	86	80	80	67	75	85	78
16	Shan (South)	71	83	83	86	86	87	85	91	96	93
17	Tanintharyi	91	97	97	97	95	96	64	96	97	96
18	Yangon	65	94	92	98	97	97	103	93	96	98
	Country	**76**	**89**	**89**	**93**	**93**	**93**	**87**	**88**	**92**	**94**

7. BUDGET AND EXTERNAL TECHNICAL SUPPORT

7.1. Government budget for NTP

While the Government budget was only 14 million Ks in Fiscal Year (FY) 1995-1996, it increased to 3,776 million Ks in FY 2012-2013. Government commitment for purchasing drugs (especially second line anti-TB drugs) was very high: 2,550 million Ks was allocated for this during FY 2013-2014. For FY 2014-2015, the Government provides 4,135 million Ks for TB control and prevention in Myanmar. Similar to previous FY, the budget for anti-TB drugs was high, about 2.83 million Ks. The Government also provides 4,962 million Ks for TB control and prevention in Myanmar for FY 2015-2016.

Table 35: Government budget for NTP (in thousand kyats)

Fiscal Year	Regular Budget	Drugs	Total
1995-1996	13,711	782	14,493
1996-1997	14,527	1,614	16,141
1997-1998	16,017	5,000	21,017
1998-1999	18,777	19,600	38,377
1999-2000	20,509	25,000	45,509
2000-2001	62,747	30,000	92,747
2001-2002	68,470	35,000	103,470
2002-2003	74,349	35,000	109,349
2003-2004	109,667	35,000	144,667
2004-2005	129,300	35,000	164,300
2005-2006	119,955	55,000	174,955
2006-2007	361,974	55,000	416,974
2007-2008	373,126	74,700	447,826
2008-2009	400,146	74,700	474,846
2009-2010	465,190	90,011	555,201
2010-2011	574,785	94,396	669,181
2011-2012	693,564	58,251	751,905
2012-2013	996,995	50,025	1,047,020
2013-2014	1,225,976	2,550,941	3,776,917
2014-2015	1,306,676	2,828,618	4,135,294
2015-2016	1,568,011	3,394,342	4,962,353

The following graph shows the annual government budget for NTP. The Government budget has significantly increased starting from 2013-2014 especially for procurement of anti-TB drugs.

Figure 25: Government budget for NTP (2008-2016)

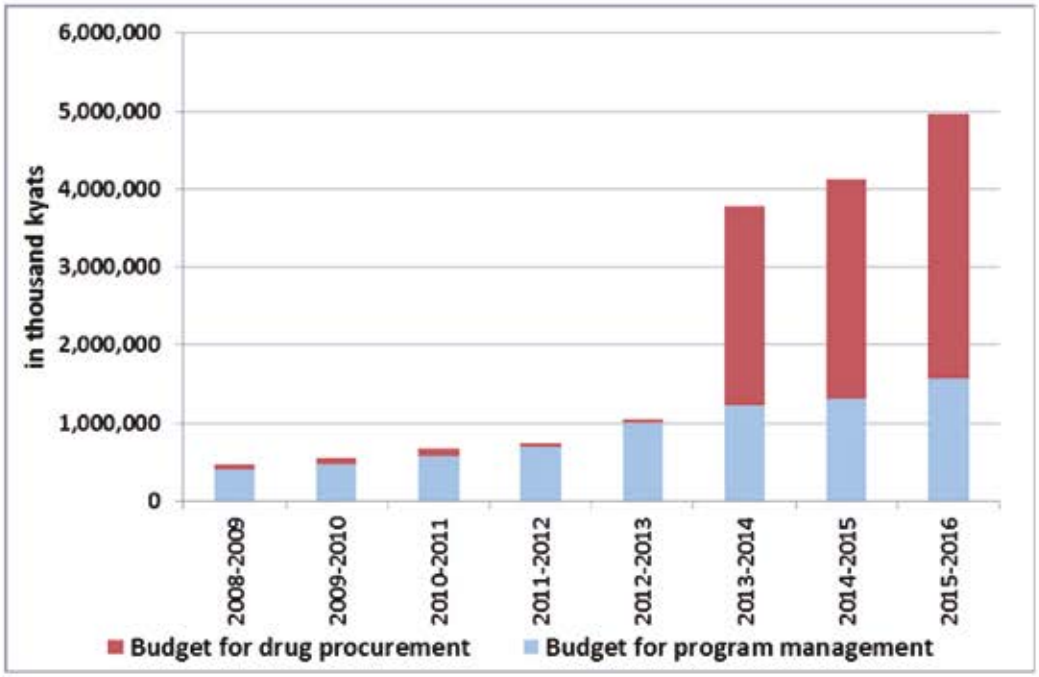


Table 36: Expenditures for NTP from external sources (2015)

Expenditure, fiscal year 2015	Global Fund	WHO	3MDG	Total Other grants
Laboratory infrastructure, equipment and supplies	3,318,834		-	**3,562,119**
NTP staff (central unit staff and subnational TB staff)		1,242,887	70,939	**1,374,857**
First-line anti-TB drugs	4,702,419		196,178	**5,163,955**
Drug-susceptible TB programme costs	1,191,666	414,850	-	**1,606,517**
Second-line anti-TB drugs	2,864,634		766,698	**3,631,332**
MDR-TB programme cost	1,217,380		233,527	**1,450,907**
Collaborative TB/HIV activities	127,213		-	**127,213**
Patient support	380,036		357,991	**738,026**
Operational research and surveys	-	23,900	-	**23,900**
All other budget lines for TB	1,788,258		1,023,118	**2,826,640**
Total	15,590,440	1,681,637	2,648,451	**20,505,467**

8. PROGRESS TOWARDS MDG'S

8.1 MDG targets and indicators for tuberculosis

Goal 6 – Combat HIV/AIDS, malaria and other diseases

Goal of the National Tuberculosis Programme (NTP) – to reduce morbidity, mortality and transmission of TB until it is no longer a public health problem and to prevent the development of drug resistant TB

Target 6.c Have halted [by 2015] and begun to reverse the incidence of malaria and other major diseases

Indicator 6.9 - Prevalence and death rates associated with tuberculosis

Indicator 6.10 - Proportion of Tuberculosis cases detected and cure under DOTS

Tuberculosis Indicator 6.9	**1990**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015 (MDG target)**
Tuberculosis prevalence rate per 100,000 population per year	922	525	506	489	473	457	461
Tuberculosis death rate per 100,000 population per year	133	49	48	48	49	53	67
Tuberculosis incidence rate per 100,000 population per year	404	384	381	377	373	369	< 404
Tuberculosis Indicator 6.10	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Tuberculosis detection rate under DOTS	76	77	78	79	76	79	
Tuberculosis treatment success rate under DOTS	86	86	85	85	85	85	

9. Progress of NTP In 2015

Regarding the Millennium Development Goal targets, the country has already achieved the TB incidence and mortality targets by the end of 2015.

9.1 Case finding and case notification

NTP targeted to achieve at least 70% case detection of estimated new smear positive (new bacteriologically confirmed pulmonary TB) in the community. NTP, implementing partners and other reporting units could notify 48825 cases of new bacteriologically confirmed TB in 2015. Thus, the nationwide case detection rate (CDR) was 85%.

During 2015, 140,700 TB cases (all forms) were notified by NTP, implementing partners and other reporting units (two TB specialist hospitals, one HIV hospital, 24 PPM Hospitals and Mandalay Central Jail hospital). Among them, 48,825 (35%) were bacteriological confirmed cases.

Table 37: Case Detection Rate by Regions and States for 2015

Regions and States	CDR for 2015	
	NTP only	NTP + other reporting Units
Kachin State	105%	126%
Kayah State	57%	59%
Chin State	28%	31%
Sagaing Region	47%	45%
Magway Region	42%	51%
Mandalay Region	60%	76%
Shan (South) State	42%	43%
Shan (East) State	72%	76%
Shan (North) State	58%	71%
Kayin State	77%	89%
Tanintharyi Region	57%	69%
Bago Region	70%	85%
Mon State	72%	87%
Rakhine State	63%	68%
Yangon Region	111%	172%
Ayeyarwaddy Region	73%	85%
NayPyiTaw Council Area	66%	84%
Union	**68%**	**85%**

The case detection rates of NTP alone (61% vs 68%) and NTP with partners (76% vs 85%) were found to be higher in 2015 compared to last year. However, most of the regions and states except Kachin, Kayin and Yangon, had lower CDR for NTP alone in 2015.

Figure 26: Case detection Rate of Regions and States by NTP alone (2015)

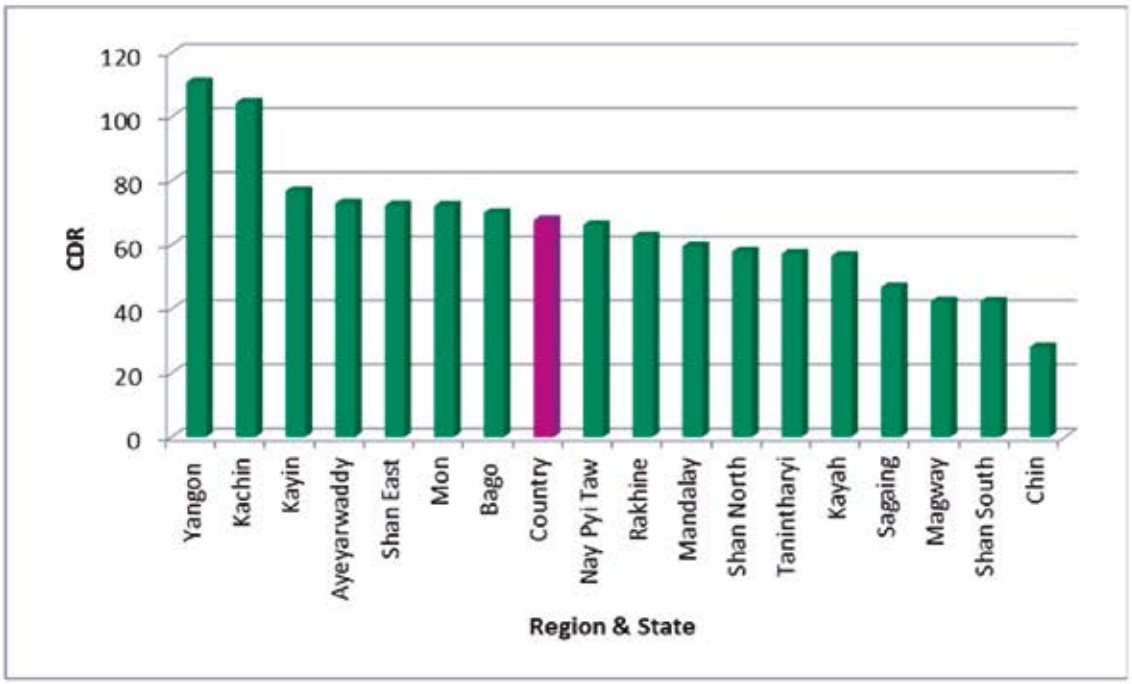
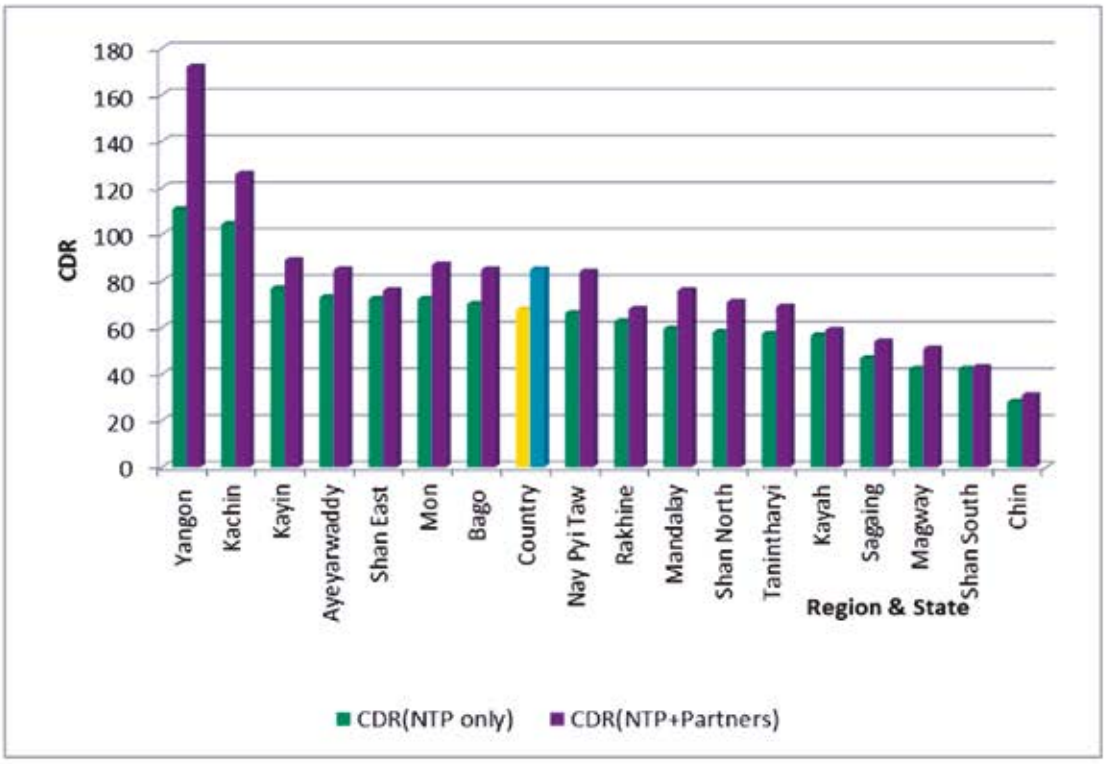


Figure 27: CDR of Regions & States by NTP alone and NTP with Partners (2015)



Regions and States with a CDR of less than 50% should be supportively supervised more than before. Accelerated Case Finding such as initial home visits and contact tracing, sputum collection points in hard to reach areas, CBTC activities and mobile team activities should be conducted in order to improve case findings.

The countrywide Case Notification Rate (CNR) for all forms of TB cases was 285 per 100,000 population, and that for bacteriologically confirmed cases was 99 per 100,000 population.

By Regions and States (including partners data), CNR for all TB cases was the highest in Yangon Region (529/100 000 pop) and followed by Kachin State (523/100 000 pop).. Regarding CNR for bacteriologically confirmed cases, it was the highest in Yangon Region (203/100 000 pop) and followed by Kachin State (153/100,000 pop).

Figure 28: Case Notification Rate (CNR) of bacteriologically confirmed TB cases per 100,000 population by Regions & States (2015)

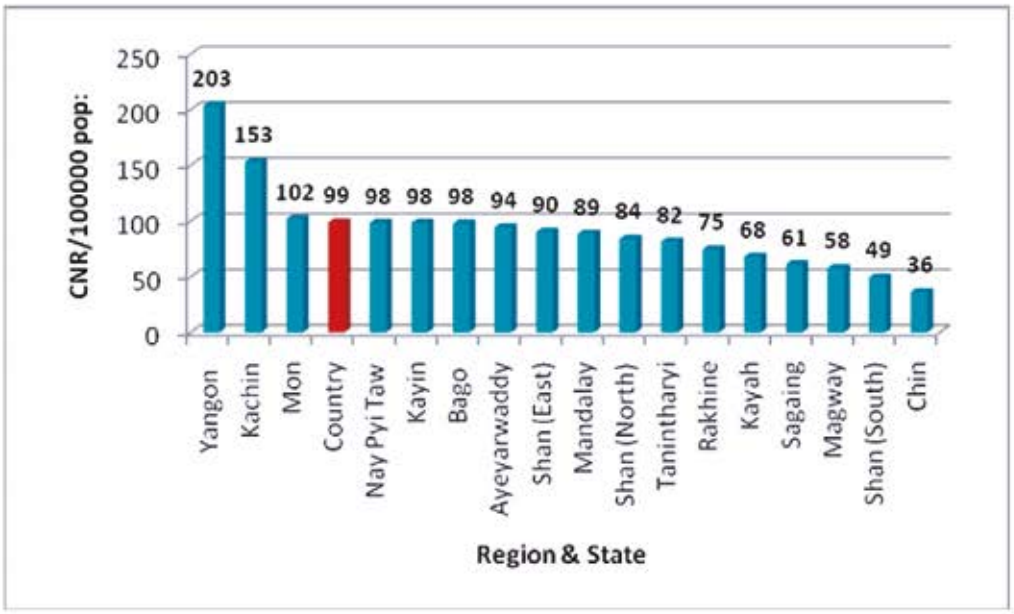
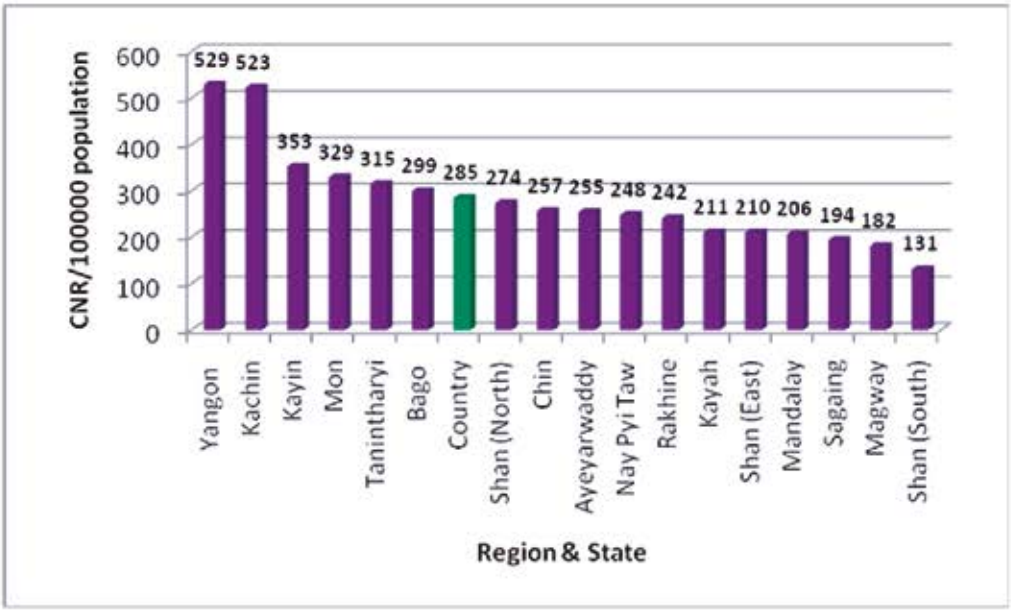


Figure 29: Case Notification Rate (CNR) of All forms of TB cases per 100,000 population by Regions & States (2015)



8.2 Age and sex distribution of new cases (bacteriologically confirmed and clinically diagnosed)

In 2015, CNR of new TB cases was the highest in >65 age group (408/100,000 pop) which was followed by 55-64 age group (393/100,000 pop). The 15-24 age groups had the lowest CNR (142/100,000 pop). Regarding childhood TB cases, CNR of 0-4 age group (313/100,000 pop) was higher than that of 5-14 age groups (210/100,000 pop).

The notification rate for males (325/100,000 pop) was 1.7 times higher than the rate for females (190/100,000 pop).

Table 38: Age and sex specific Case Notification Rates (CNR) of new cases (bacteriologically confirmed and clinically diagnosed) (2015)

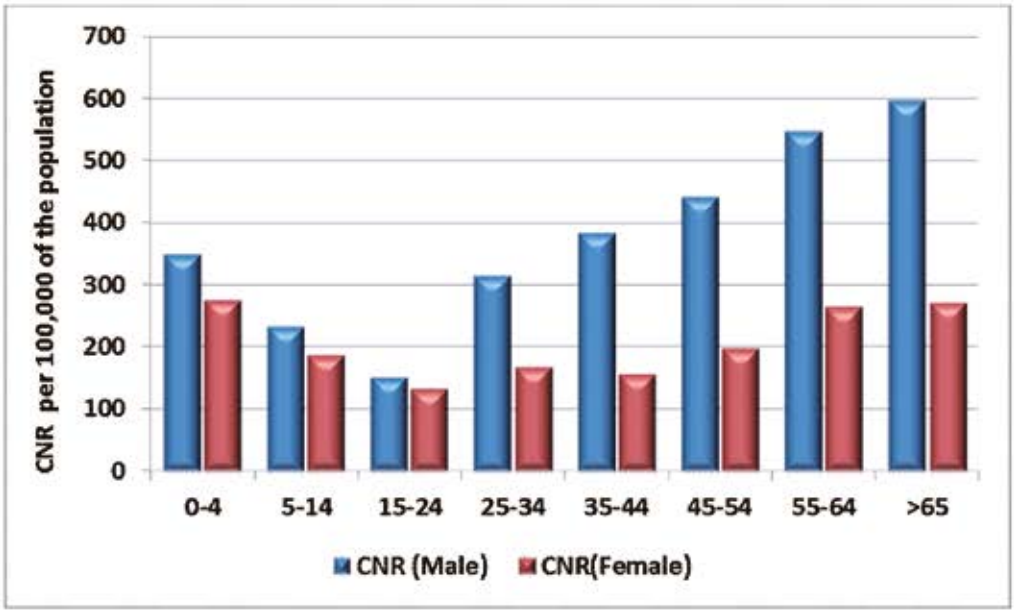
Age group	Male		Female		Total	
	TB patients/pop*	CNR**	TB patients/pop*	CNR**	TB patients/pop*	CNR**
0-4	7909/2262783	350	6095/2209347	276	14004/4472130	313
5-14	11759/5034121	234	9088/4893318	186	20847/9927439	210
15-24	6699/4382523	153	6036/4574535	132	12735/8957058	142
25-34	12268/3880014	316	7001/4164981	168	19269/8044995	240
35-44	12550/3254572	386	5636/3591981	157	18186/6846553	266
45-54	11343/2557382	444	5834/2947998	198	17177/5505380	312
55-64	9043/1648019	549	5214/1980763	263	14257/3628782	393
>65	7243/1209300	599	4572/1688263	271	11815/2897563	408
Total	78814/24228714	325	49476/26051186	190	128290/50279900	255

* Source: The 2014 Myanmar Population and Housing Census Report, (Page No.93) Department of Population, Ministry of Immigration and Population

** CNR per 100,000 of the population

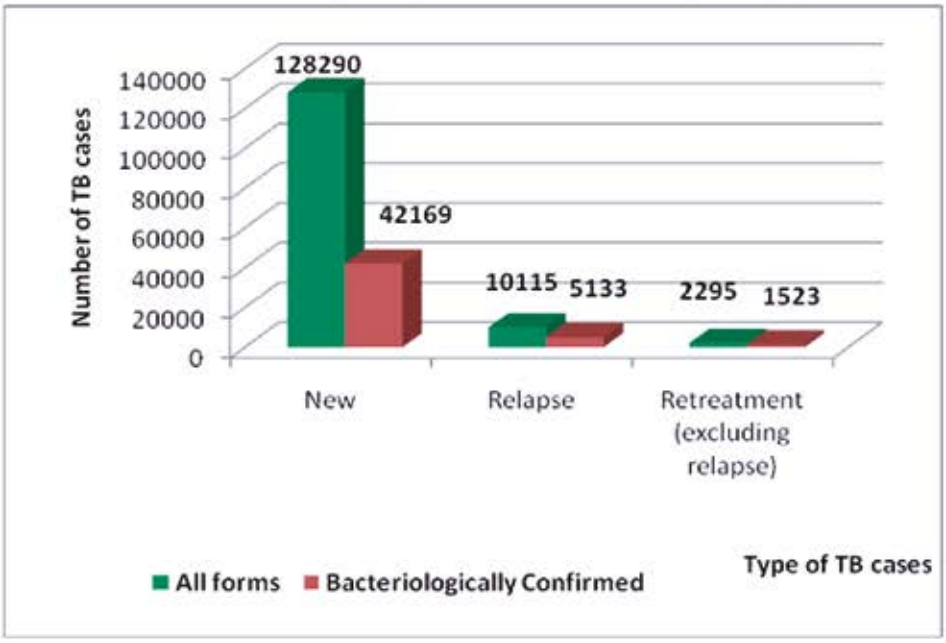
The age distribution of TB notification rates was similar in males and females. In all age groups, notification rates of males were higher than the rates of females.

Figure 30: CNR of New cases (bacteriologically confirmed and clinically diagnosed) by Age groups and Sex (2015)



9.3 Proportion of New, Relapse & Retreatment (excluding relapse) cases

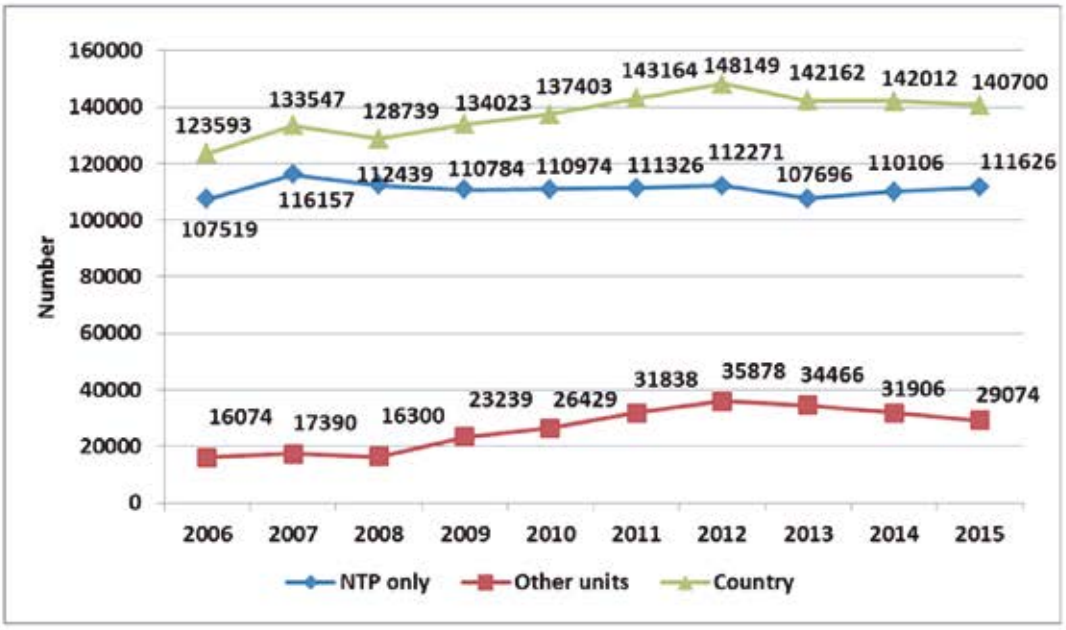
Figure 31: Proportion of New, Relapse & Retreatment (excluding relapse) cases in all forms and bacteriologically confirmed cases (2015) (NTP and Partners)



The above figure shows that 30% (42,169/128,290) of new TB cases were bacteriologically confirmed. Among them, relapse and retreatment (excluding relapse) cases,

bacteriologically confirmed cases were 50.7% (5,133/10,115) and 66.3% (1,523/2295) respectively.

Figure 32: All forms of TB patients of NTP and Other Units (2006-2015)



The trend of all forms of TB cases by NTP and partners has increased steadily from 2008 to 2012. The trend reached its peak in 2012. The cause might be due to over-diagnosis of childhood TB which was approximately 30% among all TB cases. This decreased starting from 2013 after advocacy meeting with pediatricians for diagnosing more accurately childhood TB.

Table 39: Trend in notified cases of TB (all forms), by state/region, 2006-2015

Rgions/ States	All Forms of TB Patients									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Kachin	3959	4408	4471	5169	5255	5266	5235	5000	5990	6402
Kayah	863	565	679	1177	871	591	721	743	850	550
Chin	1095	1018	1219	1213	1163	1083	971	1229	893	1035
Sagaing	9373	9702	8605	8116	8261	8234	8299	6727	7104	8793
Magway	7894	8546	7932	7900	7208	7253	6812	6661	6745	6592
Mandalay	10793	12355	12234	11991	11303	11019	11445	9274	9128	9000
Shan (South)	2493	2771	2490	2524	2510	2919	3051	3309	2946	2849
Shan (East)	1508	1630	1495	1511	2066	2084	1862	1676	1760	1678
Shan (North)	2924	3859	3701	3781	3922	4089	4220	4469	4613	4120
Kayin	3382	3920	4092	3940	4709	4145	3876	3290	3712	4248
Tanintharyi	4898	5312	5399	6092	5163	5021	5478	4847	3774	3835
Bago (East)	5831	6000	5203	5008	5583	6284	7149	7164	12934	12308
Bago (West)	5789	4973	5122	4965	4403	4656	5432	5722		
Mon	5107	5755	7026	6508	6291	6031	6563	7010	6421	5819

Rakhine	4403	5962	5473	6698	6737	6253	4812	5284	5916	7408
Yangon	23979	25854	24434	22598	22873	22547	21863	20107	22056	21618
Ayeyarwaddy	13228	13527	12864	11593	12656	13468	13742	13174	13090	13410
Naypyitaw						383	740	2010	2174	1961
TOTAL	**107519**	**116157**	**112439**	**110784**	**110974**	**111326**	**112271**	107696	110106	111626
Other Units	16074	17390	16300	23239	26429	31838	35878	34466	31906	29074
Union	**123593**	**133547**	**128739**	**134023**	**137403**	**143164**	**148149**	**142162**	**142012**	**140700**

9.4 Laboratory performance

Laboratory performance was found to be increased year by year till 2013. In 2015, laboratory performance. 437,858 presumptive TB cases were examined for sputum microscopy. Among them, about 56,975 (13%) smear positive cases could be detected.

Figure 33: Laboratory Performance (2000-2015)

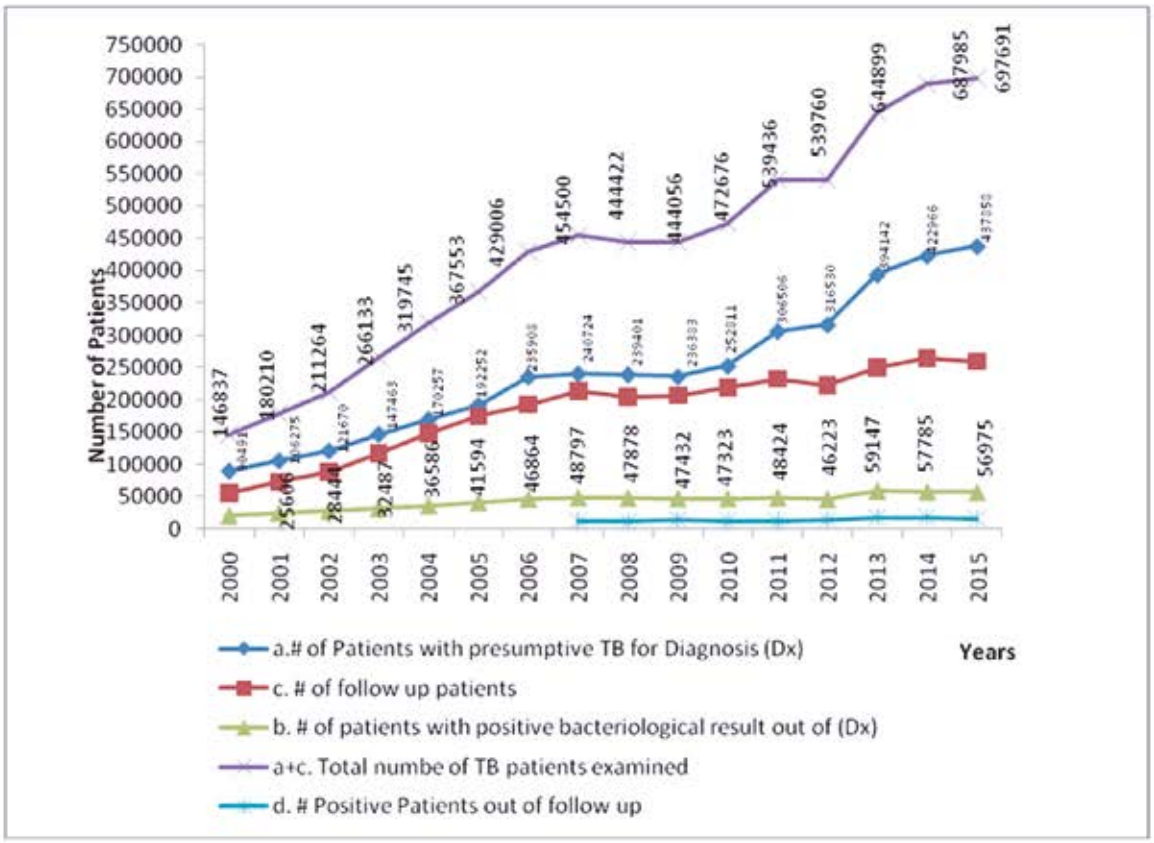


Table 40: Presumptive TB cases Notified in Regions and States (2015)

Region/State	2015		
	Population	No. of presumptive TB cases	Presumptive TB examination rate per 100,000 population
Kachin State	1402284	14619	1043
Kayah State	281009	2535	902
Chin State	969883	2731	282
Sagaing Region	5468872	32620	596
Magway Region	4117662	23086	561
Mandalay Region	5751896	34055	592
Shan (South) State	2230774	12989	582
Shan (East) State	845951	3675	434
Shan (North) State	2001308	9223	461
Kayin State	1481651	9128	616
Tanintharyi Region	1353359	6594	487
Bago Region	4882454	21283	436
Mon State	2209677	15907	720
Rakhine State	3241212	19614	605
Yangon Region	6304447	74683	1185
Ayeyarwaddy Region	6171133	35357	573
Nay Pyi Taw Council Area	1021550	5235	512
Other Units		95367	
Union	49735122	418701	**842**

Townships from which reports were not received:

Kachin State: 1. N'gyanyan 2.Hsawlaw 3.Khaunglanbu 4.Naungmon 5. Sumprabum
Shan (North) State: 1.Kongyan 2.Panwine 3.Mongmaw 4.Manphant 5.Narphant 6.Pangyan

Yangon Region and Kachin State had the highest presumptive TB examination rate per 100,000 population. The lowest presumptive TB examination rate per 100,000 population was Chin state.

9.5 Treatment outcome of TB patients (2014 cohort)

Treatment outcomes of TB patients (2014 cohort) were evaluated from 319 townships (NTP). Treatment success rate (TSR) of new bacteriologically confirmed pulmonary TB patients for the whole country was 85%.

Table 41: Categories of TSR (new bacteriologically confirmed PTB patients) of townships by Region/State (2014 cohort)

No.	Regions/States	No. of township with TSR					Total no. of townships	No. of tsps. from which reports not received
		≥85%	75-84%	60-74%	50-59%	<50%		
1.	Kachin State	5	5	3	0	0	18	5
2.	Kayah State	2	5	0	0	0	7	0
3.	Chin State	6	3	0	0	0	9	0
4.	Sagaing Region	27	10	0	0	0	37	0
5.	Magway Region	18	5	2	0	0	25	0
6.	Mandalay Region	16	10	2	0	0	28	0
7.	Shan (South) State	15	6	0	0	0	21	0
8.	Shan (East) State	4	1	4	1	0	10	0
9.	Shan (North) State	5	7	6	0	0	24	6
10.	Kayin State	4	1	2	0	0	7	0
11.	Tanintharyi Region	3	5	2	0	0	10	0
12.	Bago Region	19	9	0	0	0	28	0
13.	Mon State	4	5	1	0	0	10	0
14.	Rakhine State	11	6	0	0	0	17	0
15.	Yangon Region	27	18	0	0	0	45	0
16.	Ayeyarwaddy Region	16	10	0	0	0	26	0
17.	Nay Pyi Taw Union Territory	3	4	1	0	0	8	0
Union		**185**	**110**	**23**	**1**	**0**	**330**	**11**

Townships from which reports were not received:

Kachin State: 1. N'gyanyan 2.Hsawlaw 3.Khaunglanbu 4.Naungmon 5.Sumprabum
Shan (Lashio) State: 1.Kongyan 2.Panwine 3.Mongmaw 4.Manphant 5.Narphant 6.Pangyan

In 2014 cohort, 319 townships reported to NTP. It was found that 180 townships (56.4%) achieved the target of TSR ≥ 85%. There were no townships with TSR <50% in 2014. The other (139) townships gained TSR between 50-84%.

Regarding unfavorable outcomes, the lost to follow up rate for new bacteriologically confirmed pulmonary TB cases in the 2014 cohort was 6% (2488/42742) and the failure rate was 3% (1,091/42,742). The reported case fatality rate (CFR) was 5% (2,235/42,742).

Although loss-to-follow up rate and CFR were a bit higher than those of the previous year cohort, the failure rate was a bit lower.

Figure 34: Treatment Outcome of New Bacteriologically Confirmed PTB Cases by PPM hospitals (2014 cohort)

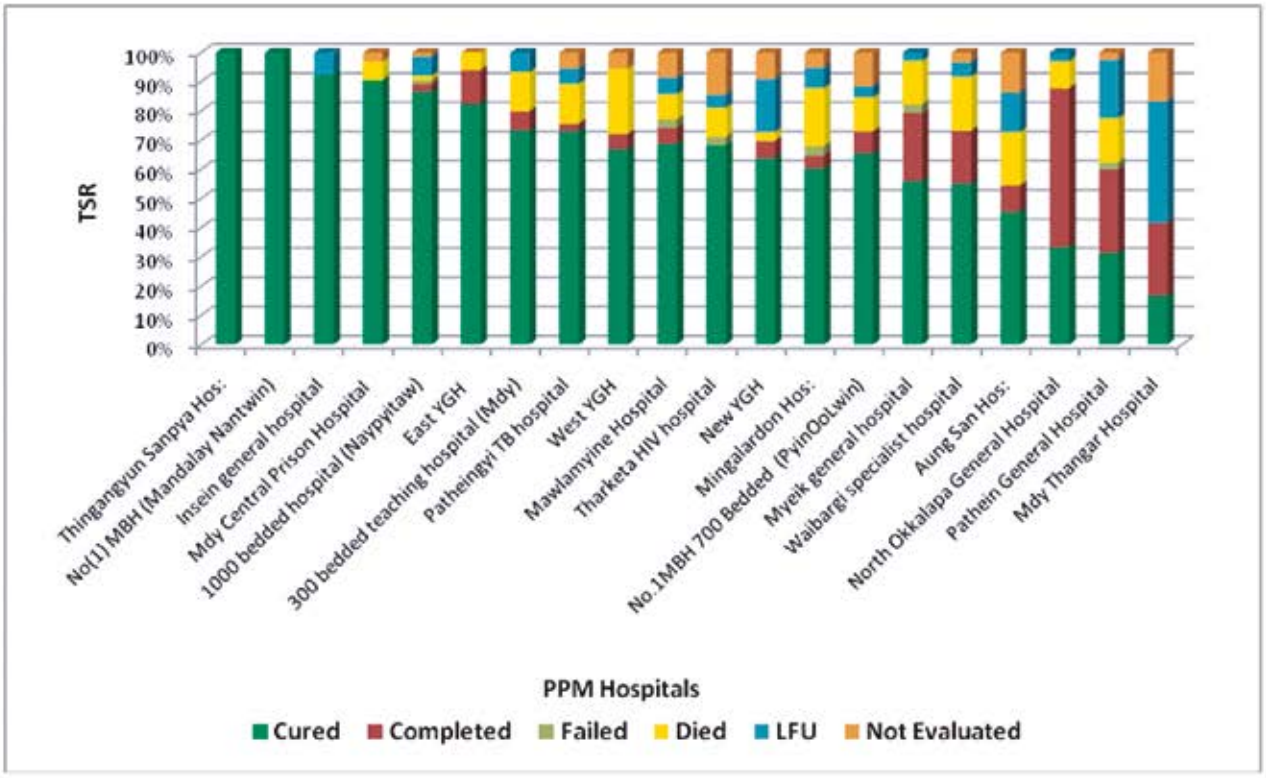
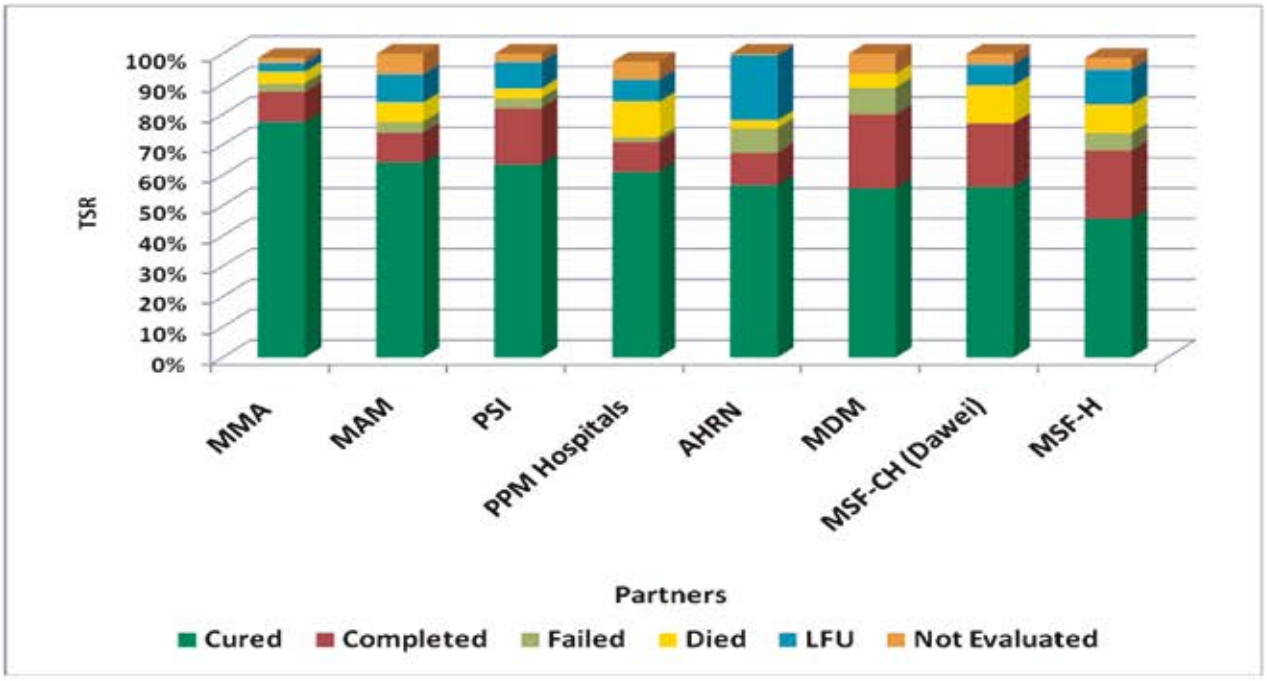


Figure 34 shows the treatment outcomes of new smear-positive patients of PPM Hospitals registered in 2014. A TSR of ≥85% was seen in Thingangyun Sanpya Hospital, Insein General Hospital and No (1) MBH (Mandalay Nantwin) Hospital, Mandalay Central Prison Hospital and 1000 bedded Hospital (Nay Pyi Taw). In addition, East Yangon General Hospital reported a TSR above 80%.

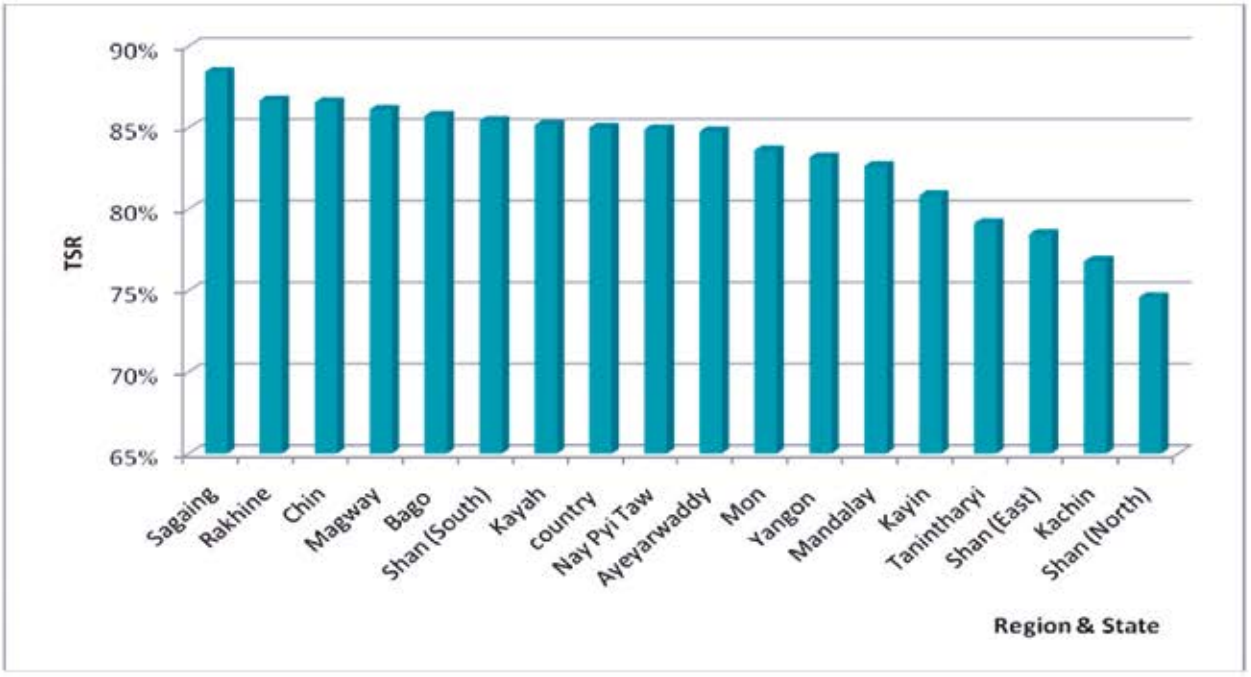
The case fatality rate was high in West YGH (22%) and Mingalardon Specialist Hospital (19%) and Waibargi specialist hospital (18%)respectively. Failure rates were in all PPM hospitals were <5%. A high loss to follow-up rate was also noted in Mandalay Sanga Hospital (42%), Pathein General Hospital (20%) and New YGH was (18%). Unfavorable outcomes were found to be high in PPM hospitals because of severity of TB disease and co-morbidity.

Figure 35: Treatment outcome of New Smear Positive Cases by partners (2014 cohort)



In 2014 cohort of implementing partners, only MMA achieved TSR of ≥ 85% and PSI achieved TSR of 82%. TSR of AHRN was only 68%. In Kachin and Shan (North) states, TSR target could not be achieved because of civil unrest and high HIV co-infection.

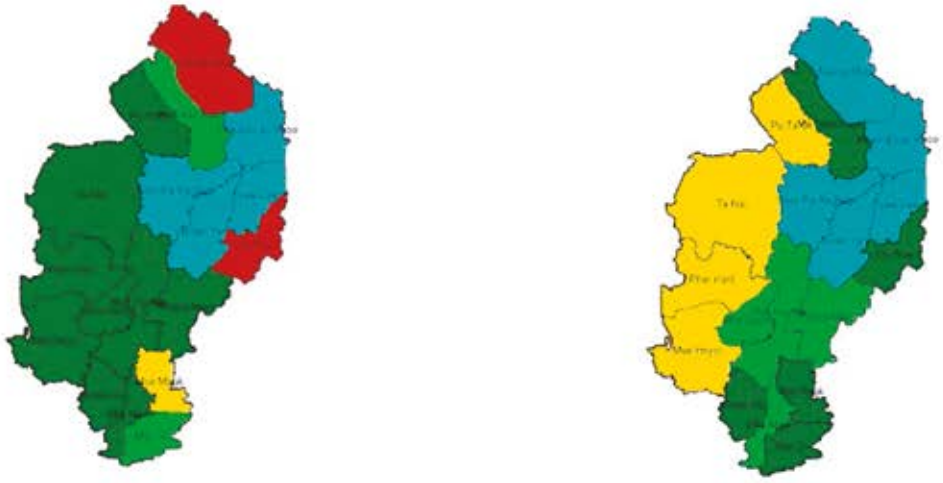
Figure 36: TSR of New Bacteriologically Confirmed PTB patients by Regions and States (2014 cohort)



In 2014 cohort, NTP and its implementing partners achieved the target of TSR 85% in 11 regions and states.

10. Evaluation of Regional and State level TB control achievement

10.1 Kachin State



Kachin State has 4 Districts including 18 townships with approximately 1.5 million populations. Reports were not received from 4 townships (Hsawlaw, Ingyanyan, Khaunglanbu, and Sumprabum) and so, the reporting efficiency was 78% (14/18) Nongmun received the report in 2015. There were two decentralized sputum microscopy centres and three sputum collection centres in 2015. Presumptive TB examination rate was much increased compared to 2014: 1339/100,000 population and sputum positivity rate was 12%.

Kachin State achieved CNR (bacteriologically confirmed TB) of 153/100,000 population and CNR (all forms) of 447/ 100 000 population by NTP and partners. Both CNR increased compared to previous year. TSR (77%) was found to be improved rather than 2014 cohort with loss-to-follow up rate (8%) and death rate (6%). The implementing partners in Kachin State were AHRN, CESVI, MAM, MDM, MMA, MSF-H and PSI. The proportion of Childhood TB cases was 30% which was higher than 2014.

In Kachin State, case holding did not reach the target because of migrant population, hard to reach areas, social conflict and quite high HIV sero-positivity rate rather than other Regions/States.

10.2 Kayah State

CDR
- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR
- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Kayah State has 2 districts including 7 townships. Approximately 0.3 million population lived. Reporting efficiency was 100%. There was no decentralized microscopy centre but there were five sputum collection centres. Presumptive TB examination rate was 845/100,000 in 2015 which was reduced compared to 2014 with sputum positivity rate 9%.

Kayah state achieved CNR (bacteriologically confirmed TB) of 68/100 000 population and CNR (all forms) 211/100,000 by NTP and partners. Childhood TB cases (30%, 168/550) was high in Kayah state. TSR was 85% (NTP with partners).

Human resources limitation, low case notification rate in most of the townships and unavailability of MDR TB treatment in the State are the main constraints in TB control activities of Kayah State.

10.3 Chin State

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

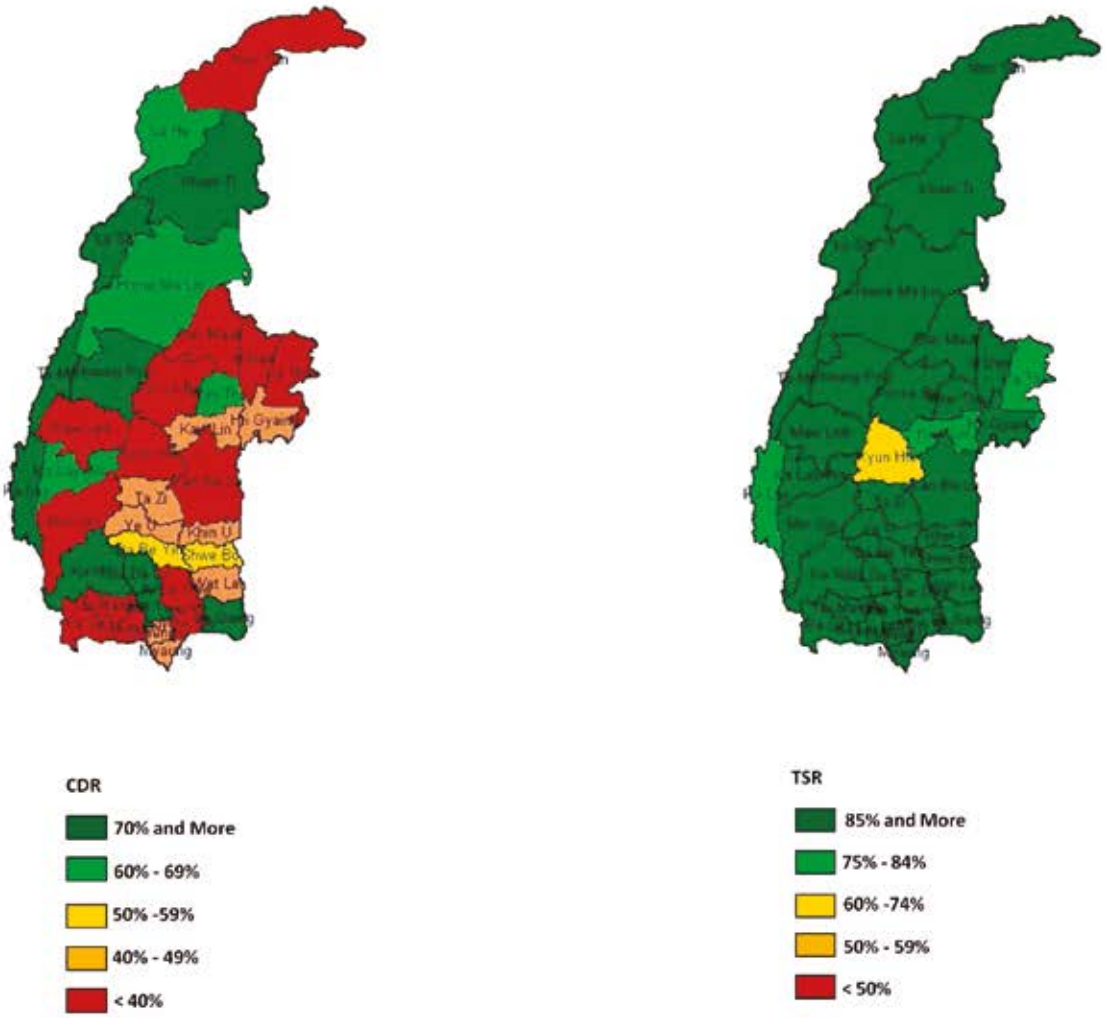
Chin State has 3 districts and 9 townships with 0.48 million population. Five townships (Falam, Hakha, Htantalan, Tiddim, Tunzan) were controlled by Sagaing Regional TB officer, 3 townships (Mindat, Kanpetlet and Matupi) were under Magway Regional TB officer and one township (Palatwa) was covered by Rakhine State TB officer.

PSI was the only one implementing partner in Chin State. CNR (bacteriologically confirmed) was 36/100 000 and CNR (all forms) was 257/100,00. Childhood TB cases was 53% (540/1027) in 2015. TSR was 87%.

TB/HIV collaborative activity was not yet initiated in Chin State. GeneXpert installation was done in September 2014 .

There were inaccessible villages and hard to reach areas in Chin State. Moreover, frequent turnover of health staff was challenge for CDR achievement in Chin State TB control activity.

10.4 Sagaing Region



Sagaing Regional TB center covers 8 districts with 36 townships and 1 township (Nanyun from Kachin State). It has approximately 5.2 million populations. There were 28 Ziehl Neelsen microscopy centres and 17 Fluorescent microscopy centres. Six Sputum collection centres were run with rotatory system in Myinmu, Monywa, Pale, Wetlet, Banmauk and Kalewa.

Presumptive TB examination rate was 596/100 000 population and sputum positivity rate was 9.7%. Implementing partners are PSI, MMA, MHAA, the Union and MRCS. Sagaing region achieved CNR (bacteriologically confirmed TB) of 61/100 000 population and CNR (all form) of 194/100,000 population by NTP and partners. TSR was 88%.

Like other regions and states, human resource requirement was challenge for Sagaing region (Katha TB Team leader vacant for long time). Low case detection and lack of motivation of health staff are also major challenges for Sagaing Region.

10.5 Magway Region

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Magway Region has 5 districts with 25 townships and there are approximately 4 million population. There were 8 townships performing sputum collection activity in Magway Region. Presumptive TB examination rate was 581/100 000 and sputum positivity rate was 10%. PSI, MMA, MHAA, MRCS, the Union and Pact are implementing partners in Magway region.

Magway Region achieved CNR (Bacteriologically confirmed TB) of 58/100 000 population and CNR (all forms) of 182/100,000 population by NTP and partners.TSR was 86% with NTP and partners.

Magway Region faced with low CNR in some townships (Saw, Htilin, Seik Phyu). Limited human resources and capacity building were included in challenges of Magway Region.

10.6 Mandalay Region

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Mandalay Regional TB Centre covers 7 districts composed of 28 townships. There are 5.7 million populations. Reporting efficacy was 100% in Mandalay Region. Presumptive TB examination rate was 552/100 000 population and sputum positivity rate was 10%. Implementing partners were MMA, PSI, the Union, Cesvi, Pact, MRCS, MHAA and MMCWA,

Mandalay Region got CNR (bacteriologically confirmed) of 89/100 000 and CNR (all forms) of 206/100 000 population.

TSR was 83%. Case fatality rate was 7%, lost to follow up rate was 3% and failure rate of the whole region was 4%.

Barriers for target achievement in Mandalay Region were weak initial home visit and contact tracing, low case detection by Sputum Collection Centre, delay CXR taking for smear negative cases, over workload for MDR-TB providers and human resource shortage.

10.7 Shan State (South)

CDR
- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

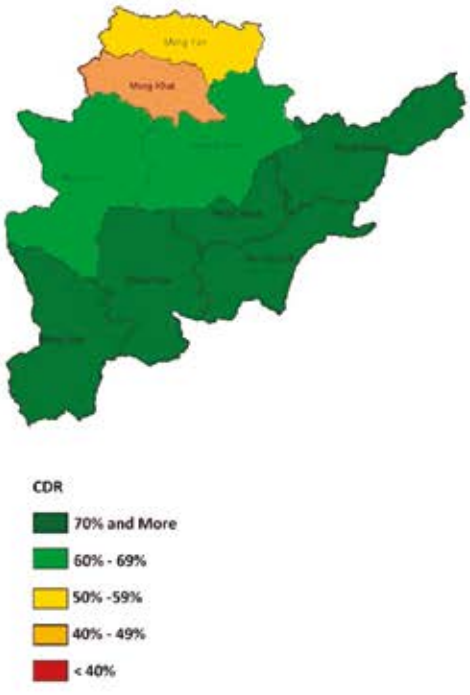
TSR
- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

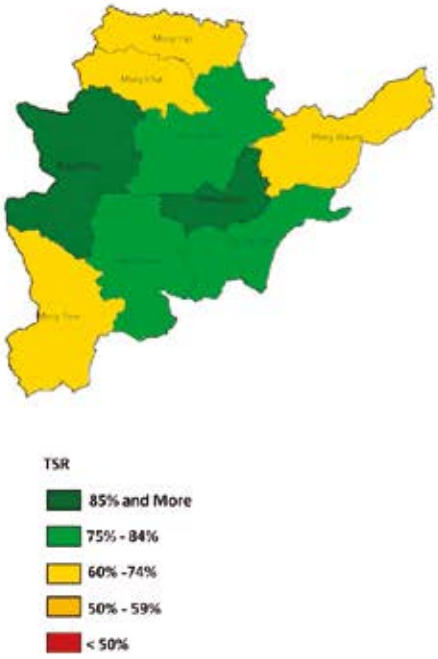
Shan State (South) TB team covers 3 districts with 21 townships. Approximately 2.1 million people live at this area. Presumptive TB examination rate was 582/100 000 population and sputum positivity rate was 7.6%.

CNR (bacteriologically confirmed) was 49/100,000 population and CNR (all forms) was 131/100 000 population. Childhood TB cases were 23.5% (654/2787) in 2015.State wise TSR was 85%.

Major problems in Shan State (South) were low presumptive TB examination and low case detection due to hard-to-reached and uncovered areas. Moreover, shortage of human resources including frequent transfer of trained person, increasing number of childhood TB cases.

10.8 Shan State (East)





Shan State (East) consists of 4 districts including 10 townships with approximately 0.7 million population. There were 2 decentralized sputum microscopy centres at Tarlay Station Hospital and Monglar sub-township. Presumptive TB examination rate was 434/100 000 population and sputum positivity rate was 18%.

Shan State (East) achieved CNR (bacteriologically confirmed TB) of 90/100 000 population and CNR (all forms) of 210/100,000 population.. State wise TSR was 78%. There were 2 townships (Mong Pyin, Mong Phyak) which got TSR 88% and above. Shan State (East) had a quite high lost to follow up rate of 12%, case fatality rate of 6% respectively. Implementing partners of Shan (Kengtong) were PSI and MWAF.

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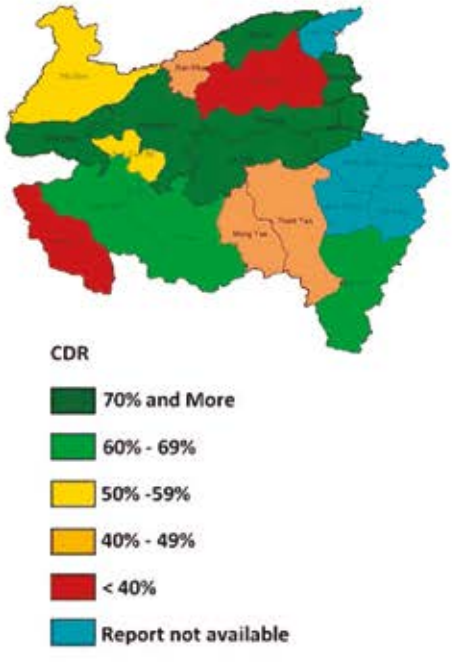
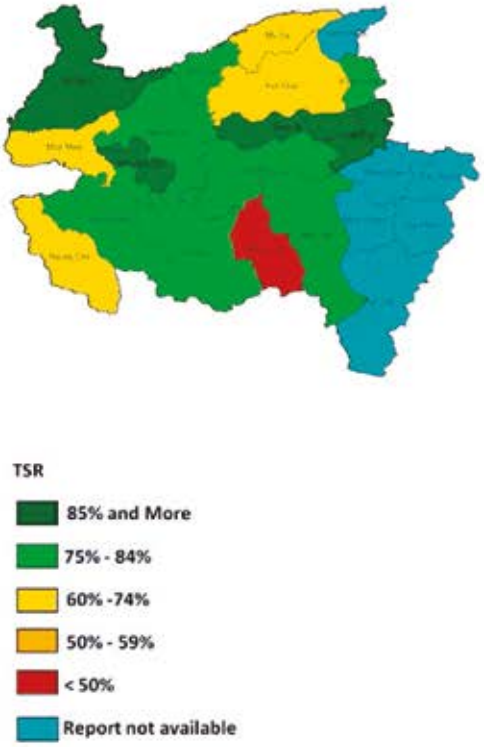
Major challenges of Shan State (East) were low TSR with high lost to follow up rate in peri-urban areas and special regions, low consumption of GeneXpert because of difficult specimen transportation, management of MDR-TB from non-project townships and shortage of human resource.

10.9 Shan State (North)





Shan State (North) consists of 6 districts including 24 townships with approximately 2 million population. Only18 townships were under MOH-NTP coverage including self-administrative area (KoeKant, Wa, Ta'ang). Reports were not received from 6 townships (Mongmaw, Manphant, Pangyan, Narphant, Panwaing, Kongyan). Thus, the reporting efficiency was 75% (18/24).

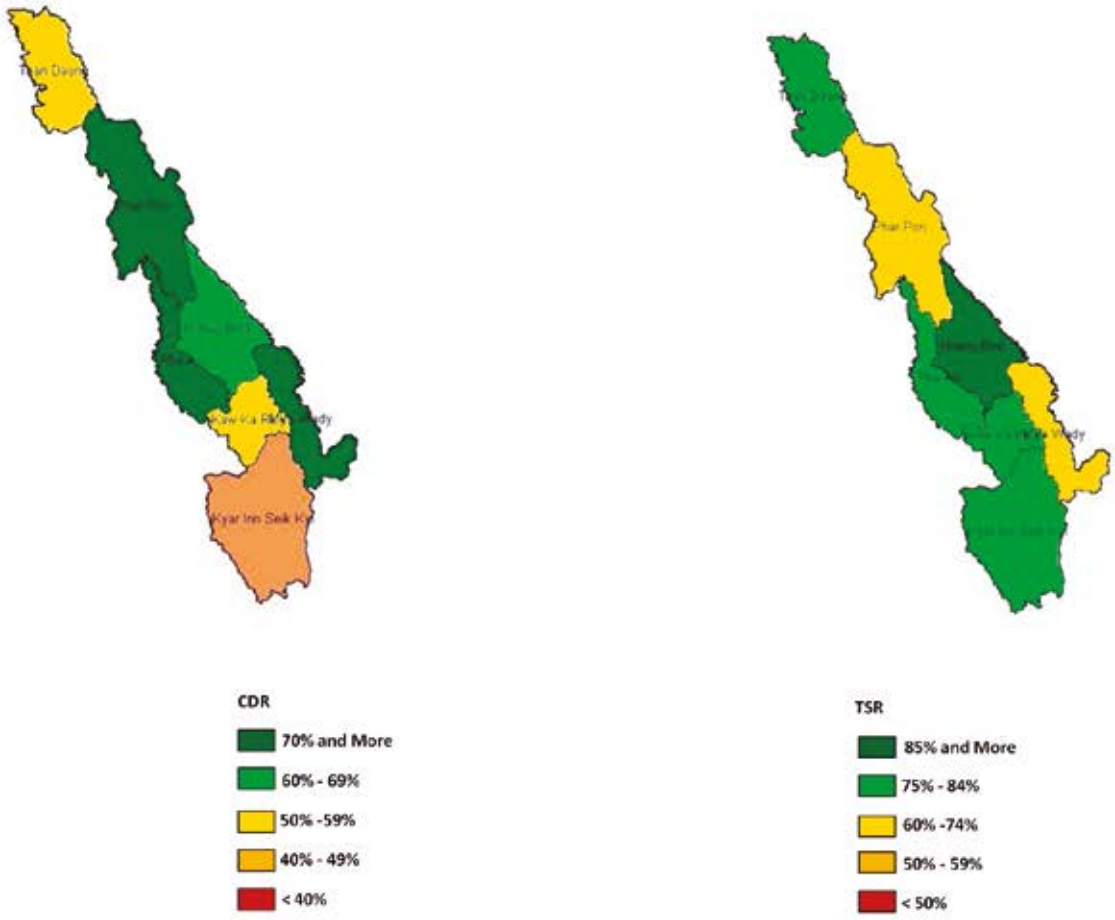
There were 2 decentralized sputum microscopy centres at Hsipaw and Namlam Station Hospitals. Presumptive TB examination rate was 461/100 000 population and sputum positivity rate was 13.5%.

Shan State (North) achieved CNR (bacteriologically confirmed TB) of 84/100 000 population and CNR (all forms) 274/100 000 population. Childhood TB cases were 24% (974/4032) in 2015.

State wise TSR was 75%. Lost to follow up rate, case fatality rate and failure rate were 11%, 6% and 4% respectively.

Implementing partners were MMA, PSI, AHRN, MSF-H, CESVI, MRCS and MWAF. Sputum collection centres were opened in 6 townships with rotation of RHC. Major challenges of Shan (Lashio) state were migrant population especially in cross border area, poor case holding leads to high defaulter rate, HR issues and need infection control measures in all areas. Some MDR TB patients from non-project townships could not be enrolled.

10.10 Kayin State



Kayin State has 3 districts including 7 townships with approximately 1.3 million populations. TB control activities were managed by Mon State TB Officer. Presumptive TB examination rate was 616/100 000 population and sputum positivity rate was 14.5%.

In 2015, Kayin State achieved CNR (bacteriologically confirmed TB) of 98/100 000 population and CNR (all forms) 353/100 000 population by NTP and partners. Childhood TB cases were 29%(1248/4279) of all TB cases. Kayin State got TSR - 81%. Failure rate and case fatality rate was 2% and 3% respectively and lost to follow up rate was 11%. Partners in Kayin State are MMCWA, PSI, MAM, MMA and IOM.

Challenges of Kayin State regarding TB control were HR necessity, low presumptive TB examination rate and high lost to follow up rate in border areas and civil unrest areas.

10.11 Taninthayi Region

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

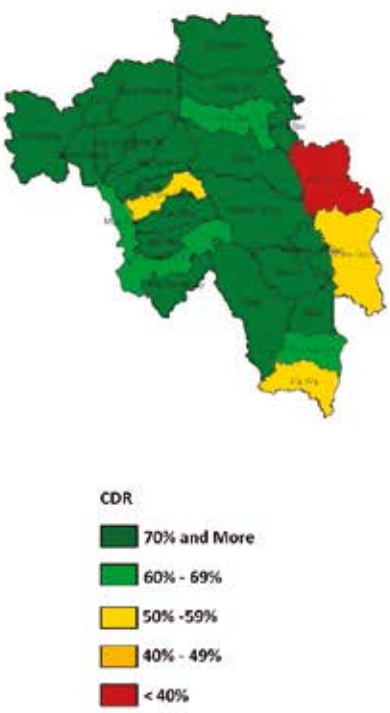
- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

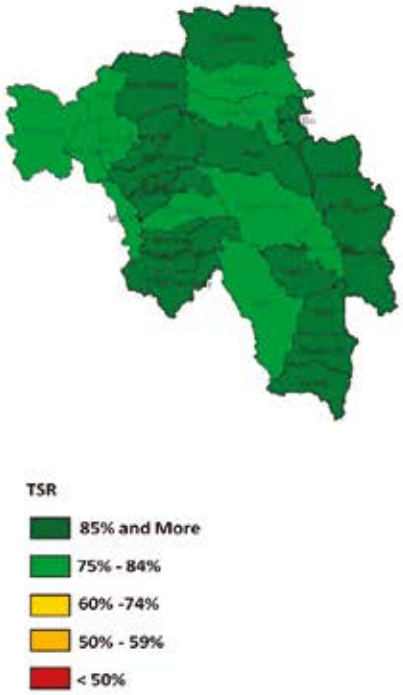
Tanintharyi regional TB center covers 3 districts with 10 townships. The estimated population was 1.3 million. The presumptive TB examination rate of Thanitharyi region was 487/100 000 population and sputum positivity rate was 14%.

Thanitharyi region achieved CNR (bacteriologically confirmed TB) of 82/100 000 population and CNR (all forms) of 315/100 000 population by NTP with partners' contribution. Childhood TB cases were 40.7% (1536/3776). TSR was 79%. Lost to follow up rate was 9% and case fatality rate was 5% in 2015. There were 4 implementing partners (MWAF, PSI, MSF-CH and World Vision) working along with NTP at Thanitharyi Region.

Thanitharyi region did not achieve targeted TSR in 2015. Very low CNR and high lost to follow up rate were seen in some townships. Huge disease burden, co-infection with HIV, migrant population and border area TB control, reaching to unreached and HR issues were challenges of Thanitharyi.

10.12 Bago Region





Bago Region has 4 districts including 28 townships with approximately 4.8 million populations. Decentralized sputum microscopy centres were established in 9 townships. In 2015, presumptive TB examination rate was 436/100 000 population and sputum positivity rate was 17.9%.

Bago region achieved CNR (bacteriologically confirmed TB) of 98/100 000 population and CNR (all forms) of 299/100 000 population by NTP with partners. The proportion of childhood TB cases was 27.7% (3368/12168). Region wise TSR was 86%. The implementing partners conducting TB control activities in Bago Region were MMCWA, MHAA, MMA and PSI.

Low presumptive TB examination rate, high proportion of Childhood TB cases and limited human resources were challenges of Bago Region.

10.13 Mon State

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

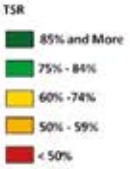
- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Mon State has 2 Districts including 10 townships with approximately 2.1 million populations. There were 10 decentralized sputum microscopy centres at Station Hospitals and RHCs in Mon state. Presumptive TB examination rate was 720/100,000 population and sputum positivity rate was 14%.

Mon State achieved CNR (bacteriologically confirmed TB) of 102/100,000 population and CNR (all forms) of 329/ 100 000 population by NTP and partners. The proportion of Childhood TB cases was 33.7% (1935/5735). TSR was 84%. Failure rate 3%, loss to follow up rate 6% and case fatality rate 5% were unfavorable treatment outcomes. The implementing partners conducting TB control activities in Mon State were MMCWA, MMA, IOM, World Vision and PSI.

Limited human resources, high proportion of childhood TB cases and high lost to follow up in some townships were major challenges for TB control activities. In addition to this, most of the MDR TB patients from non-project townships could not be enrolled.

10.14 Rakhine State



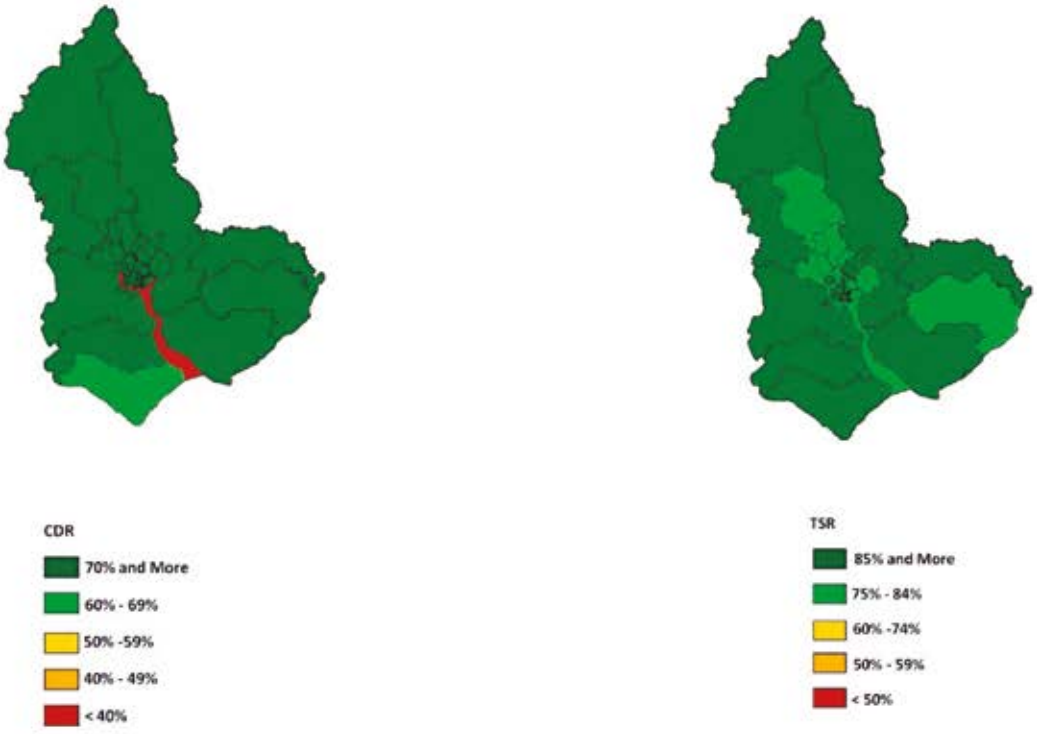
Rakhine State TB centre covers 5 districts including 17 townships with approximately 3.1million populations. Palatwa Township in Chin State was covered by Rakhine State TB team. Presumptive TB examination rate was 605/100 000 population and sputum positivity rate was 13%. Implementing partners were PSI, MMA, MSF-Holland and Malteser International.

CNR (bacteriologically confirmed TB) 75/100 000 population and CNR (all forms) was 242/100 000 population by NTP and partners. The proportion of childhood TB cases was 35% (2540/7251). In 2015, Rakhine state achieved TSR 87%.

Human resource necessity is the major challenge of Rakhine state. The regional TB officer, team leader and X-ray technician were vacant in Rakhine State. Social conflict and difficulty in transportation are the challenges for TB control activities.

10.15 Yangon Region

Yangon Region (Eastern District)



Yangon Region has 4 Districts including 45 townships with approximately 6.3 million populations. There were 2 townships conducting sputum collection activity and 5 decentralized microscopy centers. Presumptive TB examination rate was 1185/100 000 population and sputum positivity rate was 15%. Implementing partners in Yangon Region included FHI 360, MMA, MMCWA, MDM, MHAA, MRCS, MSF-H, PSI and World Vision.

Yangon Region achieved CNR (bacteriologically confirmed TB) of 203/100 000 population and CNR (all forms) 529/100 000 population by NTP with partners. Proportion of childhood TB cases was 13% (2744/21218) of the notified adult cases in 2015. Region wise TSR was 83%. Lost to follow up rate was 5% and case fatality rate was 5%.

Old government building, sub-optimal infection control, inadequate supervision, no electronic recording/reporting, migrant and mobile population, MDR TB crisis and presence of XDR-TB were the challenges of Yangon Region.

10.16 Ayeyarwaddy Region

CDR

- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR

- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Ayeyarwaddy Region has 5 districts including 26 townships with approximately 6 million populations. The reporting efficacy was 100%. There were 10 decentralized sputum microscopy centres at station hospitals, sub-township and RHCs. In 2015, presumptive TB examination rate was 573/100 000 population and sputum positivity rate was 15.5%.

Ayeyarwaddy Region achieved CNR (bacteriologically confirmed TB) of 94/100 000 population and CNR (all forms) of 255/100 000 population by NTP and partners. The proportion of childhood TB cases was 25% (3307/13249). The region wise TSR was 85%. The implementing partners conducting TB control activities in Ayeyarwaddy region were MMA, MWAF and PSI.

There were vacant posts (team leaders, lab technicians) in Ayeyarwaddy region. It is also needed to strengthen infection control measures in district TB centers.

10.17 Nay Pyi Taw Union Territory

CDR
- 70% and More
- 60% - 69%
- 50% -59%
- 40% - 49%
- < 40%

TSR
- 85% and More
- 75% - 84%
- 60% -74%
- 50% - 59%
- < 50%

Nay Pyi Taw Union Territory has 2 districts and 8 townships. Presumptive TB examination rate was 512/100 000 populations and sputum positivity rate was 17.7 %. Implementing partners of Nay Pyi Taw Union Territory were MMA, MMCWA and PSI.

Nay Pyi Taw Union Territory achieved CNR (bacteriologically confirmed TB) of 98/100 000 population and CNR (all forms) of 248/100 000 populations by NTP and partners. 23% (438/1917) of the notified cases were childhood TB cases. TSR was 85%. Challenges of Nay Pyi Taw Union Territory were low presumptive TB examination in some townships, need to strengthen Infection control measures and filling up of vacant posts.

11. Possible actions to be taken for solving the problems

A. Case detection rate less than 70%

- to promote community awareness by widespread health education concerning TB with the support of IEC materials
- to identify TB suspected patients in community and refer for proper investigations
- to educate family members of TB patients and promote contact tracing
- to advocate general practitioners and local NGOs to involve in TB control
- to advocate community and registered TB patients to involve in TB control
- to promote early case referral for diagnosis and treatment from GPs
- to assess the laboratory performance, to ensure 2 sputum smear examinations are being done for all chest symptomatic
- to ensure that all smear positive TB patients in the laboratory register are registered and treated

- to ensure that sputum microscopy is done by trained laboratory technician is accessible to patients
- to improve laboratory quality assurance system by close supervision of TMO
- to strengthen sputum collection points in hard to reach areas
- to improve the skills of health staff who diagnose the TB patients
- to promote presumptive TB identification and referral early as possible
- to decentralize the sputum microscopy according to the geographical variation
- to initiate ACF using mobile teams equipped with diagnostic facilities
- to add partners' contribution when case detection is evaluated

B. CDR more than 100% and Cure rate less than 50%

- to assess any migrant population in the area
- to assess laboratory quality assessment system which is implementing or not
- to ensure that TB patients reside in the respective township are being treated
- to treat TB patients till cured with DOT
- to do regular sputum follow-up examination during the treatment
- to check the township actual population
- To consider HIV co-infection
- to conduct epidemiological surveillance
- to strengthen health education session for TB patients at the time of registration for treatment and during follow-up visits

C. Cure rate of new smear positive TB cases less than 85%

- to ensure that every dose of medication is directly observed i.e. to assign DOT provider for every TB patient put on treatment
- to provide TB counseling to TB patients especially for treatment adherence
- to intensify the follow-up sputum examination during and at the end of treatment
- to give refresher training for BHS
- to consider HIV co- infection and strengthen TB/HIV collaboration
- to use quarterly cohort review meeting for early identification of missed dose patients
- to monitor closely the performance of partners at all level and take timely action especially for partners treating TB/HIV

D. Cure rate >85% with Case detection rate less than 40%

- to maintain Cure Rate and raise the CDR as suggestion A.
- to check data quality
- to check laboratory quality
- to identify more presumptive TB cases

E. Sputum positivity rate less than 10%

- to check quality of laboratory performance whether laboratory technician strictly follows the SOP on sputum microscopy
- to ensure that 2 sputum specimens are examined for all presumptive TB
- to check whether the presumptive TB is correct or not
- to check quality of stains and microscopes using in that microscopy centre
- to improve the accessibility of presumptive TB to sputum microscopy centre

F. Sputum Positivity Rate more than 10%

- to evaluate the prevalence of TB in that particular township
- to improve the accessibility of presumptive TB to sputum microscopy centre
- to check whether PPs under PPM are using Chest X Ray before sputum examination

G. Sputum conversion rate less than 80-85% in new smear positive TB cases

- to check whether categorization of TB patients based on proper history taking is correct or not
- to check whether that every dose of medication is directly observed
- to ensure sputum microscopy accuracy with quality assurance system
- to monitor the drug resistant TB situation
- to check correctness of TB-07, Block 5
- to explain all the staff involving in TB control about the importance of follow-up sputum examination in TB control
- to provide qualified DOT to every patient

H. Case fatality rate more than 5% in new smear positive TB cases

- to identify and refer presumptive TB as early as possible
- to ensure that every dose of medication is directly observed
- to consider HIV prevalence among TB patients
- to advocate and encourage local PPs to refer promptly
- to find out other causes of death other than TB

I. Treatment failure rate more than 5% in new smear positive TB cases

- to check whether categorization of TB patients based on proper history taking is correct or not
- to ensure the quality of anti-TB drugs, stored in appropriate condition and being used before their expiry date

- to ensure that every correct dose of medication is directly observed, especially in intensive phase
- to consider the level of primary drug resistance in the community
- to check laboratory quality

J. Lost to follow up rate more than 10% in new smear positive TB cases

- to consider for migrant population
- to strengthen DOT by supervision and close monitoring
- to educate TB patients concerning TB disease, its treatment and follow-up
- to provide adherence counseling as necessary
- to instruct the DOT supervisors and providers how to take action for patient with missed dose
- to find the patients with missed dose within 1 week (not to miss more than 1-2 doses) and put under DOT again.

K. Transferred out rate more than 5% in new smear positive TB cases

- To ensure that defaulted TB patients are not counted as transferred out cases
- To strengthen the system of proper referral
- To ask for the treatment outcome of transferred out patients from the transferred townships

L. Cure rate less than 85% but Treatment Success Rate more than 85% in new smear positive cases

- to intensify follow-up sputum examination at 2nd , 5th and 6th month of treatment in new smear positive TB patients
- to explain all the staff involving in TB control the crucial importance of follow-up sputum examination in TB control
- to make sure lost to follow up TB patients are not counted as completed TB patients and misuse of anti-TB drugs

12. Recommendations

1. To strengthen township health system: e.g.To decentralize DOTS services to appropriate SHU/RHCs, capacity building of BHS
2. To establish standard organization set up at all levels
3. To fill up the important vacant posts
4. To ensure adequacy of resources for TB control
8. To evaluate and scale up the prevention and control activities for TB/HIV co-infection and MDR-TB

9. To enhance accelerated TB case finding especially in hard to reach area and plan for scale up
10. To scale up on Public-Private Mix and strengthen the public-public Mix
11. To cover all public and private laboratories including PPM hospitals and private hospitals under the external quality assurance system of NTP
12. To strengthen coordination mechanism related to TB control at all levels
13. To strengthen monitoring, supervision and evaluation on TB control activities
14. To promote Operational Research
15. To strengthen data quality and verification at all levels

1. Conclusion

NTP, Myanmar has covered all the townships since November, 2003. NTP achieved case detection rate 85% and treatment success rate 85% in 2014 and has reached the global TB control targets since 2006. The achievement should be sustained by implementing innovative approaches in line with Stop TB Strategies and Millennium Development Goals according to the accessibility status of different location in the country.

Case finding activities will also be improved by innovative approaches. Townships not reaching the targets, should scale-up their effort with appropriate and innovative strategies (mobile team activities in working places and prisons). In conclusion, strong political commitment, health system strengthening and partnership are important to maintain the achievement and reaching the MDGs.

Balance of Anti-TB Drugs at NTP Central Drug Store (2015) **Annex-1-a**

SN.	Item Description	Basic Unit	Opening Balance	Received	Issued	Closing Balance	Expire Date
	Anti TB 1st line						
1	Patient kit (I & III)	kit	17405	69494	78325	8574	Dec-17
2	4FDC (HRZE) (75/150/400/275)mg	tab	708288	6299358	3444576	3563070	Dec-17
3	3FDC 672's(HRE) (75/150/275)mg	tab	1430016	6001632	4002432	3429216	Dec-17
4	2FDC 672's (HR) (75/150)mg	tab	647808	2826432	1832928	1641312	Dec-17
5	ETB 100mg 100's	tab	0	193000	41000	152000	Feb -19
6	ETB 400mg 100's	tab	0	600000	350000	250000	Dec-19
7	INH 100mg, 100's	tab	0	0	0	0	-
8	INH 300mg 672's	tab	0	236000	137000	99000	Apr-20
9	Paed: HRZ (30/60/150)mg 84'S	tab	0	8144640	4955328	3189312	Nov-16
10	Paed: HR (30/60)mg 84'S	tab	0	0	0	0	-
11	Paed: HR (60/60)mg 84's	tab	0	28127400	12984216	15143184	Jan-17
12	PZA 400mg 672's	tab	0	36960000	36960000	0	-
13	Streptomycin 1G inj 100's	vial	0	1335300	810200	525100	Nov-18
14	Amikacin 500mg/2ml inj: 10's	Vial	108910	985864	565342	529432	Jan-18
15	Capreomycin 1g, inj:	Vial	450	450	876	24	Dec-16
16	Cycloserine250mg 100's	Tab	2210900	2916200	2149300	2977800	Jun-16
17	Ethionamide 250mg 100's	Tab	2000700	3186000	2115600	3071100	Dec-16
18	Kanamycin 1G 10'S injection	Vial	2480	0	2480	-	
19	Levofloxacin 250mg 100's	Tab	1369500	3387300	2824800	1932000	Sep-18
20	PAS sodium Granules 60% 100g	Jar	70980	48180	24049	95111	Jan-17
21	PAS powder / sac 25's	sach	305625	0	305625	0	-
22	PZA 500mg	Tab	1829856	3671136	2388960	3112032	Sep-18
	Consumable items						
23	Syringe & Needles, 100's	Pcs	60000	2836800	1484400	1412400	Nov-19

Balance of Anti-TB Drugs at NTP Lower Myanmar Drug Store (2015) Annex-1-b

SN.	Item Description	Basic Unit	Opening Balance	Received	Issued	Closing Balance	Expire Date
	Anti TB 1st line						
1	Patient kit (I & III)	kit	10326	59004	68970	360	Dec-17
2	4FDC (RHZE) (150/75/400/275)mg	tab	704112	2659776	3202608	161280	Oct-17
3	3FDC (RHE) (150/75/275)mg	tab	690816	3013248	3489024	215040	Oct-17
4	2FDC (RH) (150/75)mg	tab	60480	1192992	1253472	0	
5	ETB 100mg	tab	0	131000	108500	22500	Feb-19
6	ETB 400mg	tab	0	170000	163000	7000	Dec-19
7	INH 100mg	tab	117200	16500	133700	0	
8	INH 300mg	tab	0	47000	45000	2000	April -20
9	Paed: RHZ (60/30/150)mg	tab	840	3576636	3510276	67200	Nov-16
10	Paed: RH (60/60)mg	tab	0	11025252	10847844	177408	Feb-17
11	Pyrazinamide 400mg	tab	16128	0	16128	0	
12	Streptomycin 1G inj	vial	87800	539200	607000	20000	Nov-18
13	Amikacin 500mg/2ml inj:	vial	49050	428732	460102	17680	Feb-18
14	Capreomycin 1g, inj:	vial	0	696	618	78	
15	Cycloserine250mg	tab	259300	1702231	1877531	84000	June-16
16	Ethionamide 250mg	tab	227100	1680800	1847900	60000	Dec-17
17	Kanamycin 1G injection	vial	3410	2480	5890	0	Feb-16
18	Levofloxacin 250mg	tab	307500	2210150	2405650	112000	Sep-18
19	PAS sodium Granules 60% 100g	jar	6636	16150	22786	0	Dec-16
20	PAS powder / sac	sach	3825	305625	309450	0	
21	Pyrazinamide 500mg	tab	393248	2347840	2641088	100000	Sep-18
	Consumable items						
22	Syringe & Needles	pcs	96400	1075200	1051600	120000	Dec-19

Balance of Anti-TB Drugs at NTP Upper Myanmar Drug Store (2015) **Annex-1-c**

SN.	Item Description	Basic Unit	Opening Balance	Received	Issued	Closing Balance	Expire Date
	Anti TB 1st line						
1	Patient kit (I & III)	kit	16044	19320	26304	9060	Dec-17
2	4FDC (RHZE) (150/75/400/275)mg	tab	508032	1147680	1377252	278460	Dec-17
3	3FDC (RHE) (150/75/275)mg	tab	719040	989184	1202880	505344	Dec-17
4	2FDC (RH) (150/75)mg	tab	159936	662112	594720	227328	Dec-17
5	ETB 100mg	tab	0	107500	88500	19000	Dec-19
6	ETB 400mg	tab	2000	181200	143200	40000	Dec-19
7	INH 100mg	tab	60000	12500	72500	0	
8	INH 300mg	tab	0	66736	48736	18000	April-20
9	Paed: RHZ (60/30/150)mg	tab	1680	2268000	1757280	512400	Nov-16
10	Paed: HR (60/60)mg	tab	110880	6784008	4976664	1918224	Dec-16 Jan-17 Feb-17
11	Pyrazinamide 400mg	tab	209664	0	202272	7392	April-16
12	Streptomycin 1G inj	vial	40000	271000	234000	77000	Oct-18
13	Amikacin 500mg/2ml inj:	vial	31690	96650	98470	29870	Dec-17 Jan-18
14	Capreomycin 1g, inj:	vial	0	-	-	0	
15	Cycloserine250mg	tab	107200	556500	547700	116000	June-16
16	Ethionamide 250mg	tab	111100	440800	447100	104800	Nov-17 Dec-17
17	Kanamycin 1G injection	vial	360	-	360	0	
18	Levofloxacin 250mg	tab	146800	740300	705200	181900	Aug-18 Sep-18
19	PAS sodium Granules 60% 100g	jar	4898	7900	10018	7280	Dec-16 Jan-17
20	PAS powder / sac	sach	0	-	-	0	
21	PZA 500mg	tab	208960	309120	379648	138432	July-18 Dec-18
	Consumable item						
22	Syringe & Needles	pcs	247640	415200	408540	254300	Jan-17 Nov-19

Laboratory supplies and equipments (2015) **Annex-2**

No.	Items	Opening balance (1-1-2015)	Received 2015	Issued 2015	Closing balance (31-12-2015)
1.	Fuchsin Basic (25 gm)	634	0	400	234
2.	Phenol Crystals (500 gm)	0	195	100	95
3.	Methylated Spirit (5 Gallon/Can)	20	1025	340	705
4.	Microscopes (Max II Bino)	19	0	3	16
5.	Binocular Microscope Nikkon E100	2	0	0	2
6.	Microscope Glass Slides 3600/unit	0	577.9	327.9	250
7.	Xylene(1 Litre)	556	0	40	516
8.	Objective lens (100 X)	75	47	3	119
9.	Methylene Blue (25 gm)	658	0	87	571
10.	Sulphuric Acid (2.5 Litre)	401	0	168	233
11.	Sulphuric Acid (1 Litre)	410	0	410	0
12.	Sputum Containers (bags of 1000)	200	1500	1570	130
13.	Immersion Oil (500 ml)	353	47	10	390
14.	Methanol (1 Litre)	820	0	588	232
15.	Methanol (2.5 Litre)	12	0	0	12
16.	Glycerol (2.5 Litre)	0	5	3	2
17.	Glycerol (500 ml)	1	0	1	0

Manpower Situation of National Tuberculosis Programme (2015) **Annex-3**

No	Designation	Pay	Sanction	Posted	Vacant
1	Deputy Director (TB)	310000-4000-330000	1	1	-
2	Medical Superintendent	310000-4000-330000	1	1	-
3	Lecture /TB Specialist	310000-4000-330000	1	1	-
4	Consultant Microbiologist	310000-4000-330000	1	1	-
5	Assistant Director (TB)	280000-4000-300000	4	2 + 2*	2
6	Microbiologist	280000-4000-300000	5	5	-
7	Regional/State TB Officer	280000-4000-300000	6 + 8*	4 + 4*	2 + 4*
8	Medical Officer	250000-2000-270000	56 + 3*	37 + 2*	19 +1*
9	Assistant Microbiologist	250000-2000-270000	13	5	8
10	AO(Lab)	250000-2000-270000	10	-	10
11	Assistant Engineer (Bio)	250000-2000-270000	2	-	2
12	Public Health Sister Nurse(1)	195000-2000-205000	3	3	-
13	Public Health Sister Nurse(2)	185000-2000-190000	1	1	-
14	Nurse(2)	180000-2000-190000	1	1	-
15	Assistant Statistical Officer	180000-2000-190000	2	2	-
16	Health Assistant	180000-2000-190000	82	69	13
17	Phramacy	180000-2000-190000	4	4	-
18	Social Worker	180000-2000-190000	2	2	-
19	Medical Technician	180000-2000-190000	18	18	-
20	Radiographer Technician	180000-2000-190000	11	11	-
21	BC (Budget /Admin)	180000-2000-190000	4 + 1*	4 + 1*	-
22	BCG Supervisor	180000-2000-190000	7	7	-
23	Blue Staff	165000-2000-175000	4	2	2
24	LHV	165000-2000-175000	7	6	1
25	Trained Nurse	165000-2000-175000	114	99	15
26	Grade I , lab: Technician	165000-2000-175000	30	21	9
27	Grade I , X-Ray Technician	165000-2000-175000	10	9	1
28	Assistant Statistician	165000-2000-175000	5	3	2
29	BCG Technician	165000-2000-175000	45	15	30
30	UD (Budget / Admin)	165000-2000-175000	11	11	-
31	Grade II, Lab Technician	150000-2000-160000	222	139	82
32	LD (Budget /Admin)	150000-2000-160000	31	10	21
33	Compounder	150000-2000-160000	5	3	2
34	Grade II, X-Ray Technician	150000-2000-160000	6	-	6
35	Steward	150000-2000-160000	2	-	2
36	Typist	150000-2000-160000	2	1	1
37	Health Assistant (4)	150000-2000-160000	109	74	35
38	Statistical Clerk (4)	150000-2000-160000	99	65	34
39	Driver	135000-2000-145000	36	10	26
40	Lab: Boy and Lab: Assistant	120000-2000-130000	15	5	10
41	Peon	120000-2000-130000	10	4	6
42	X-Ray Van Assistant	120000-2000-130000	2	1	1
43	X-Ray Department Assistant	120000-2000-130000	4	2	2
44	Night Watch	120000-2000-130000	20	5	15
45	Sweeper and Manual Worker	120000-2000-130000	48	24	24
	Total		1072 + 14*	688 +9*	384 +5*

Block 1: All TB cases registered in Annual 2015 except Transfer in patients **Annex-4**

Sr.no	Region & State	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
1	Kachin	Pulmonary, bacteriologically confirm				1046	452	161	49	84	26	0	0	1291	527	1818
		Pulmonary, clinica lly diagnosed				1763	960	146	66	18	3	0	0	1927	1029	2956
		Extra pulmonary, bacteriologically co				23	10	1	0	0	0	0	0	24	10	34
		Extra pulmonary clinically diagnosed				929	657	5	3	0	0	0	0	934	660	1594
		Total TB cases	1433380	129	447	3761	2079	313	118	102	29	0	0	4176	2226	6402
2	Kayah	Pulmonary, bacteriologically confirm				110	49	12	8	3	1	0	0	125	58	183
		Pulmonary, clinica lly diagnosed				179	126	15	5	0	0	1	0	195	131	326
		Extra pulmonary, bacteriologically co				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				18	22	1	0	0	0	0	0	19	22	41
		Total TB cases	281009	65	196	307	197	28	13	3	1	1	0	339	211	550
3	Chin	Pulmonary, bacteriologically confirm				82	46	10	1	2	1	0	0	94	48	142
		Pulmonary, clinica lly diagnosed				375	299	8	4	3	1	0	0	386	304	690
		Extra pulmonary, bacteriologically co				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				105	91	2	4	1	0	0	0	108	95	203
		Total TB cases	455357	31	227	562	436	20	9	6	2	0	0	588	447	1035
4	Sagaing	Pulmonary, bacteriologically confirm				1789	772	210	66	52	16	0	0	2051	854	2905
		Pulmonary, clinica lly diagnosed				2960	1880	132	56	15	4	0	0	3107	1940	5047
		Extra pulmonary, bacteriologically co				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				475	349	13	4	0	0	0	0	488	353	841
		Total TB cases	5468872	53	161	5224	3001	355	126	67	20	0	0	5646	3147	8793
5	Magway	Pulmonary, bacteriologically confirm				1171	574	142	59	38	19	0	0	1351	652	2003
		Pulmonary, clinica lly diagnosed				2005	1285	159	81	26	12	0	0	2190	1378	3568
		Extra pulmonary, bacteriologically co				0	8	1	1	0	0	0	0	1	9	10
		Extra pulmonary clinically diagnosed				519	469	12	8	2	1	0	0	533	478	1011
		Total TB cases	4117662	49	160	3695	2336	314	149	66	32	0	0	4075	2517	6592
6	Mandalay	Pulmonary, bacteriologically confirm				2413	1013	358	122	106	40	0	0	2877	1175	4052
		Pulmonary, clinica lly diagnosed				1706	1043	136	70	6	2	0	0	1848	1115	2963
		Extra pulmonary, bacteriologically co				16	9	1	0	1	0	0	0	18	9	27
		Extra pulmonary clinically diagnosed				1024	865	35	32	1	1	0	0	1060	898	1958
		Total TB cases	5751896	71	156	5159	2930	530	224	114	43	0	0	5803	3197	9000

Sr.no	Region & State	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
7	Shan (Taunggyi)	Pulmonary, bacteriologically confirm				647	297	64	21	34	17	0	0	745	335	1080
		Pulmonary, clinica lly diagnosed				813	415	27	11	4	5	0	0	844	431	1275
		Extra pulmonary, bacteriologically co				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary clinically diagnosed				289	195	6	1	2	0	0	0	297	196	493
		Total TB cases	2230774	48	128	1749	908	97	33	40	22	0	0	1886	963	2849
8	Shan (kengtong)	Pulmonary, bacteriologically confirm				430	182	66	17	23	8	0	0	519	207	726
		Pulmonary, clinica lly diagnosed				498	313	44	11	5	1	1	0	548	325	873
		Extra pulmonary, bacteriologically co				1	1	0	0	0	0	0	0	1	1	2
		Extra pulmonary clinically diagnosed				46	28	1	1	0	0	1	0	48	29	77
		Total TB cases	845951	86	198	975	524	111	29	28	9	2	0	1116	562	1678
9	Shan (Lashio)	Pulmonary, bacteriologically confirm				818	338	137	25	53	11	0	1	1008	375	1383
		Pulmonary, clinica lly diagnosed				1387	858	95	34	13	7	1	1	1496	900	2396
		Extra pulmonary, bacteriologically co				1	2	0	0	0	0	0	0	1	2	3
		Extra pulmonary clinically diagnosed				182	146	4	5	1	0	0	0	187	151	338
		Total TB cases	2001308	69	206	2388	1344	236	64	67	18	1	2	2692	1428	4120
10	Kayin	Pulmonary, bacteriologically confirm				754	384	46	32	30	18	0	0	830	434	1264
		Pulmonary, clinica lly diagnosed				1529	1265	59	27	14	6	1	0	1603	1298	2901
		Extra pulmonary, bacteriologically co				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary clinically diagnosed				39	41	1	1	0	0	0	0	40	42	82
		Total TB cases	1481651	85	287	2322	1691	106	60	44	24	1	0	2473	1775	4248
11	Tanintharyi	Pulmonary, bacteriologically confirm				506	270	85	26	26	19	0	0	617	315	932
		Pulmonary, clinica lly diagnosed				1260	937	96	67	11	2	0	0	1367	1006	2373
		Extra pulmonary, bacteriologically co				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				279	245	5	0	0	1	0	0	284	246	530
		Total TB cases	1353359	69	283	2045	1452	186	93	37	22	0	0	2268	1567	3835
12	Bago	Pulmonary, bacteriologically confirm				2290	1132	327	122	88	30	0	0	2705	1284	3989
		Pulmonary, clinica lly diagnosed				4063	2843	426	242	16	6	0	0	4505	3091	7596
		Extra pulmonary, bacteriologically co				0	2	0	1	0	0	0	0	0	3	3
		Extra pulmonary clinically diagnosed				359	344	9	8	0	0	0	0	368	352	720
		Total TB cases	4882454	82	252	6712	4321	762	373	104	36	0	0	7578	4730	12308

Sr.no	Region & State	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
13	Mon	Pulmonary, bacteriologically confirm				1044	553	175	73	55	21	0	0	1274	647	1921
		Pulmonary, clinica lly diagnosed				1990	1489	68	43	4	1	0	0	2062	1533	3595
		Extra pulmonary, bacteriologically co				1	0	0	0	0	0	0	0	1	0	1
		Extra pulmonary clinically diagnosed				155	139	3	2	1	2	0	0	159	143	302
		Total TB cases	2209677	87	263	3190	2181	246	118	60	24	0	0	3496	2323	5819
14	Rakhine	Pulmonary, bacteriologically confirm				1327	704	90	43	51	23	5	3	1473	773	2246
		Pulmonary, clinica lly diagnosed				1974	1628	48	28	49	21	1	3	2072	1680	3752
		Extra pulmonary, bacteriologically co				3	2	0	0	0	0	0	0	3	2	5
		Extra pulmonary clinically diagnosed				737	661	3	3	1	0	0	0	741	664	1405
		Total TB cases	3241212	69	229	4041	2995	141	74	101	44	6	6	4289	3119	7408
15	Yangon	Pulmonary, bacteriologically confirm				4685	2299	873	298	128	39	0	0	5686	2636	8322
		Pulmonary, clinica lly diagnosed				6249	3944	787	346	157	63	0	0	7193	4353	11546
		Extra pulmonary, bacteriologically co				1	1	0	0	0	1	0	0	1	2	3
		Extra pulmonary clinically diagnosed				776	929	11	19	4	8	0	0	791	956	1747
		Total TB cases	6304447	132	343	11711	7173	1671	663	289	111	0	0	13671	7947	21618
16	Ayeyarwaddy	Pulmonary, bacteriologically confirm				2925	1578	308	140	91	40	0	0	3324	1758	5082
		Pulmonary, clinica lly diagnosed				4104	2842	257	157	18	6	3	1	4382	3006	7388
		Extra pulmonary, bacteriologically co				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary clinically diagnosed				471	449	12	5	1	1	0	0	484	455	939
		Total TB cases	6171133	82	217	7500	4870	577	302	110	47	3	1	8190	5220	13410
17	Naypyitaw	Pulmonary, bacteriologically confirm				450	227	68	22	28	12	0	0	546	261	807
		Pulmonary, clinica lly diagnosed				478	279	64	31	2	2	0	0	544	312	856
		Extra pulmonary, bacteriologically co				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				155	134	2	7	0	0	0	0	157	141	298
		Total TB cases	1021550	79	192	1083	640	134	60	30	14	0	0	1247	714	1961
18	Other Units	Pulmonary, bacteriologically confirm				5781	2914	659	201	197	75	1	1	6638	3191	9829
		Pulmonary, clinica lly diagnosed				8853	6085	456	247	73	27	11	3	9393	6362	15755
		Extra pulmonary, bacteriologically co				16	17	7	5	4	1	0	0	27	23	50
		Extra pulmonary clinically diagnosed				1740	1382	138	67	75	35	1	2	1954	1486	3440
		Total TB cases				16390	10398	1260	520	349	138	13	6	18012	11062	29074
	Country	**Pulmonary, bacteriologically confirm**				**28268**	**13784**	**3791**	**1325**	**1089**	**416**	**6**	**5**	**33154**	**15530**	**48684**
		Pulmonary, clinica lly diagnosed				**42186**	**28491**	**3023**	**1526**	**434**	**169**	**19**	**8**	**45662**	**30194**	**75856**
		Extra pulmonary, bacteriologically c				**62**	**55**	**10**	**7**	**5**	**2**	**0**	**0**	**77**	**64**	**141**
		Extra pulmonary clinically diagnose				**8298**	**7146**	**263**	**170**	**89**	**49**	**2**	**2**	**8652**	**7367**	**16019**
		Total TB cases	**49251692**	**98**	**283**	**78814**	**49476**	**7087**	**3028**	**1617**	**636**	**27**	**15**	**87545**	**53155**	**140700**

Block 1: All TB cases registered in Annual 2015 except Transfer in patients

Annex-5

Sr.no	Name	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
	Kachin															
1	Myitkyina	Pulmonary, bacteriologically confirmed				309	128	61	15	34	9	0	0	404	152	556
		Pulmonary, clinica lly diagnosed				484	264	51	18	9	2	0	0	544	284	828
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				300	196	3	2	0	0	0	0	303	198	501
		Total TB cases	251325	221	750	1093	588	115	35	43	11	0	0	1251	634	1885
2	Waingmaw	Pulmonary, bacteriologically confirmed				87	32	16	8	11	2	0	0	114	42	156
		Pulmonary, clinica lly diagnosed				148	68	23	11	2	0	0	0	173	79	252
		Extra pulmonary, bacteriologically confirmed				1	0	0	0	0	0	0	0	1	0	1
		Extra pulmonary clinically diagnosed				270	188	0	0	0	0	0	0	270	188	458
		Total TB cases	124702	126	695	506	288	39	19	13	2	0	0	558	309	867
3	Tanai	Pulmonary, bacteriologically confirmed				51	25	10	1	7	2	0	0	68	28	96
		Pulmonary, clinica lly diagnosed				153	83	5	3	2	0	0	0	160	86	246
		Extra pulmonary, bacteriologically confirmed				19	9	0	0	0	0	0	0	19	9	28
		Extra pulmonary clinically diagnosed				32	28	1	0	0	0	0	0	33	28	61
		Total TB cases	43914	282	981	255	145	16	4	9	2	0	0	280	151	431
4	Chipwe	Pulmonary, bacteriologically confirmed				5	0	0	0	0	0	0	0	5	0	5
		Pulmonary, clinica lly diagnosed				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary, bacteriologically confirmed				1	0	1	0	0	0	0	0	2	0	2
		Extra pulmonary clinically diagnosed				1	1	0	0	0	0	0	0	1	1	2
		Total TB cases	19182	36	52	7	2	1	0	0	0	0	0	8	2	10
5	Salaw	Pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Pulmonary, clinica lly diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	8641	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Ingyanyan	Pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Pulmonary, clinica lly diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	9365	0	0	0	0	0	0	0	0	0	0	0	0	0

Sr.no	Name	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
7	Moenyin	Pulmonary, bacteriologically confirmed				136	62	6	3	14	6	0	0	156	71	227
		Pulmonary, clinica lly diagnosed				154	55	2	4	2	1	0	0	158	60	218
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				27	26	0	0	0	0	0	0	27	26	53
		Total TB cases	204546	111	243	317	143	8	7	16	7	0	0	341	157	498
8	Moegaung	Pulmonary, bacteriologically confirmed				88	39	19	8	3	0	0	0	110	47	157
		Pulmonary, clinica lly diagnosed				139	86	10	6	0	0	0	0	149	92	241
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				15	15	0	0	0	0	0	0	15	15	30
		Total TB cases	142121	110	301	242	140	29	14	3	0	0	0	274	154	428
9	Phakant	Pulmonary, bacteriologically confirmed				122	56	15	6	5	4	0	0	142	66	208
		Pulmonary, clinica lly diagnosed				154	65	0	0	0	0	0	0	154	65	219
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				13	16	0	0	0	0	0	0	13	16	29
		Total TB cases	173217	120	263	289	137	15	6	5	4	0	0	309	147	456
10	Bamaw	Pulmonary, bacteriologically confirmed				87	35	13	1	2	2	0	0	102	38	140
		Pulmonary, clinica lly diagnosed				324	198	28	15	1	0	0	0	353	213	566
		Extra pulmonary, bacteriologically confirmed				2	1	0	0	0	0	0	0	2	1	3
		Extra pulmonary clinically diagnosed				160	105	0	1	0	0	0	0	160	106	266
		Total TB cases	125480	114	777	573	339	41	17	3	2	0	0	617	358	975
11	Mansi	Pulmonary, bacteriologically confirmed				27	11	8	2	0	0	0	0	35	13	48
		Pulmonary, clinica lly diagnosed				43	33	6	3	0	0	0	0	49	36	85
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				29	19	0	0	0	0	0	0	29	19	48
		Total TB cases	65416	73	277	99	63	14	5	0	0	0	0	113	68	181
12	Moemauk	Pulmonary, bacteriologically confirmed				26	14	5	0	0	0	0	0	31	14	45
		Pulmonary, clinica lly diagnosed				61	33	7	2	1	0	0	0	69	35	104
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				57	53	0	0	0	0	0	0	57	53	110
		Total TB cases	73581	61	352	144	100	12	2	1	0	0	0	157	102	259
13	Shwegu	Pulmonary, bacteriologically confirmed				49	25	2	0	2	0	0	0	53	25	78
		Pulmonary, clinica lly diagnosed				30	22	3	1	1	0	0	0	34	23	57
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				17	7	0	0	0	0	0	0	17	7	24
		Total TB cases	86736	90	183	96	54	5	1	3	0	0	0	104	55	159

Sr.no	Name	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
14	Putao	Pulmonary, bacteriologically confirmed				53	22	5	4	5	1	0	0	63	27	90
		Pulmonary, clinica lly diagnosed				73	51	11	3	0	0	0	0	84	54	138
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				8	3	1	0	0	0	0	0	9	3	12
		Total TB cases	61700	146	389	134	76	17	7	5	1	0	0	156	84	240
15	Machanbaw	Pulmonary, bacteriologically confirmed				5	1	1	1	1	0	0	0	7	2	9
		Pulmonary, clinica lly diagnosed				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	8874	101	113	5	2	1	1	1	0	0	0	7	3	10
16	Sumparabun	Pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Pulmonary, clinica lly diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	10658	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Naungmun	Pulmonary, bacteriologically confirmed				1	2	0	0	0	0	0	0	1	2	3
		Pulmonary, clinica lly diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	12142	25	25	1	2	0	0	0	0	0	0	1	2	3
18	Khaunglanbu	Pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Pulmonary, clinica lly diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	11780	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**Pulmonary, bacteriologically confirmed**				**1046**	**452**	**161**	**49**	**84**	**26**	**0**	**0**	**1291**	**527**	**1818**
		Pulmonary, clinica lly diagnosed				**1763**	**960**	**146**	**66**	**18**	**3**	**0**	**0**	**1927**	**1029**	**2956**
		Extra pulmonary, bacteriologically confirmed				**23**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**24**	**10**	**34**
		Extra pulmonary clinically diagnosed				**929**	**657**	**5**	**3**	**0**	**0**	**0**	**0**	**934**	**660**	**1594**
		Total TB cases	**1433380**	129	447	**3761**	**2079**	**313**	**118**	**102**	**29**	**0**	**0**	**4176**	**2226**	**6402**

Sr.no	Name	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
	Kayah															
1	Loikaw	Pulmonary, bacteriologically confirmed				40	23	7	4	2	1	0	0	49	28	77
		Pulmonary, clinica lly diagnosed				119	65	5	5	0	0	0	0	124	70	194
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				9	15	1	0	0	0	0	0	10	15	25
		Total TB cases	126500	61	234	168	103	13	9	2	1	0	0	183	113	296
2	Deemawso	Pulmonary, bacteriologically confirmed				32	11	3	0	0	0	0	0	35	11	46
		Pulmonary, clinica lly diagnosed				30	33	8	0	0	0	0	0	38	33	71
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				2	3	0	0	0	0	0	0	2	3	5
		Total TB cases	83687	55	146	64	47	11	0	0	0	0	0	75	47	122
3	Phruso	Pulmonary, bacteriologically confirmed				7	1	1	2	1	0	0	0	9	3	12
		Pulmonary, clinica lly diagnosed				6	6	1	0	0	0	1	0	8	6	14
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				5	2	0	0	0	0	0	0	5	2	7
		Total TB cases	30770	39	107	18	9	2	2	1	0	1	0	22	11	33
4	Bawlake	Pulmonary, bacteriologically confirmed				10	6	1	1	0	0	0	0	11	7	18
		Pulmonary, clinica lly diagnosed				6	6	1	0	0	0	0	0	7	6	13
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				1	1	0	0	0	0	0	0	1	1	2
		Total TB cases	8817	204	374	17	13	2	1	0	0	0	0	19	14	33
5	Phasaung	Pulmonary, bacteriologically confirmed				14	4	0	0	0	0	0	0	14	4	18
		Pulmonary, clinica lly diagnosed				15	12	0	0	0	0	0	0	15	12	27
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	18662	96	241	29	16	0	0	0	0	0	0	29	16	45
6	Maese	Pulmonary, bacteriologically confirmed				6	3	0	1	0	0	0	0	6	4	10
		Pulmonary, clinica lly diagnosed				3	3	0	0	0	0	0	0	3	3	6
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				0	0	0	0	0	0	0	0	0	0	0
		Total TB cases	5722	175	280	9	6	0	1	0	0	0	0	9	7	16

Sr.no	Name	Type of patient / Type of Disease	Population	CNR Bact: Confirmed	CNR (All Cases)	New		Re-treatment Cases						Total		Grand Total
								Relapse		Previously treated (excluding relapse		Unknown previous treatment history				
						M	F	M	F	M	F	M	F	M	F	
7	Shadaw	Pulmonary, bacteriologically confirmed				1	1	0	0	0	0	0	0	1	1	2
		Pulmonary, clinica lly diagnosed				0	1	0	0	0	0	0	0	0	1	1
		Extra pulmonary, bacteriologically confirmed				0	0	0	0	0	0	0	0	0	0	0
		Extra pulmonary clinically diagnosed				1	1	0	0	0	0	0	0	1	1	2
		Total TB cases	6851	29	73	2	3	0	0	0	0	0	0	2	3	5
	Total	**Pulmonary, bacteriologically confirmed**				**110**	**49**	**12**	**8**	**3**	**1**	**0**	**0**	**125**	**58**	**183**
		Pulmonary, clinica lly diagnosed				**179**	**126**	**15**	**5**	**0**	**0**	**1**	**0**	**195**	**131**	**326**
		Extra pulmonary, bacteriologically confirmed				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		Extra pulmonary clinically diagnosed				**18**	**22**	**1**	**0**	**0**	**0**	**0**	**0**	**19**	**22**	**41**
		Total TB cases	**281009**	65	196	**307**	**197**	**28**	**13**	**3**	**1**	**1**	**0**	**339**	**211**	**550**