

KINGDOM OF CAMBODIA

NATION RELIGION KING

MINISTRY OF HEALTH

TUBERCULOSIS REPORT 2019



Prepared by

National Center for Tuberculosis and Leprosy Control

អង្គការជាតិប្រយុទ្ធនឹងជំងឺបាតុភ័យ និងជំងឺស្រាវជ្រាវ
ENGLISH VERSION

MARCH 2020



TABLE OF CONTENTS

Abbreviation	3
1. Introduction.....	5
2. Tuberculosis Situation in the World	5
3. Main Achievements.....	5
3.1. Service Coverage.....	5
3.2. Case Detection	5
3.3. Treatment	6
3.4. Mortality and Incidence of Tuberculosis	6
4. Main Interventions.....	7
4.1. Drug Resistance Tuberculosis.....	7
4.1.1. MDR-TB Suspect Screening, Diagnosis, and Treatment.....	7
4.1.2. MDR-TB Treatment Outcome	8
4.2. Collaborative TB/HIV activities	10
4.2.1. Training	10
4.2.2. Supervision	10
4.2.3. TB/HIV Data:.....	11
4.3. Diagnosis by Bacteriological Examination	14
4.3.1. Diagnosis by Smear Microscopy	14
4.3.2. Diagnosis by GeneXpert, Xpert MTB/RIF.....	15
4.3.3. TB Culture and Drug Susceptibility Testing	15
4.3.4. Training	16
4.4. Childhood TB	16
4.5. Financing	17
4.6. Drug and laboratory supplies	18
4.7. TB Infection Control.....	20
4.8. Community DOTS	20

4.9. Public-Private Mix DOTS	21
4.10. TB in Congregational Settings.....	22
4.10.1. Prisons.....	22
4.10.2. Factories and Enterprises	23
4.11. Summary of Active Case Finding Project.....	23
4.12. Collaborative DM-TB Services.....	24
4.12.1. Workshop and partners	24
4.12.2. Achievement of TB/DM Collaborative Activities with HSD:	25
4.13. Advocacy, Communication and Social Mobilization	27
4.14. Research.....	28
4.14.1. Third national drug resistance survey	28
4.14.2. Research project to strengthen pediatric tuberculosis services:	28
4.14.3. Cambodia Patient Pathway Analysis:.....	28
4.14.4. Research on “All-oral shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB) (ShORRT_Cambodia):.....	28
4.14.5. Cambodia Committee for TB Research	29
4.14.6. Other activities related to TB research:	29
4.15. Electronic TB Management Information System	29
5. Summary of TB Joint Program Review	31
6. Targets for 2020	36
7. Acknowledgement	37

Abbreviation

aDSM	Active drug safety monitoring and management
ART	Antiretroviral therapy
CARITAS	CARITAS
CATA	Cambodia Anti-Tuberculosis Association
CDA	Community Development Association
CENAT	The National Leprosy Control Programme of Cambodia
Challenge TB	Challenge Tuberculosis
CHC	Cambodian Health Committee
DOT	Directly Observed Therapy
ECH	Empowering Communities for Health
FHI-360	Family Health International 360
GFATM	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HbA1c	Hemoglobin A1c
HC	Health Center
HIPA	Health Information Policy Advocacy
HP+	Health Policy Plus
HSD	Center for Health and Social Development
IPT	Isoniazid Preventive Therapy
JATA	Japan Anti-Tuberculosis Association
JPR	Join Program Review
KHANA	Khmer HIV/AIDS NGO alliance
MDG	Millennium Development Goal
MRD-TB	Multi-drug-resistant tuberculosis
MSF-B	Médecins Sans Frontières Belgium
MSF-F	Médecins Sans Frontières France
NCHADS	The National Centre for HIV/AIDS Dermatology and STDs
NTP	The national TB Program
OD	Operational District
OI	Opportunistic infections
OpASHA	Operation ASHA

PMDT	Programmatic management for drug resistant TB
PPM	Public-Private Mix
Pre-XDR-TB	Pre-Extensively Drug-Resistant Tuberculosis
RACHA	Reproductive and Child Health Alliance
RH	Referral Hospital
SDG	Sustainable Development Goal
ShoRRT	Shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis
TB	Tuberculosis
TB/CARE I	Tuberculosis Care I
TPT	TB Prevention Therapy
USAID	United States Agency for International Development
US-CDC	United States Centers for Disease Control and Prevention
UV	Ultra Violet
VHSG	Village Health Support Group
WHO	World Health Organization
XDR-TB	Extensively Drug-Resistant Tuberculosis

1. Introduction

The Ministry of Health of Cambodia has given high priority to TB Control. With the support and encouragement from the Royal Government of Kingdom of Cambodia led by the Prime Minister, **Samdech Akka Moha Sena Padei Techo Hun Sen**, as the Honorable Chairman of the National Anti-Tuberculosis Committee, as well as the involvement from all partners, TB control in Cambodia has achieved the remarkable results in the last recent years. This achievement has been recognized by the World Health Organization (WHO) and other key partners.

In 2015, WHO reclassified the countries with high burden of tuberculosis in which there are 30 countries with high burden of TB in the new list compared to 22 high burden countries in the previous one. By the end of 2015, Cambodia was one of the 9 countries among 22 TB high burden countries that have successfully achieved Millennium Development Goal (MDG). Despite this great achievement, based on the new classification, Cambodia is still one of the 30 countries with high burden of TB in the world. However, Cambodia is no longer country with high burden of TB/HIV and not high burden of MDR-TB.

According to the 2019 WHO Global TB Report, Cambodia had TB incidence of 302 per 100,000 populations, while the mortality rate was 18 per 100,000 populations in 2018.

The followings are the main achievements on TB control in 2019 and direction/targets for 2020 and the years beyond.

2. Tuberculosis Situation in the World

Worldwide, 10 million people are estimated to have fallen ill with TB in in 2018; of which only 7 million new cases of TB were detected and reported to WHO. In the same year, there were an estimated 1.2 million TB deaths among HIV-negative people and additional 251,000 deaths among HIV-positive people. TB is the leading cause of death among infectious diseases, ranking above HIV/AIDS.

3. Main Achievements

3.1. Service Coverage

The coverage of TB service has been maintaining at 100% in all referral hospitals (RHs) and health centers (HCs) nationwide. Community DOTS (C-DOTS) has been expanded from 506 HCs in 2008 to 644 HCs in 2018 and in late 2019, we expanded to other 356 HCs in 30 ODs. So, since late 2019, C-DOTS has been implementing in 76 ODs (1,000 HCs). TB/HIV collaborative activity has been implementing in all ODs in 2019 (compared to only 57 ODs in 2008) while TB in children activity was implemented in 76 ODs. In addition, the TB activities have been implementing in 12 factories and 19 prisons in 2019. MDR-TB treatment sites have increased from 9 in 2010 to 11 in 2019.

3.2. Case Detection

In 2019, the National Tuberculosis Program (NTP) has detected a total of 30,017 TB cases, of which 10,092 were bacteriologically confirmed new TB cases.

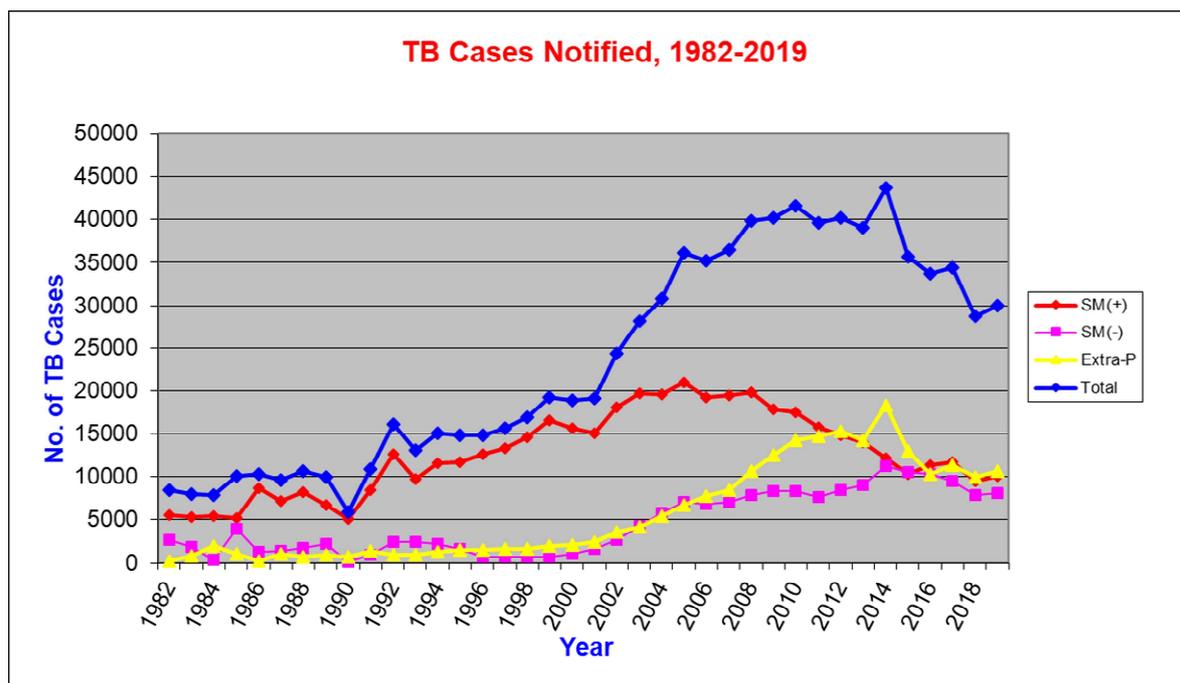


Figure 1: TB case notified from 1982 - 2019

3.3. Treatment

The Treatment Success Rate of TB has been maintained over 90% during the last 21 years. For instance, NTP has achieved 93% of the treatment success rate in 2019 which surpassed the target of only 90%.

3.4. Mortality and Incidence of Tuberculosis

In the recent years, Cambodia has achieved remarkable results in TB control. The 2019 WHO Global TB Report has shown that TB mortality rate dropped from 42 per 100,000 populations (pop) in 2000 to 18 per 100,000 pop in 2018, which equal to 57% reduction. While the incidence has also fallen from 575 per 100,000 pop in 2000 to 302 per 100,000 pop in 2018, which equal to 47% reduction.

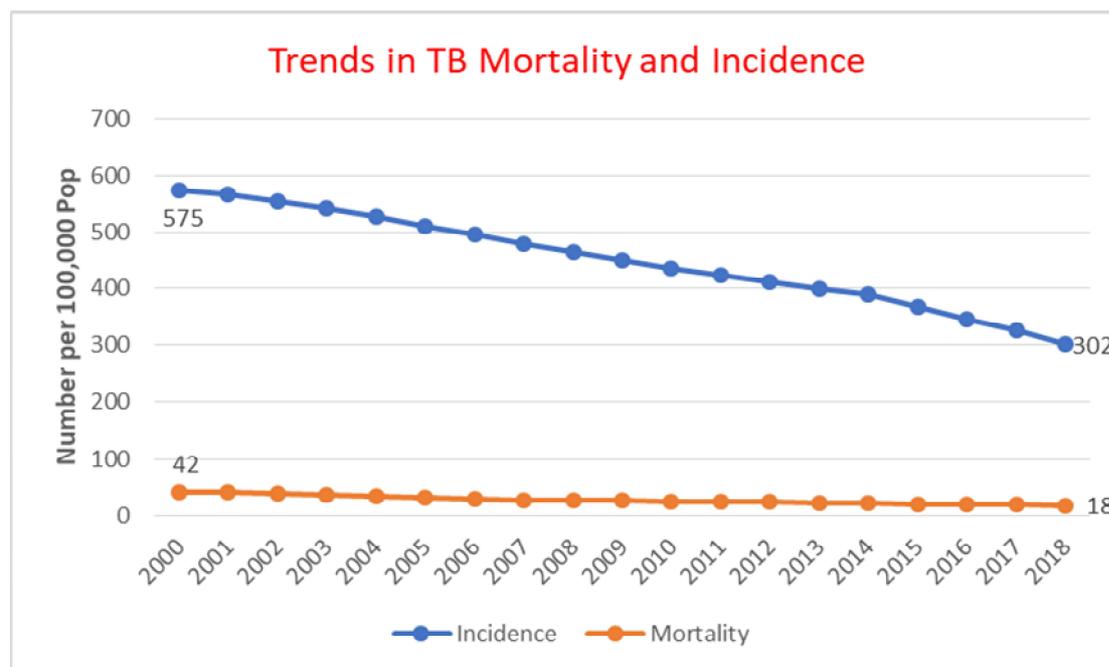


Figure 2: Trend of TB mortality and incidence from 2000 – 2018

Ministry of Health’s NTP has already achieved MDG targets (1990 - 2015) in reversing incidence, reduction of prevalence and death rate due to TB by 50% since 2011; that’s four years earlier than scheduled.

4. Main Interventions

In addition to the key achievements as mentioned above, NTP also achieved significant results relating to the interventions against tuberculosis as follow:

4.1. Drug Resistance Tuberculosis

The Cambodia NTP started implementing programmatic management for drug resistant TB (PMDT) since 2006 in collaboration with partners, especially WHO, Cambodian Health Committee (CHC), Médecins Sans Frontières-France (MSF-F), and Médecins Sans Frontières-Belgium (MSF-B), US-CDC, and USAID. The second National Drug Resistant Survey (NDRS) conducted in 2006-2007 showed that the proportion of Multi-Drug Resistant TB (MDR-TB) were 1.4% and 10.5% among new and previously treated TB cases respectively. The third National Drug Resistant Survey has been conducted in 2017. The primarily result of the 3rd DR survey shows that the estimated prevalence of RR cases among the captured BC cases is 0.9% for new cases and 9.4% for previously treated cases and estimated prevalence of RR by DST among smear-positive cases is 1.1% for new cases and 12.4% for previously treated cases.

4.1.1. MDR-TB Suspect Screening, Diagnosis, and Treatment

In 2019, there were 1,474 DR-TB suspects tested by Xpert MT/RIF. Of those, 135 RR/MDR-TB cases were detected and treated which was achieved of 100% compared to the target (135/135). The figure below shows drug-resistant TB suspects that were tested by Xpert (Figure 3) and drug-resistant TB cases treated during 2007-2019.

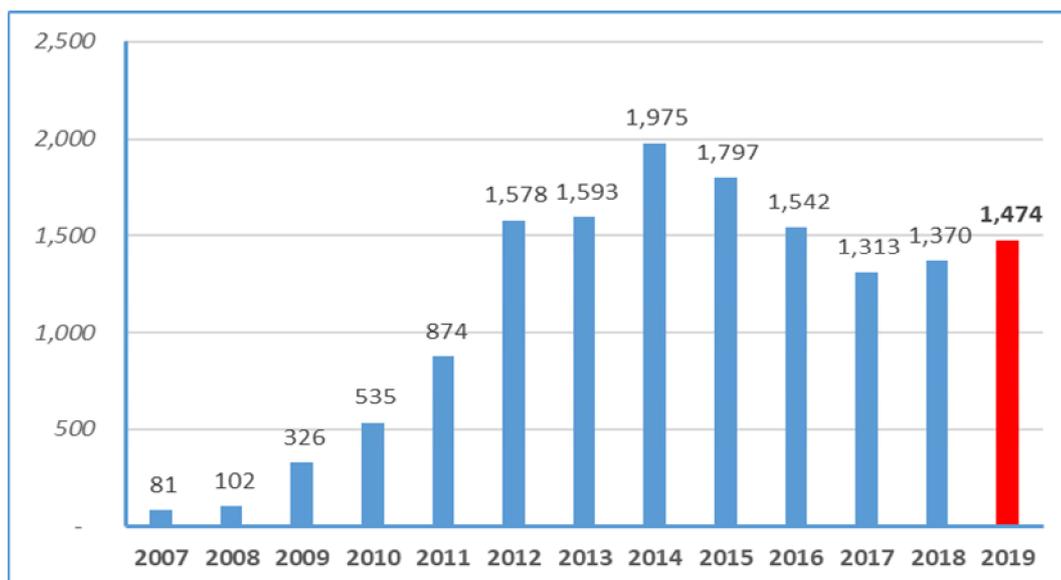


Figure 3: Number of drug-resistant TB suspects tested by Xpert from 2007 - 2019

Cambodia has 11 MDR-TB treatment sites with 57 isolation rooms by the end of 2019.

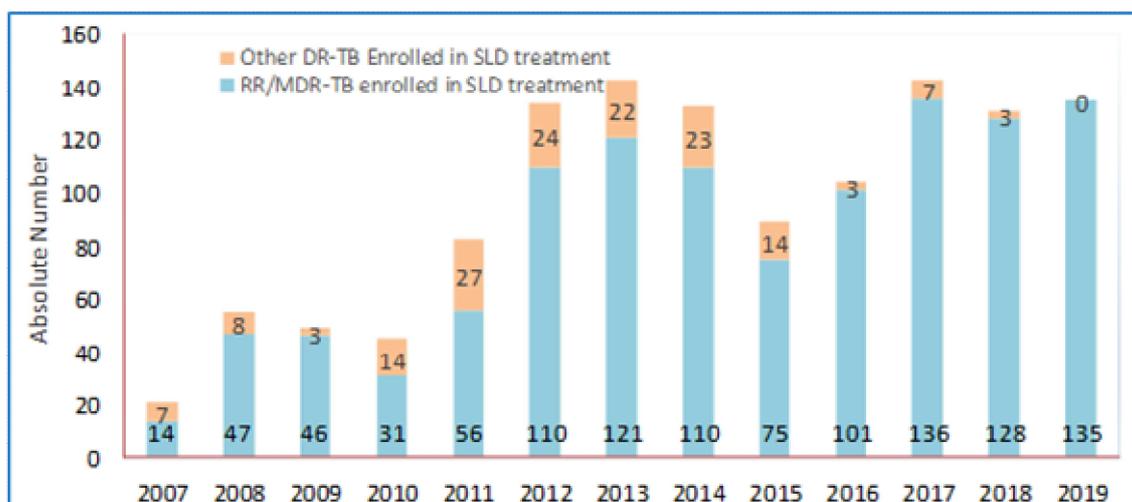


Figure 4: Number of drug-resistant TB cases treated with second-line drugs during 2007-2019

4.1.2. MDR-TB Treatment Outcome

The treatment success rate among RR/MDR-TB patients initiated on MDR-TB regimen (long regimen) in Cambodia was higher than an average of global level, which was only 54%. The treatment success rate varies from year to year; and it was 71% in 2017 cohort while the death rate also varies from one year to another (Figure 5). In the cohort of 2017, 10 cases were received shorter treatment regimen (9-11 months), in which

8 cases (80%) were cured, 1 case was switched to longer individualized regimen and 1 was lost to follow-up.

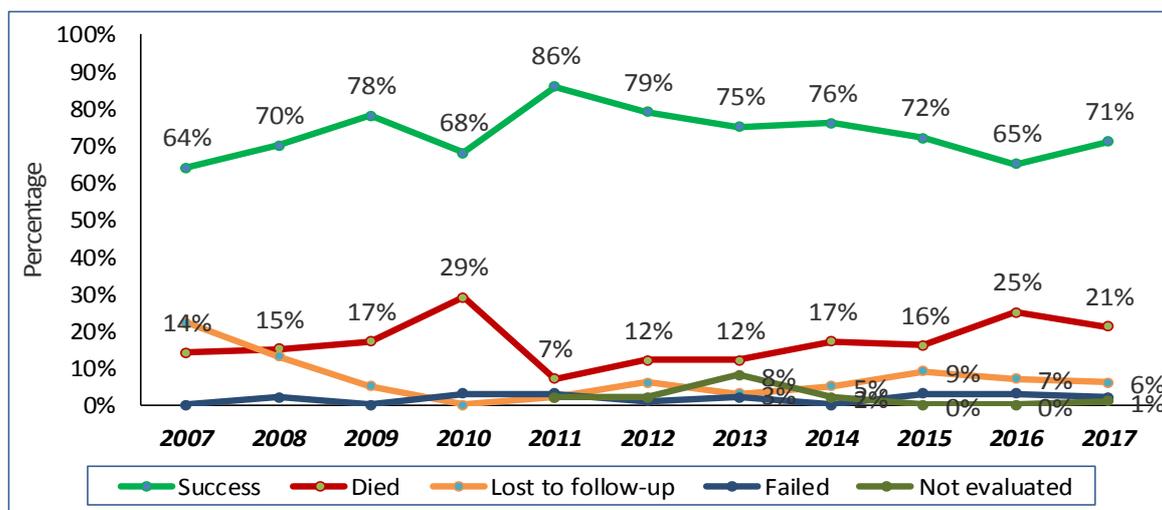


Figure 5: RR/MDR-TB treatment outcome cohort: 2007-2017

Moreover, in response to the new WHO consolidated guidelines on drug-resistant tuberculosis treatment in 2019, we have revised its own country guidelines for PMDT aligned with the latest global recommendations. The main changes in this documentation include the revised case finding algorithms for presumptive DR-TB that more comprehensive and tailored to the epidemiology and program reference of Cambodia. The new recommendations signal an important departure from previous approached to the treatment of MDR/RR-TB. Fully all-oral regimens are prioritized and are the preferred options for most of patients and injectable agents are no longer among the most effective medications to consider when designing the longer regimen. Patients who are eligible for the 9-11 months standardized shorter regimen with an injectable may still prefer, but Kanamycin will be systematically replaced by Amikacin based on the latest WHO recommendation.

As the result we have provided a comprehensive 5 days training course on the new PMDT guidelines to all clinicians and nurses from all MDR-TB treatment sites, including all provincial TB supervisors and laboratory officers as well. During 2019, among 135 MDR-TB patients enrolled for treatment, 87 cases (64%) received shorter treatment regimen and 48 cases (36%) received longer individualized treatment regimen, in which 34 cases were put on all-oral longer regimen with new drug such as Bedaquiline and or Delamanid containing treatment regimens. This year, 21 cases were confirmed for Pre-XDR-TB using line probe assay tests to detect second line drugs such as fluoroquinolones and second line injectable drugs. In 2019 there are 41 cases received new drug Bedaquiline, and 5 cases on Delamanid in their treatment regimens.

Regarding the PMDT transition plan 2019-2021, National Center for Tuberculosis and Leprosy (CENAT) will allocate a proportion of RR-/MDT-TB patients on all-oral shorter treatment regimen (9months) on operational research to be in line with WHO recommendation advised to phase out use of the injectable-containing shorter regimen in the future. Hence, with technical support from WHO/TDR, we have developed a protocol

on all-short oral regimen and was approved by the National Ethics Committee for Health Research (NECHR) and this research will be implemented in 2020.

So far, NTP, in collaboration with relevant partners, has trained health workers, doctors, nurses, practitioners in 11 drug-resistant TB clinics and provincial TB administrators from 25 provinces and cities on the new TB instruction program guidelines in order to build their capacity to manage performance related to the diagnosis and treatment using new formula including monitoring report by active drug safety monitoring and management (aDSM).

Yet we have challenges in strengthening and improving quality of care especially for MDR-TB patients in special situations or patients who presents with resistance to second line drugs such as XDR-TB or Pre-XDR-TB cases by special focusing on the appropriate use of active drug safety monitoring and management (aDSM) and regular patient monitoring to assess regimen effectiveness, including patient-centered care and support as well.

4.2. Collaborative TB/HIV activities

4.2.1. Training

With the financial support from GFATM, CENAT in collaboration with National Center for HIV/AIDS, Dermatology and STD (NCHADS) conducted refresher trainings on TB diagnostic workup for PLHIV to staff working at IO/ART service. In 2019, there are 2 courses conducted at Kampong Cham province (23th to 24th May 2019 and 25th to 26th September 2019). The objective of the TB diagnostic workup training is to strengthen TB diagnostic capacities for staff working at OI/ART services and TB services and to provide TB prevention therapy with INH.

4.2.2. Supervision

A main objective of supervision is to monitor and follow up the performance of collaborative TB/HIV activities and provide job coaching at sites visited if there is mistake or misunderstanding during the implementation.

The challenges found to be addressed in the field are: (1): difficult to collect sputum from PLHIV who have symptom screening positive with dry cough; (2): Challenge of transportation of specimen of PLHIV to Xpert machine; (3): workload for the staff at the field; and (4): mal-distribution of INH 100mg and 300mg from Central Medical Store (CMS) to some OI/ART sites where INH 100mg should reserve for children rather than to provide for adult PLHIV (we will distribute INH 300mg to replace INH 100mg to be used for PLHIV).

4.2.3. TB/HIV Data:

HIV / AIDS among TB Patients 2019									
Quarter	Number of TB cases registered for treatment (including HIV+)	Number of TB Cases Registered for treatment (excluding HIV+)	Number of Known HIV+ before TB treatment	Number of TB Cases Referred to VCT for HIV testing	Number of TB Cases tested for HIV at VCT	HIV+	HIV -	CPT	ARV
1	7,714	7,576	138	7,472	7,037	33	7,004	164	164
2	7,389	7,240	149	7,145	7,012	35	6,977	178	178
3	7,800	7,648	152	7,351	7,213	28	7,185	179	179
4	7,114	6,948	166	6,893	6,424	39	6,385	204	204
total	30,017	29,412	605	28,861	27,686	135	27,551	725	725

Table 1: HIV/AIDS among TB patients in 2019

Percentage of registered unknown HIV status TB patients referred and tested for HIV (tested on sites mostly at HCs where the activity has been implemented in the middle of 2014) was increased gradually from 47% in 2007 to 82% in 2011, 94% in 2018, and increased to 94.2% in 2019.

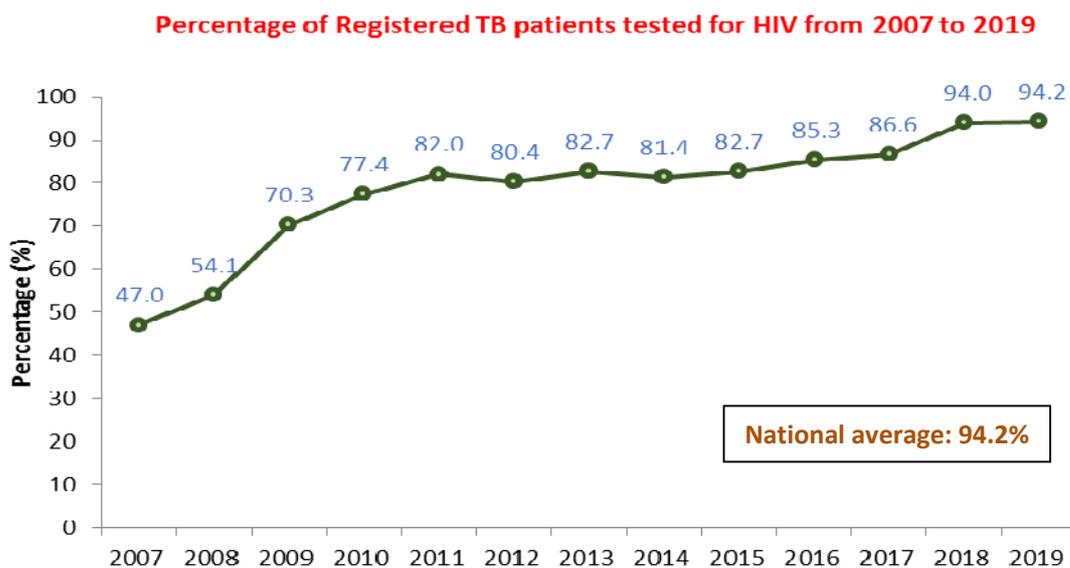


Figure 6: Percentage of Registered TB patients tested for HIV from 2007 - 2019

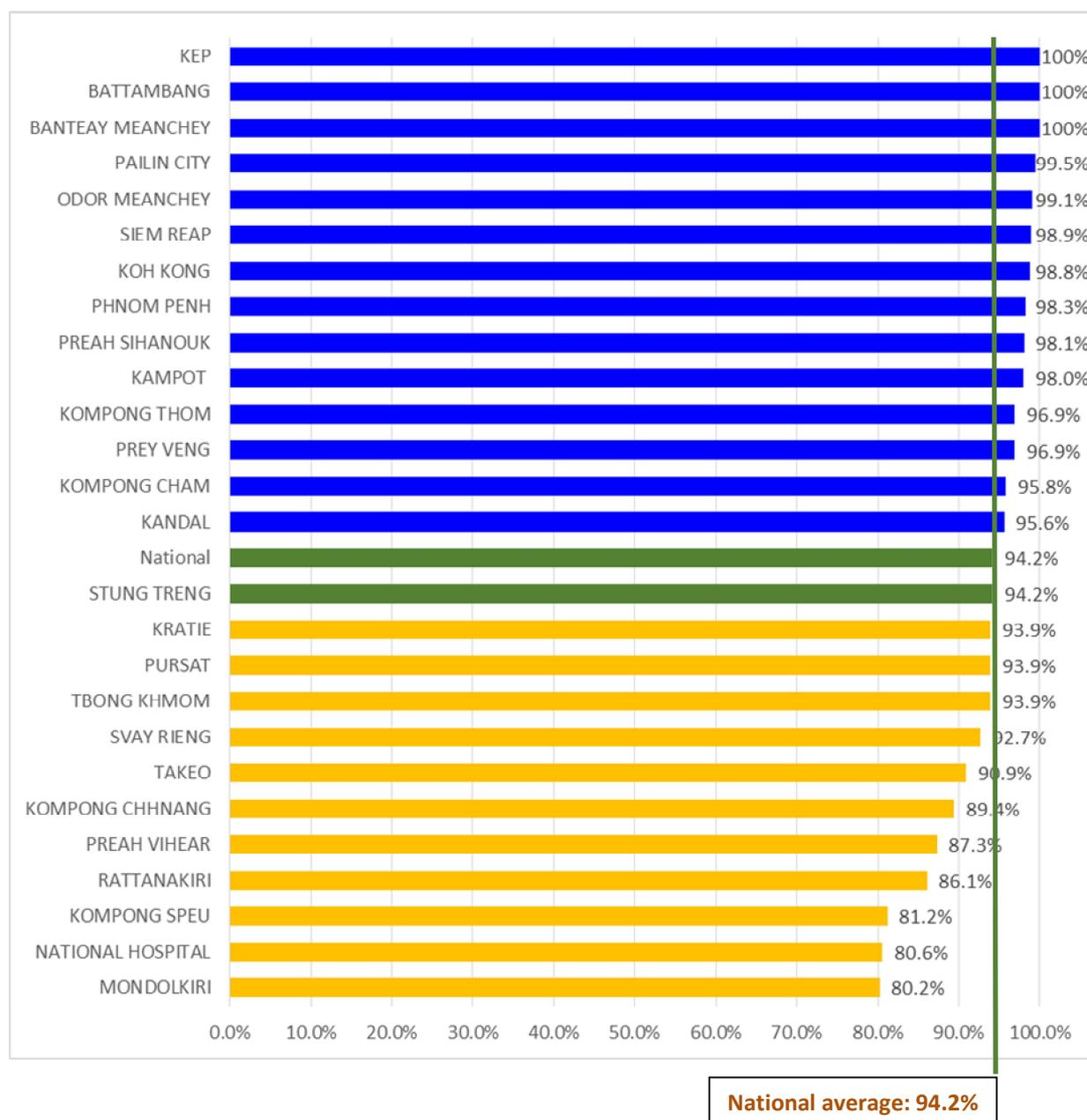


Figure 7: Proportion of HIV testing among registered TB patients by different provinces, 2019

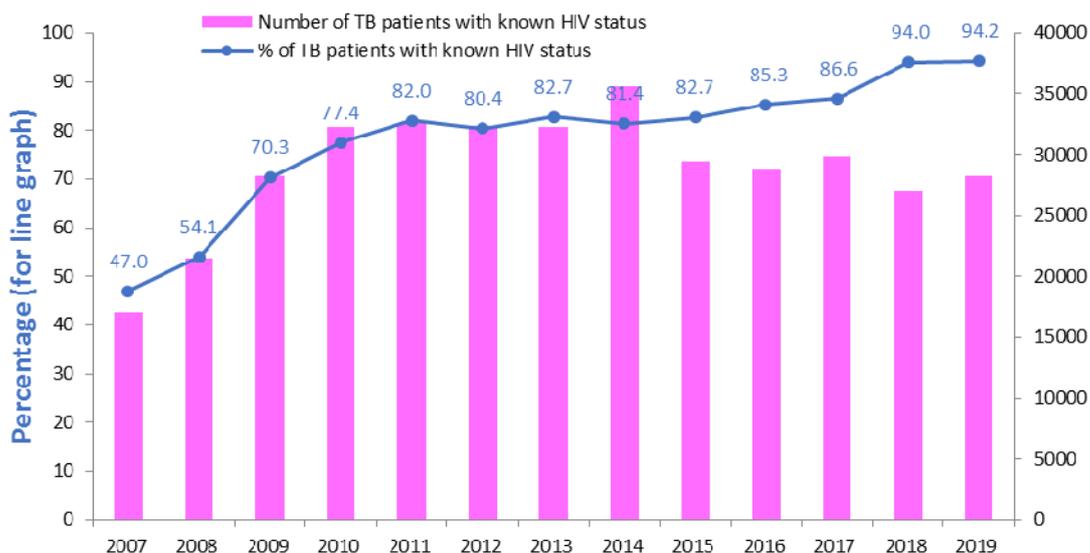


Figure 8: Number and Proportion of registered TB patients with HIV test results from 2007 to 2019

HIV positive TB patients who received Cotrimoxazole Preventive Therapy (CPT) increase from 65% in 2010 to 92% in 2015, to 98.2% in 2016, to 95.3% in 2017, to 88.4% in 2018 and to 98.0% in 2019. Anti-Retroviral Treatment (ART) among TB/HIV patients also increase from 45% in 2010 to 92% in 2015, to 98.2% in 2016, to 93.3% in 2017, to 91.2% in 2018 and to 98.0% in 2019.

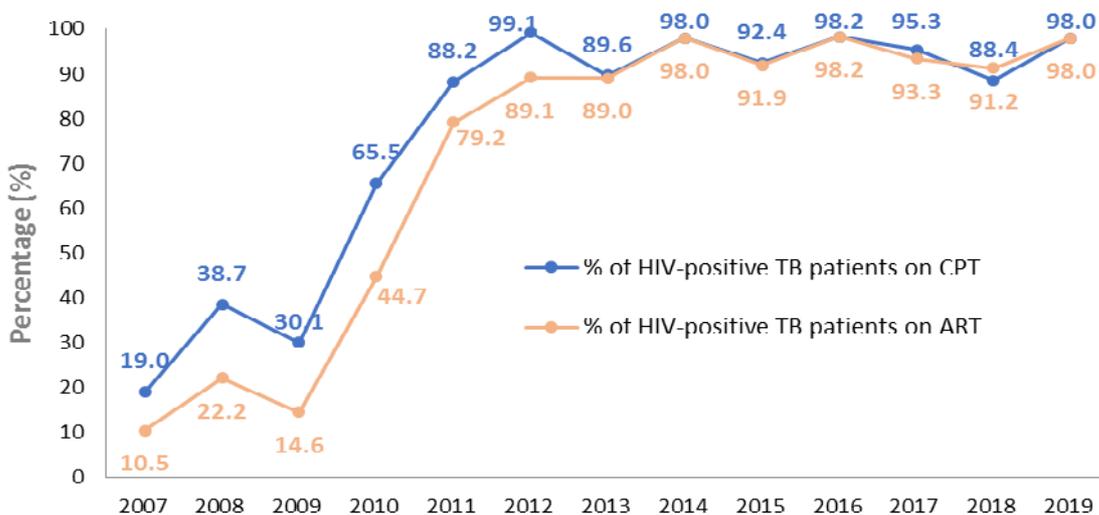


Figure 9: Percentage of HIV+ TB patient received CPT and ART from 2007 to 2019

INH Preventive Therapy for people living with HIV/AIDS who are not likely having TB disease is increasing from 172 in 2010 to 1,043 in 2011. Since the mid of 2014 we start introduce IPT for all PLHIV (new and ART clients) the number of PLHIV who are unlikely to have TB disease is increasing from 767 in 2014 to 954 in 2015, to 2,379 in 2016, to 2,567 in 2017, to 2,778 in 2018 and to 13,111 in 2019. Referral of newly HIV positive clients for TB screening at OI/ART services is around 90% in 2019.

TB among PLHIV 2019									
Quarter	Number of HIV + clients registered at VCCT	Number of HIV+ clients at VCCT referred to OI/ART service for TB screening	Number of HIV+ clients screened TB at OI/ART	PTB		EPTB		Total	Number of HIV+ received IPT
				BK+	BK-	BK+	BK-		
1	561	524	535	29	18	0	50	97	1,301
2	894	806	492	38	24	4	19	85	3,429
3	494	370	364	17	24	0	47	88	6,421
4	831	696	302	27	18	5	26	78	1,960
Total	2,780	2,396	1,693	111	84	9	142	348	13,111

Table 2: TB among PLHIV 2019

4.3. Diagnosis by Bacteriological Examination

4.3.1. Diagnosis by Smear Microscopy

The total number of slides that NTP used for TB smear examination in 2019 was 298,827 slides (detection and follow up), of which 275,935 slides were for detection. The positivity rate among smear examination for case detection was 4.3%.

To strengthen the quality of sputum examination, NTP has conducted the crosschecking by re-examining the read slides. This is one of the laboratory quality assurance activities. Results showed that agreement rate was 99.4% with false positive and false negative rates of 0.0% and 0.6% respectively for the 3rd Quarter of year 2019.

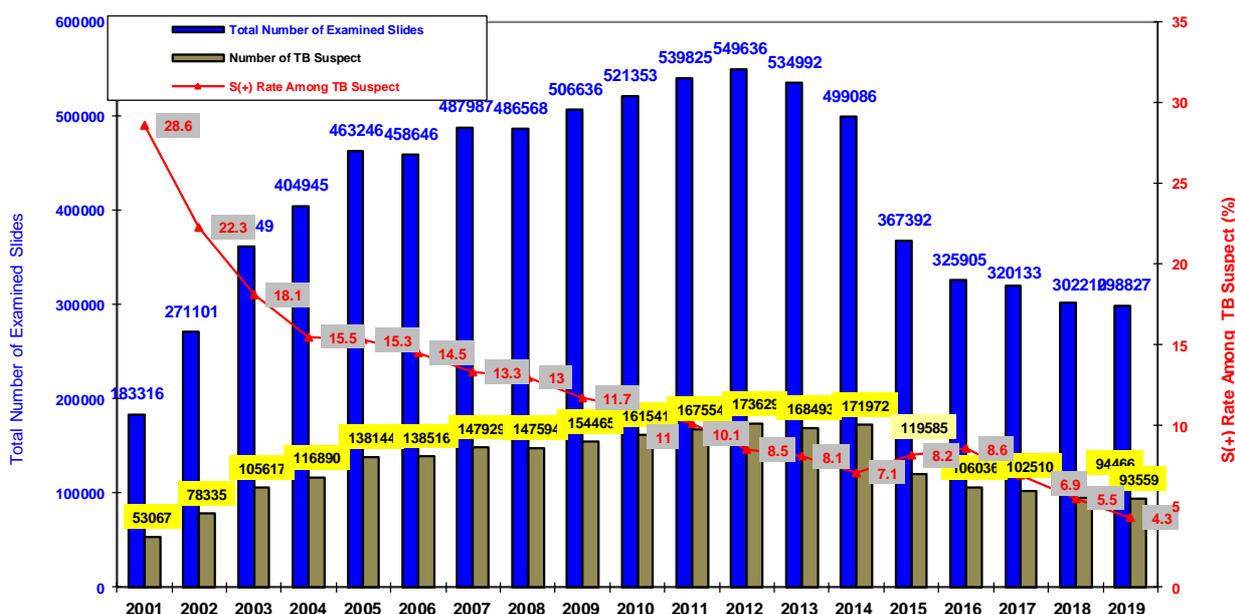


Figure 10: Smear microscopy report from 2001 to 2019

4.3.2. Diagnosis by GeneXpert, Xpert MTB/RIF

New diagnostic tool is GeneXpert machine, which had the tests called Xpert® MTB/RIF has put into operation in the country in 2011 after an official authorization from WHO in late 2010 and currently the 78 sets have been using. Among these 78 sets, 69 sets (at 64 sites) are used for routine activities. In addition, in late 2019, NTP in collaboration with IPC through TB-Speed procure GeneXpert Edges that can be used at front line health facilities. Those GeneXpert Edges will be piloted in 2020. These tests are simple, highly effective and gets results faster for less than two hours.

This new test is not only detected susceptible TB but it also can detect Rifampicin resistant. Based on their specific characteristic, NTP decided to roll out these machines to use for case detection among the group of presumptive MDR-TB, the group of PLHIV, the group of new smear positive cases, the group of high risk population (elderly over 55 years old, close contact with smear positive PTB, Diabetic, and PLHIV) and for Active Case Finding activities. The utilization of tests varied from year to year, i.e. in 2019, national program used 71,488 tests with the results as following: Rate of MTB detected and Rifampicin resistant detected (RR) 0.3%, MTB detected and Rifampicin not detected (T) 12.2%, MTB detected and Rifampicin resistant indeterminate (TI) 0.3% and test Error (I) 3.8%.

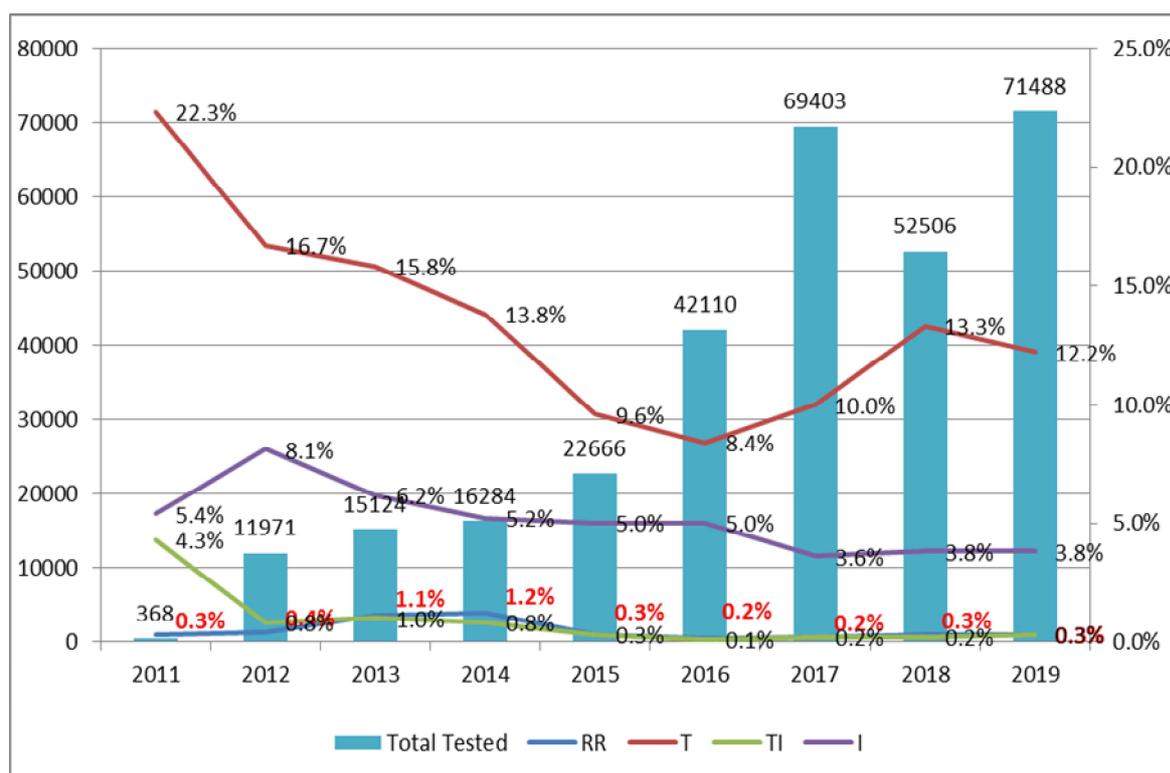


Figure 11: Test by Xpert MTB/Rif report from 2011 to 2019

4.3.3. TB Culture and Drug Susceptibility Testing

In late 1999, NTP with the technical assistance from JICA introduced TB culture with solid medium. Step by step later on, the capacity to culture on liquid medium (MGIT)

and rapid method to make identification for MTB started up in 2011 at CENAT Control, Battambang TB Laboratory and 2014 at Kampong Cham TB Laboratory. The first line Drug Susceptibility Testing by using liquid medium (MGIT) was evaluated and introduced at CENAT and later at Kampong Cham TB Laboratory (2014). The second line Drug Susceptibility Testing by using liquid medium (MGIT) was evaluated by the supranational TB reference laboratory from Research Institute of Tuberculosis of Japan (RIT) and was put into service since 2014.

In 2019, three culture center laboratories (CENAT, Battambang and Kampong Cham) received 3,974 specimens to do culture for TB with positive rate of 9.5%.

4.3.4. Training

In 2019, National TB Laboratory conducted 4 refresher training courses on utilization of GeneXpert machine. These courses were supported by Global Fund 2 courses with 42 participants and by WHO 2 courses with 62 participants. In addition, National TB Laboratory conducted others 2 refresher training courses on smear microscopy with 38 participants were supported by Global Fund.

4.4. Childhood TB

Childhood TB remains one of the priorities of NTP. There were 6,247 childhood TB cases nationwide (all ODs) notified and treated in 2018 (see the figure below). Since August 2017, NTP has been using the new pediatric drug formulation for childhood cases, which is more effective and better than the old one.

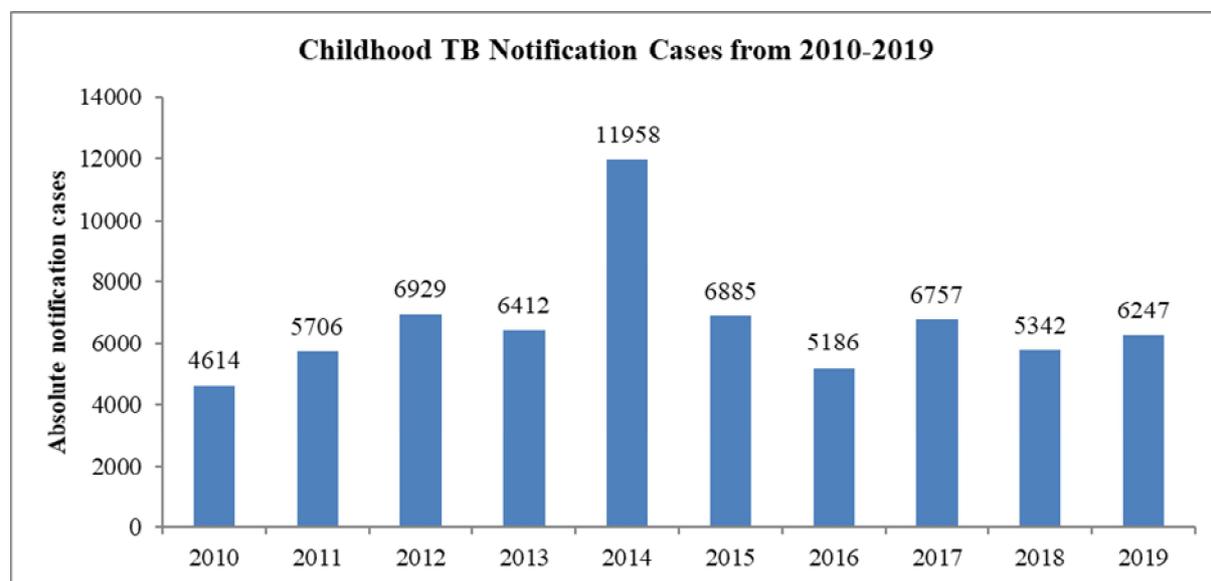


Figure 12: Childhood TB Notification cases in 2010-2019

After JATA ended its USAID-TB/CARE I project implemented in 27 ODs in 2014, NTP had maintained and strengthened childhood TB activities in 25 ODs supported by USAID, and most of them were former ODs implementing childhood TB previously covered by JATA. By 2017, childhood TB activities supported by USAID were implemented by FHI-360 under Challenge TB project collaborated with ECH project of RACHA. The childhood TB activities in 25 ODs of the 10 provinces namely Battambang,

Pursat, Kampong Chhnang, Kampong Thom, Kampong Speu, Prey Veng, Svay Rieng, Kampot, Kampong Cham, and Tbong Khmum were ended by the end of first quarter of 2018.

Challenge TB project in collaboration with CHC supported contact investigation activity to identify TB suspected children and refer them to RH for TB diagnosis. Childhood TB is becoming a routine activity in community and HC/RH. Currently this activity has been implemented five NGO partners that received fund from the Global Fund in 76 ODs. The number of children received IPT drops at 3,033 cases (see figure below).

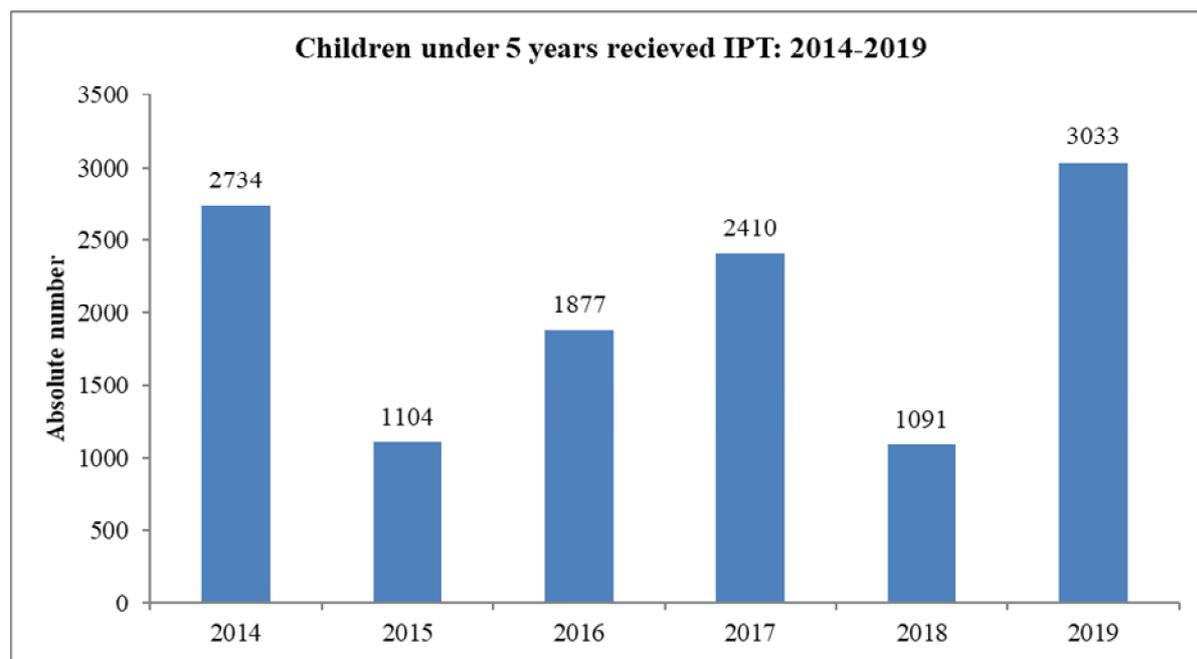


Figure 13: Children under 5 years old received IPT in 2014-2019

4.5. Financing

NTP has clearly identified a 7-year National Strategic Plan (2014-2020) by thoroughly consultation with all concern partners and financial gap was also clearly shown. In average, the need of NTP is about US\$20 million per year. Budget plan for 2019 was developed based on this National Strategic Plan. NTP is trying to negotiate with all potential partners for program financing.

From April 2009 to the end of 2014, National Center for Tuberculosis Control has become a Principal Recipient (PR) for the Global Fund to Fight with AIDS, Tuberculosis and Malaria (GFATM) for TB grant round 7 and managed the financing of 11 Sub-Recipients (11SRs). From 2015 to 2017, CENAT still continue as a PR for The Global Fund under New Funding Model (NFM) with the total funding amount about US\$15.6 million and managed the financing of 5 Sub-Recipients (5SRs).

In late 2017, Ministry of Economy and Finance that became the new Principal Recipient from Global Fund has been signed for the three-year Global Fund project cover from January 2018 to December 2020. In this project, the Global Fund initially support TB program with the total amount of about US\$13.7 million and additional US\$2.7 million

was provided in September 2019, so in total fund that is committed to support by GF about US\$16.4 million for the year of 2018-2020. This grant fund implemented by CENAT itself and as Sub-Implementer (SI) for TB program, CENAT also manages grant implementation of all Provincial Health Departments and five Sub-Sub-Implementers (SSIs) namely: CHC, CRS, HPA, Op-ASHA and RHAC.

Also in 2019, there are four major donors supporting NTP namely US-CDC, USAID, ADB, and TB REACH. In addition, under the support from USAID through TB Local Organization Network Project (TB LON), NTP in collaboration with KHANA, CHC and HSD has started a 5 year project called Community Mobilization Initiatives to End Tuberculosis (COMMIT).

In addition to these grants from development partners, Royal Government of Cambodia is increasing fund allocation from National Budget to TB program including 70% contribution for purchasing adult TB Drugs in 2019.

In summary, NTP received funding support in 2019 from seven main sources namely National Budget, The Global Fund, USAID, US-CDC, ADB, TB REACH and CHAI.

However, since the funding of some projects have reduced in 2018-2019, NTP will remain facing budget shortage over the coming years in order to more aggressively control TB to meet the new direction

4.6. Drug and laboratory supplies

Proving highly important in TB Control, TB Drug Management (TBDM) is deemed the core element of TB control. An uninterrupted supply of anti-TB drugs, reagents, and consumables is necessary for the sustained provision of quality TB diagnostic and treatment services through DOTS in all service delivery facilities nationwide and leads to better treatment success and reduces TB deaths.

NTP closely collaborates with Ministry of Health (MoH)'s Department of Drug and Food (DDF) and Central Medical Store (CMS); and TB partners to thoroughly monitor stock situation, distribution and utilization of anti-TB drugs. This is done especially through quarterly report of NTP, monthly report of CMS (MoH) in order to ensure the uninterrupted supply and proper management of good quality of anti-TB drugs, reagents and consumables to TB networks.

In 2019, NTP received First Line Drugs (FLD) for treating adult and childhood TB patients 12 shipments: from national budget 06 shipment, under the Global Fund New Funding Model (GF-NFM) grant 03 shipments, and United States Agency for International Development (USAID) 03 shipments.

	Product and formulation	Source			Total Quantity (Tablet or Vial)
		NB	GF	USAID	
	<i>Adult formulation</i>				
RHZE	Rifampicin/Isoniazid/Pyrazinamide/Ethambutol 150/75/400/275 mg	3,563,616		3,292,800	6,856,416
RH	Rifampicin/Isoniazid 150/75mg	3,144,960		8,131,200	11,276,160
S	Streptomycin 1g	62,000			62,000
E	Ethambutol 400mg	585,312			585,312
Z	Pyrazinamide 400mg	34,272			34,272
H	Isoniazid 300mg	1,204,224		706,272	1,910,496
	<i>Paediatric formulation</i>				
RHZ	Rifampicin/Isoniazid/Pyrazinamid 75/50/150 mg		825,720		825,720
RH	Rifampicin/Isoniazid 75/50 mg		1,265,376		1,265,376
E	Ethambutol 100 mg		220,700		220,700
H	Isoniazid 100mg	336,000		856,100	1,192,100

Table 3: First Line Drugs procured in 2019

In addition, 2019, NTP received Second Line Drugs (SLD) for drug resistance TB treatment 4 shipments of which from under the Global Fund New Funding Model (GF-NFM) grant 02 shipments and United States Agency for International Development (USAID) 02 shipments.

	Product and formulation	Source		Total Quantity (Tablet, Capsule, Vial, Cont.)
		GF	USAID	
Cm	Capreomycin 1g	670		670
Km	Kanamycin 1g	8,930		8,930
Cs	Cycloserine 250mg	39,500		39,500
PAS	Para Aminosalicylic Acid Sodium	1,600		1,600
Mxf	Moxifloxacin 400mg	42,400		42,400
PZA	Pyrazinamide 400mg	94,080		94,080
INH	Isoniazid 300mg	4,032		4,032
Bdq	Bedaquiline 100mg		15,228	15,228
Cfz	Clofazimine 100mg	29,800		29,800
Lnz	Linezolid 600mg	10,730		10,730

Table 4: Second Line Drugs procured in 2019

NTP always sends its officers to attend regular drug management meetings organized by relevant departments of Ministry of Health to report TB drug management activities of the national program and obtain information on the current national drug management update.

4.7. TB Infection Control

In 2019, due to limited financial resource, a very limited TB infection control (TBIC) activities have been done. However, NTP closely collaborated with partners including GFATM, USAID, FHI360, HSD, OpASHA, KHANA, CATA. NTP successfully implemented some key activities to reassessed the status of infection control with a positive result, i.e. 15 hospital had established and reactivated dormant infection control committees and setting up action plan for TBIC in the hospitals. Moreover, the screenings for presumptive TB and for TB patients were timely done at OPD and IPD and separated them systematically. Most of the TB care areas keep doors and windows opened for natural ventilation and air flow. The hospitals were maintaining UVGI fixtures and lamps appropriately. Access, utilization and storage of N95 masks were adequate appropriate and waiting areas, in-patient and outpatient departments have well-displayed posters on infection control. The hospitals have built sputum collection booths with their local budget.

In upcoming 2020, to overcome the limitations in the available funds and to further strengthen the TB Infection Control activities in the country, NTP will intensify its plans

4.8. Community DOTS

The main purpose of Community DOTS implementation is to improve case finding through referral of TB suspects as well as to ensure daily DOTS for TB treatment at community. Strengthening and scaling up the Community DOTS is one of NTP's priorities in order to bring DOTS service closer to the community to achieve case detection and treatment outcome; and to contribute to speeding up the progress towards the goal of ending the TB epidemic by 2030. As shown in the figure below, the number of health facilities implementing Community DOTS varies from year to year according to the support from NGO TB partners and donors. After Challenge TB project of FHI-360 under the USAID support has phased out from the second quarter of 2018, the Community DOTS remain only in areas supported by the Global Fund in 644 HCs in 46 ODs in 2018 and in late 2019, we expanded to other 356 HCs in 30 ODs. So since late 2019, C-DOTS has been implementing in 76 ODs (1,000 HCs) by the five sub-sub-implementers. During this year, as a result of community DOTS implementation, we detected 9,665 TB cases which equal to 32% of total TB cases in the country.

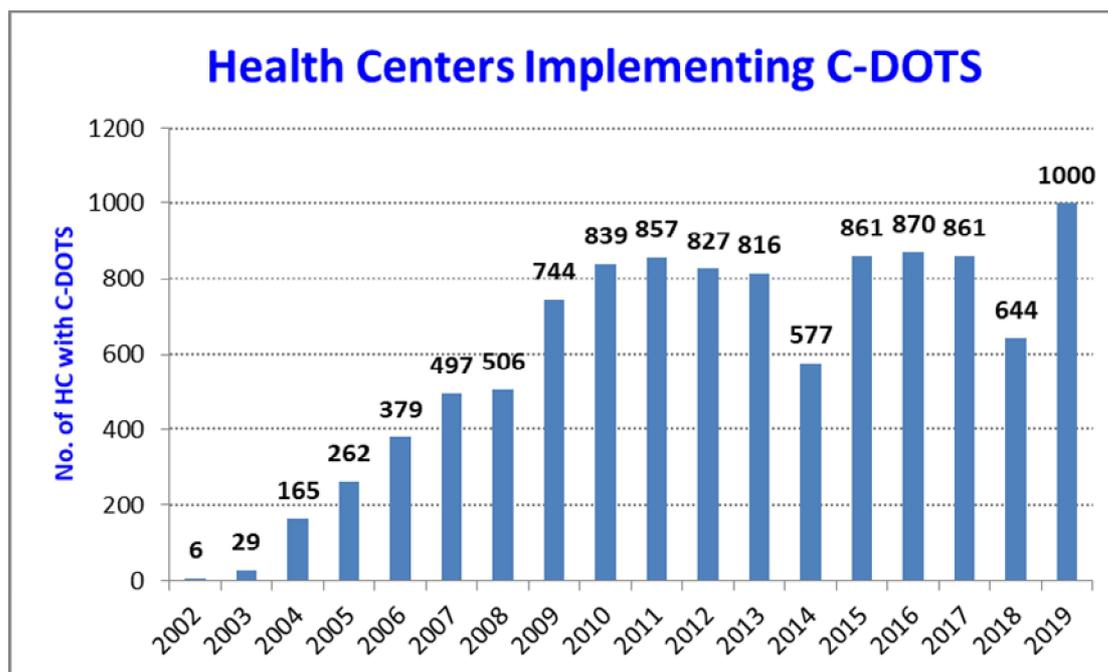


Figure 14: Health Centers Implementing C-DOTS

Some constraints and obstacles remain our challenges in the implementation of Community DOTS. Insufficient funding support limits the community DOTS implementation at all levels. The insufficient resources cause limited capacity of frontline TB health workers, especially funding for detection TB cases at households or at communities. We have limited resources to support VHSG / DOT watchers, as well as TB supervisors and health center staff. This issue is still a concern in the future when more works needed to be achieved with limited fewer human resources. In addition, we also facing other challenges such as turn-over of trained TB staff, limited capacity of TB health workers at HFs, and seasonal migration of VHSGs and/or DOT Watchers for employment seeking and these challenges need to be solved timely in order to make community DOTS sustainable.

4.9. Public-Private Mix DOTS

The provision of TB service through Public-Private Mix DOTS (PPM-DOTS) is collaboration between NTP and public and private healthcare providers to promote DOTS service. This approach aims to strengthen the referral of TB suspects from the private sector (including pharmacy, consultation room, private clinics etc.) to public health facilities for appropriate TB diagnosis and treatment. In collaboration with many NGOs and International partners, NTP has intensified the implementation of PPM-DOTS since its start in 2005 up to 2014. TB CARE I project that supported this activity has ended at the end of 2014 and this activity had not been continued from 2015 till 2019 due to lack of funding support.

On the other hand, other activities have been strengthened, particularly the band of import 1st line TB drugs and TB test in the markets.

4.10. TB in Congregational Settings

In last recent years, NTP has been focusing on TB control activities in congregational settings such as prisons and factories where TB transmission may be high.

4.10.1. Prisons

With strong support from the Ministry of Health and the Ministry of the Interior, and in close collaboration with the Prison Department and other partners, great progress has been made in TB control activities in prison. The activities include TB health education for prisoners and referral of TB suspects to public health facilities for tuberculosis diagnosis and subsequent treatment at prison health post with DOTS approach. Below table depicts the increasing TB control activities in prison in the recent years. The number of prisons implementing TB control activities increased from 8 in 2009 to 26 in 2015. In 2019, there were two partners doing TB control activities in prison, including Global Fund supporting 10 prisons and CARITAS supported 9 prisons. Through passive and active case finding, 107 TB cases (50 cases through routine case finding and 57 cases through active case finding) were detected including 02 TB/HIV co-infection cases.

Year of Implementation	Number of Prisons	TB Cases Detected	TB/HIV Cases Detected
2009	8	203	26
2010	11	315	26
2011	19	342	19
2012	19	368	8
2013	22	299	7
2014	26	229	12
2015	26	191	4
2016	17	139	2
2017	17	117	1
2018	19	120	10
2019	19	107	2

Table 5: TB Control Activities in Prisons: 2009-2019

4.10.2. Factories and Enterprises

Factory and enterprises are ideal for TB transmission as employees work together in close area and have high interaction with others. NTP in collaboration with Occupational Health Department of Ministry of Labor and Vocational Training, and with the support from partners especially from CATA, has been implementing DOTS pilot project in 6 factories and enterprises in 2007. The main activities are to strengthen capacity of health staff who are working at infirmary of factories and enterprises, to refer TB suspects to HCs for diagnosis, to conduct supportive supervision, and quarterly meeting that aims to motivate staff and to prepare plan for the coming quarters. In 2019, 12 factories and enterprises have been providing TB-DOTS services at their workplaces as in 2018.

TB control activities in factories and enterprises (2007-2019) are shown in table below. The table shows that the number of workers covered by the activities fluctuate from year to year. In recent years, the number of TB suspects referred were between of 100 -150 cases and TB cases detected were from 05 to 17 cases.

Year of implementation	Number of workers	TB suspects referred	TB cases detected	Yield per population (per 100 000)	Yield per referral (%)
	(a)	(b)	(c)	(c)/(a)	(c)/(b)
2007	10900	44	6	55	14 %
2008	22701	149	22	97	15 %
2009	15740	102	10	64	10 %
2010	21077	99	24	114	24 %
2011	25171	107	15	60	14 %
2012	25881	127	16	62	13 %
2013	22575	145	17	75	12 %
2014	19402	139	11	57	8 %
2015	20402	144	14	69	10 %
2016	18443	68	10	54	15%
2017	18443	293	13	70.48	4.4%
2018	16843	321	5	30	2%
2019	14926	303	7	47	2.3%

Table 6: TB Control Activities in Factories and Enterprises: 2007-2019

4.11. Summary of Active Case Finding Project

In 2019, NTP has implemented Active Case Finding in:

- 7 ODs by identifying 283 TB cases of which 156 cases are bacteriologically confirmed TB among 8,589 people screened.
- 3 prisons (in Takeo, Kampong Chhnang and Siem Reap provinces) by identifying 57 TB cases of which 2 cases are MDR-TB.

In addition, CATA had implemented Active Case Finding from 14 January 2019 to 28 December 2019, under the grant funded by TB REACH Wave 5 scale up and NUS. This project was implemented among Elderly aged 55 and over and high-risk population in community. This ACF intervention was implemented in 12 operational districts (OD) in 10 provinces: OD Sampovloun, OD Stung Treng, OD Ponheikrek, OD Sithorkandal, OD Kamchaymea, OD Remeihek, Koh Thom, OD Koh Andeith, OD Angkor Chey, OD Kampong Trach OD Oudong and OD Boribo (NUS). As the result, a total of 2,097 TB cases were identified (Table 7). The CATA’s mobile team equipped with semi-digital Xray machine and X-pert MTB/RIF Ultra visited each HC (HC) in the target areas as planned schedule.

In each village, a team of at least 2 volunteers (VHSG) with village chief sensitized communities living in the catchment area about TB within one to two weeks prior to each of the ACF days at each HC. All people aged 55 and over, regardless of TB symptoms were invited to visit the health facility for chest Xray screening. Small transport enablers also provided to those in need to improve participation. VHSG outreach efforts focused on people aged 55 years and over, but people aged less than 55 with at least has one among four TB symptom greater than two weeks have been encouraged to come for screening and testing. All people visiting the ACF day were screened by both a multi-TB symptoms questionnaire and chest X-ray. Any person with either TB symptoms and/or an abnormal chest X-ray were asked to submit a spot sputum specimen for testing with the Xpert MTB/RIF Ultra. HC, OD and PHD staff will invite to participate in ACF team. Test results have been returned within a day to HC and TB patients started on treatment at the HCs under the supervision of National TB Program (CENAT). Below table is the results of the ACF in 2019:

Process indicators	January to December 2019		
	Actual Result (AR)		
	>55	Other	Total
# Screened by VHSGs	117422	66311	183,733
# Visited HC	30392	19798	50,190
# Screened by CXR	30243	18880	49,123
# Tested Xpert	4871	1434	6,305
# Bact+	451	190	641
# All Forms	1486	711	2,197

Table 7: Results of Active Case Findings

4.12. Collaborative DM-TB Services

4.12.1. Workshop and partners

With financial support from Global Fund and good collaboration with Department of Preventive Medicine and other implementing partners, CENAT conducted the 4th National Workshop on TB and DM on 20th December 2019 at Siem Reap province. There are 140 participants from CENAT, MoH, partners such as (HSD, MoPoTsyo, KHANA, Community Development Association (CDA), CHC and other partners), OD/PHD TB supervisors, DM clinicians and PHD director/deputy directors. The main objectives of the workshop are (1) to sensitize and highlight the burden of TB-Diabetes comorbidity at global, regional and local levels, (2) to share lesson learnt on TB-DM activities among implementing partners and (3) to strengthen the collaborative TB-DM activities. The expected outputs of the workshop were to make aware of the burden of TB-DM comorbidity and enhance collaboration and coordination among these two programs. We made effort, during the discussion, to identify and prioritize challenges and find local and appropriate solution. Many discussions focusing on DM activities to help for TB screening and most of the DM clinics lack of human resources to screen TB and need internal management to arrange more staff to do this screening and training.

Health and Social Development (HSD) has been implementing the project on case finding among co-morbidity DM-TB funded by the World Diabetes Foundation (WDF) under the leadership of CENAT and MOH department Preventive Medicines in close collaboration with implementing partners in 5 provinces, 7 ODs, and 113 HCs that coverage 1,611 901 population.



Figure 15: Workshop on TB-DM on 20-Dece-2019 at Siem Reap province

4.12.2. Achievement of TB/DM Collaborative Activities with HSD:

- Project supported refresher training on DM, TB, DM-TB and DM complication care to 18 medical doctors, to 244 nurses of the target HCs and RHs. The project also supported refresher training on DM, TB to 28 peer educators.

- Total number of TB patients screened for DM were 3,019 in 7 ODs (HCs and RHs) through glycaemic test. The total number of DM patients screened for TB were 3,080 and 157 were diagnosed as TB-DM.



Figure 16: Refresher training on DM, TB and DM foot complication care to the target OD, RH and HC staff in Takeo and Siem Reap province in 2019

- HSD worked in close collaboration with Department of Preventive Medicine (DPM), National TB Program (CENAT) and five target Provincial Health Departments (PHD) to organize the World Diabetes Day (WDD) in November 2019. WDD has been organized in five target ODs: Memot, Sotnikum, Daun Keo, Pearaing and Cheung Prey under the main slogan “We prevent our family from Diabetes”. Blood sugar tests were done for 408 participants and blood test’s result is shown in figure 18 below:



Figure 17: Screening for DM in community

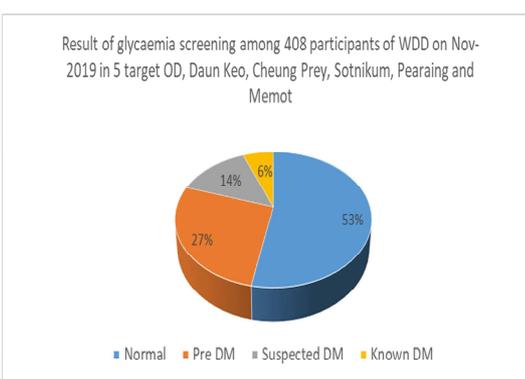


Figure 18: Result of DM screening in community

- Supervision and review meeting: A quarterly supervision was conducted to 7 DM clinics, 7 TB clinics and 60 HCs by DPM, CENAT, OD and HSD team. The quarterly meeting have been organized at the 7 target ODs (a time per quarter per OD) under the leadership of OD chief, OD supervisor for TB/Diabetes and HC staff.

- Supply materials and equipment, 2019
 - 308 boxes of glucose strips test (box of 25 strips) to 113 HF, 7 TB clinics in target RHs
 - 28 boxes of HbA1c strip tests have been provided to all 7 laboratories at RHs, 4 boxes (25 strips/box) to each hospital.



Figure 19: Distribution of DM screening materials and other materials

- Experience & lessons learned
 - Strong collaboration/support from DPM and CENAT and other relevant partners;
 - Supervision team from NCD, CENAT & HSD to strengthen TB and DM service;
 - TB screening for diabetes was worked as routine;
 - Established technical working on TB-Diabetes co-morbidity
 - Developed guideline on TB-Diabetes co-morbidity case management
- Challenges
 - Limited referral system between TB and diabetes (many cases were not followed up, not used referral slip, not noted “TB patient” on referral slip)
 - Limited human resource at RH and HC level
 - Limited information on DM-TB co-morbidity management at private clinic
- Way forward
 - Continue to screen DM among TB and vice versa
 - Improve DM- TB co-morbidity management
 - Continue to share experience with all stakeholders/implementing partners
 - Increase community awareness on DM, DM-TB co-morbidity

4.13. Advocacy, Communication and Social Mobilization

Advocacy, Communication and Social Mobilization (ACSM) is an integral part of the TB control program. In 2019, the activities NTP always ensure that various ACSM approaches are included in the contents of refresher trainings, workshops and Health education to general population at Health Centre, Communities: Buddhist, School, Patient home etc.

Due to financial resource constraints in 2019, a very limited number of IEC materials were produced in 2019. However, the NTP has been working hard with relevant partners including GFATM, USAID, FHI-360, HSD, OpASHA, KHANA, PSI, CATA produced IEC materials such as poster, educational leaflet on general TB adult and children awareness, MDR-TB, Prevention Infection Control, TB-Diabetic.

In 2019, PSI partnered with the National TB Program conducted a research in Pailin and Battambang (Thmor Koul OD) entitled “**why are people aged 55 or older giving up more than adults**”.

At the mean time, for advocacy and for improving knowledge among general population, NTP has raised awareness of TB on the World TB Day at all levels throughout the country.

To overcome the limitations in the available funds and to further strengthen the ACSM activities in the country, NTP will intensify its plans.

4.14. Research

4.14.1. Third national drug resistance survey

Research activity is one of the national TB control program (NTP)’s priorities. The third national drug resistance survey was started from May to December 2017. This survey is supported by different sources, mainly by Global Fund, FHI-360/Challenge TB project, and US-CDC. In 2018, samples were collected and analyzed in laboratory. In late 2019, the primarily result of the 3rd DR survey shows that estimated prevalence of RR cases among the captured BC cases is 0.9% for new cases and 9.4% for previously treated cases and estimated prevalence of RR by DST among smear-positive cases is 1.1% for new cases and 12.4% for previously treated cases. Final result is expected to be released in early 2020. This result indicates that between 2007 – 2017 the prevalence of DR-TB remains stable. These results reflex a great success of MDR-TB control in Cambodia.

4.14.2. Research project to strengthen pediatric tuberculosis services:

In 2019, NTP and Institute Pasteur of Cambodia under TB-Speed project has continued the implementation of the research project to strengthen pediatric tuberculosis services for enhanced early case detection, which was supported by the UNITAID and INITIATIVE 5%. This research will be finished in 2021. Besides, NTP has been discussing and preparing a study on TB preventive therapy using 3HP involving multi-countries project in collaboration with CHAI. This project entitled “Evaluating the scale up of short course TB preventive therapy (3HP) among people living with HIV (PLHIV) and child household contacts of TB patients at sentinel sites in Cambodia (IMPAACT4TB)”.

4.14.3. Cambodia Patient Pathway Analysis:

In quarter 4 2019, NTP in collaboration with WHO and relevant stakeholders has developed research protocol on “Cambodia Patient Pathway Analysis”. The protocol is being revised and the implementation is expected to be in 2020.

4.14.4. Research on “All-oral shorter treatment regimens for multidrug- and

rifampicin-resistant tuberculosis (MDR/RR-TB) (ShORRT_Cambodia):

The research protocol on All-oral shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB) has been developed and approved by Cambodian National Ethic Committee for Health Research in late 2019. This research is undertaken under the collaboration between NTP and WHO/TDR. This research will be implemented in 2020.

4.14.5. Cambodia Committee for TB Research

NTP has been collaborating with relevant partners such as NIPH, UHS, WHO, US-CDC, USAID, IPC, NUS, and international and local NGOs to establish Cambodia Committee for TB Research (CCTBR) in the aim to strengthen TB research which is the 3rd pillar to end TB by 2030. As a result, NTP has organized meetings and draft ToR for the CCTBR. NTP expects that this committee will be established and formally operated in 2020.

4.14.6. Other activities related to TB research:

- The national TB control program is discussing with National University of Singapore and other partners to explore/select the study topics for the period 2020-2021.
- In addition, in December 2019, NTP and relevant stakeholders organised a meeting to conduct SWOT analysis on TB research and to identify topics for TB research priority. As a result, several research topics have been identified and prioritised.

4.15. Electronic TB Management Information System

TB-MIS is a web-based tool that enables decision-makers to monitor the status of TB treatment by integrating data across key aspects of TB control. It was developed and managed by CENAT with technical assistance from the USAID funded Health Information Policy Advocacy (HIPA) project. TB-MIS was customized by local programmers using the existing core application e-TB MANAGER¹ to fit the case management flow of Cambodia's TB program. The system captures the registration of DS-TB cases of all health facilities from the paper-based recording forms into web-based application.

¹ e-TB Manager is a web-based tool for managing the information needed by national tuberculosis control programs (NTPs). It integrates data across all aspects of tuberculosis (TB) control, including information on suspected cases, patients, medicines, laboratory testing, diagnosis, treatment, and outcomes. It is developed by Management Science for Health (msh) with open source tools to enable countries to customize the program to fit particular country needs without requiring specific licensing. Uses a comprehensive application programming interface that allows third-party software to integrate with e-TB Manager. It has been applied in East, South and West Africa, Europe and Central Asia, South Asia, Latin America and the Caribbean.

Data entry is done by the OD TB supervisor while the progress monitoring and technical support is done by provincial TB supervisors and team of National TB Program with back-up support by HIPA and HP+. This includes information on TB cases, both DS-TB and MDR-TB, medicines, laboratory testing, diagnosis, treatment, and outcomes. The TB-MIS was successful piloted in three provinces – Kampong Cham, Svay Rieng and Kampong Speu provinces, leading to the national rollout in 2018 in 100 ODs, 114 RHs and 103 separate microscopy centers in Cambodia. HIPA ended on Sept 30, 2018. However, due to request from the leader of CENAT to continue the project, USAID agreed to extend its support HP+ from October 2018 to present in order to ensure full institutionalization of the TB-MIS system and to build CENAT staff’s capacity to provide ongoing technical support to health facilities.

An Addition, Joint Team HP+ and CENAT conducted field visit to follow up TB activities for strengthening capacity of TB supervisors both PHD and OD. Meantime, team also provided on the job training to nine OD-TB supervisors and 132HC’s staff attended – 73 health’s staff from all ODs in Tboung Khmum Province, 38 health’s staff from OD Kratie in Kratie Province and 21health’s staff from OD Kampong Thom in Kampong Thom province where those health center’s staff are willing to learn and entering their own TB data into TB-MIS. 106 HCs who received training out of 1212 HCs (9%) performed TB-MIS by using existing resources available such as computers, internet connection, staff commitment. Among 132 users there were 126 users have been accessing and generated report from TB-MIS.

Beside field visit, team also provide daily technical support to health staff via email, phone call, telegram and team view who has issues need to solve immediately. Moreover, there are 99 ODs out of 101 ODs (97%) nationwide access TB-MIS, 94 ODs out of 99 ODs (95%) have been generated TB indicator report from TB-MIS.

HP+ Cambodia team have worked closely with CENAT team to review the existing template of entry form, and reporting format to improve the quality of data accuracy and completeness of TB program report to supporting strategic planning and decision-making. The national TB Program (NTP) has prioritized gaps such as adding some parameters for tracking the migration and Isoniazid Preventive Therapy (IPT) which is modified into TB Prevention Therapy (TPT). The TPT module includes:

1. Screening closed contact;
2. Treatment;
3. Monitoring/follow up;
4. Outcome of Treatment;
5. TPT indicator report.

A CENAT and HP+ team will pilot the new TPT module in three provinces – Kampot, Tboung Khmum and Siem Reap in April 2020. As part of preparing for piloting, the team start is developing the training curriculum and materials to provide Training of Trainer to CENAT staff in order to strengthen the capacity of NTP staff’ to support the use all TB-MIS functions. We will mobilize resources in order to build capacity of the staff to implement TB-MIS system in the whole country from 2021 onward.

5. Summary of TB Joint Program Review

Cambodia has conducted 3 rounds of Joint Program Reviews (JPR) in 2006, 2012 and 2019. The purpose is to review the performance of the program on the achievement, challenges/gaps and to provide the strategic recommendation to the program. The last one was carried out from 17 and 28 June 2019. There were 23 international and 69 national TB experts participated in the review and gathered information through desk reviews of documents and records, field visits and interviews, and consultations with a wide range of stakeholders.

The objectives of the third JPR were to:

- Review the National TB Programme of Cambodia;
- Note the accomplishments since the last JPR of 2012;
- Identify gaps, constraints and challenges to making progress;
- Make recommendations to help make rapid progress towards ending TB in the country; and
- Inform the development of the next ten-year strategic plan to be prepared keeping in view the TB-related sustainable Development Gold (SDG) target of ending TB in Cambodia.

The finding has highlighted that the program has made major progress towards Ending TB with clear evidence of a 45% decline in the prevalence for bacteriologically confirmed TB from 2002 to 2011². Since 2000, 500,000 TB patients have been cured and 400,000 deaths have been averted. TB incidence in Cambodia has declined from 575 in 2000 to 423 in 2011, and 302 per 100 000 population in 2018.³ MDR-TB levels are kept well under check and the HIV epidemic is also on a steady decline. The treatment success rate among TB patients has been consistently over 90%. Notably, Cambodia has made pioneering innovations in approaches to systematic screening and active case finding to increase TB case detection. In short, the foundations to meet the national commitments – the End TB Strategy and TB-related SDG targets, and actions agreed in the Moscow Declaration and the first United National High Level Meeting (UNHLM) on TB – are all in place.

The country is gearing up to Universal Health Coverage (UHC) and social protection prioritizing poor populations. The TB programme has a strong and stable leadership for several years. There are clear policies, strategies, plans and guidelines for an effective TB response. There is demonstrated willingness and readiness to adopt and scale up innovations to End TB, and importantly, there have been durable national and international partnerships to share the enormous task of ending TB.

Having noted the considerable progress made, the JPR team identified several challenges facing the country's TB response. The prominent among them include the following:

² CENAT report, TB prevalence survey 2011

³ WHO annual global TB report 2019

- A top challenge for a comprehensive TB response has been **deficient funding** which is currently limiting progress and will continue to hamper further progress towards meeting committed national TB targets. The current and projected levels of finances are clearly insufficient to implement the country's national strategic plan that ends in 2020 and beyond. Large funding gaps persist as does a heavy dependence on donor funding.
- Another major and persistent problem has been that **as many as one third of the estimated TB cases in the country go undetected or unreported**. The main reasons for this include inadequate access to recommended sensitive tools for TB case detection – chest X-ray for screening and rapid molecular testing for diagnosis; non-engagement of private practitioners; incomplete engagement of public and private hospitals; and limited geographic coverage of systematic screening and active case finding interventions. Notably, TB is not a notifiable disease in Cambodia; this may also be a reason for under-notification.
- Although the National TB Programme has very strong and long-standing partners contributing substantially to the national TB response, their engagement is confined to **time-bound and resource-limited projects tied up to funding availability from donors**. Cessation of funding has led to interruption or termination of several projects including those addressing important issues such as increasing TB case detection through innovative approaches.
- **Many important initiatives** such as private provider engagement, hospital engagement, active TB case finding, workplace TB management though successful, have either been **discontinued** (public-private mix for instance) or have limited geographic coverage.
- On the demand side, about a third of patients may face **catastrophic costs due to TB**, especially non-medical expenses such as transport and wage loss, adding to economic burden.
- Importantly, **TB prevention** – starting with preventive treatment of people living with HIV (PLHIV) and children and infection control measures – need country wide scaling up and finally,
- Multisectoral engagement is essential to end TB. To that effect, CENAT has initiated and established collaboration with departments within the Ministry of Health (MOH) and with other relevant ministries. However, these multisectoral initiatives are modest in their scope and nature.

Based on the key success, programmatic strength and gaps, the review has provided clear set of recommendation to the ministry of the health and the TB program as following:

- a. **To the Ministry of Health, Kingdom of Cambodia**
 - **Secure and sustain enhanced funding to End TB in Cambodia**

The Ministry of Health (MOH) need to make the case for investment in TB to contribute to the economic development of Cambodia considering that the current financing of the national TB response is only a half of what is required and the estimated future funding will also be insufficient to meet committed national targets for TB reduction. The MOH should work with the Ministry of Economy and Finance (MEF) to ensure that government financing for a multisectoral TB response is increased and sustained. This is essential also to reduce overreliance on external donors

– **Set up and use a high-level mechanism for a national multisectoral effort to End TB**

Since addressing drivers of the TB epidemic necessitates inputs from multiple sectors beyond health, ending TB in Cambodia will require a very high level of political commitment. This JPR inferred that beyond the currently existing and functioning committees and platforms, there is a scope to set up a high-level and high-profile mechanism, possibly under the leadership of **Samdech Akka Moha Sena Padei Techo Hun Sen**, Prime Minister of Cambodia. Convening power and authority of a high-level mechanism may be essential to elicit sustained collaboration and coordinating with other ministries such as finance, labour and education as well as those responsible for migrant populations and prison health services.

– **Sustain strong leadership of CENAT and support partnerships with all stakeholders**

A stable and strong leadership by CENAT spanning several years deserves much credit for the significant progress Cambodia has achieved in tackling TB. In order to address shortcomings identified in this JPR and coordinate sustained efforts that are still required to scale up and diversify the TB response, the current leadership needs further strengthening. At the same time, MOH needs to meet requirements of properly trained human resources for an expanded TB response especially for implementation of new and innovative strategies and tools. In this regard, one of the greatest strengths of NTP has been working in partnerships with all stakeholders including civil societies and communities which have contributed substantially to programme implementation. These partnerships will have to be further strengthened for scaling up successful initiatives and commencing new ones.

– **Make TB a notifiable disease and regulate sale and use of all anti TB medicines**

Under-notification of diagnosed TB cases is an important cause of the problem of “missing” TB cases worldwide. For this reason, TB case notification is mandatory in most countries. In Cambodia too, not all public and private hospitals notify all TB cases to the national TB programme. Further, while Cambodia has been successful in restricting availability and use of first line anti-TB medicines in the public sector, some of the second-line TB medicines especially quinolones are widely available in private pharmacies and used for treating health problems other than TB. Therefore, resistance to quinolones has been shown to be high in the country. In view of this, MOH needs to extend and effectively enforce current regulatory measures for TB to:

- making notification of TB cases mandatory for all care providers
- regulating the sale and use of all anti-TB medicines including second line drugs used in the treatment of drug-resistant TB.
- **Ensure social protection for people with TB and their families**

Evidence indicates that TB patients and their families bear a substantial financial burden due to TB and these are due especially to the non-medical expenses such as those for transport and loss of wages. For a section of poor people with TB and their families these costs reach catastrophic proportions and lead to their further impoverishment as a result of TB. Cambodia's Health Equity Fund has a benefit package for TB patients which is currently available to identified poor TB patients. Considering that TB is largely a disease of poverty and a tracer for progress on the Sustainable Development Goals, the JPR team strongly recommends that all TB patients, by default, should be eligible to receive the benefit package that reimburses providers for providing TB care and compensates indirect costs of TB care to the patients and affected families.
- b. To CENAT and Partners**
 - **Provide universal access to quality chest X-ray and rapid test for TB case detection**

WHO advises using chest X-ray as a screening tool and Xpert MTB/RIF as the diagnostic tool for early TB case detection. While Cambodia has plans to progress in that direction, currently there are issues related to availability, access and quality of chest X-rays. Furthermore, most X-ray machines use conventional film-based technology. With regards to Xpert MTB/RIF, besides availability of the machines at the OD level, an efficient system to transport sputum samples from peripheral health centres needs also to be in place. Access to Xpert MTB/RIF is not available in about a third of ODs while a specimen transport system for community screening exists in less than half ODs. This JPR recommends CENAT to improve ease of access to Xpert MTB/RIF including sample transport and to scale-up the network of functional X-ray machines through repair, maintenance, upgrade to digital technology; and procurement of additional Xray machines, especially digital ones, and more Xpert MTB/RIF machines.
 - **Expand active case finding with attention to key populations**

Community outreach for systematic screening for TB and active case finding (ACF) is essential to find missing TB cases. Cambodia has demonstrated that ACF not only contributes substantially to TB case detection but can also be cost-effective as demonstrated for targeted household and neighbourhood contacts. Despite this, ACF coverage is currently limited to 14 of 102 ODs, and 9 out of 28 prisons while TB screening activities are limited to 46 of 102 ODs. This JPR lauds Cambodia's pioneering effort in community outreach to increase TB case detection and supports scaling up of ACF across the country including systematic screening of key populations such as PLHIV, elderly people, migrant populations and prison inmates.
 - **Engage private providers and strengthen hospital involvement**

Engaging private pharmacies and private practitioners in identifying and referring people with TB and strengthening TB management in public and private hospitals

through internal coordination and networking with peripheral health centres have been shown to help early detection and notification of all TB cases and improved case management. These initiatives, however, have been limited largely to time-bound projects dependent on external funding. As a result, currently, private providers are not engaged in TB case detection and all hospitals do not notify all TB cases presenting to them. This JPR recommends scaling up engagement of private care providers through proven and innovative approaches based on diverse country experiences in other Asian countries, and involvement of all public and private hospitals, making them integral to the national TB response.

– **Scale up preventive TB treatment and infection control**

The End TB Strategy gives great importance to TB prevention. Specifically, it includes treatment of Latent TB Infection (LTBI) and infection control. We observed that Cambodia has some way to go with regards to TB prevention. Only 21% of newly enrolled PLHIV and 44% of child contacts under 5 years are on preventive treatment. Infection control and prevention (IPC) in health facilities, undertaken to protect patients, health care workers (HCW) and visitors is not yet adequately implemented. This JPR recommends phased scale up of active contact tracing approaches and preventive TB treatment, including implementation of a plan for transition to new LTBI regimens, and IPC in general and across the country.

– **Pursue innovation and research**

Epidemiological, clinical and operational research in Cambodia has been of great value to not just the national but also the global TB response. Examples include two consecutive national prevalence surveys, drug resistance surveys and various studies related to ACF. National and local innovations such as specimen transport systems, use of mobile technology for patient and provider support, digital TB registers and an electronic monitoring and evaluation system have shown to improve programme implementation in Cambodia as in many other countries. Institutionalizing TB research and innovation will add great value to Cambodia's TB response. This JPR team has a number of specific recommendations to pursue innovation and research including creating a platform for TB researchers and innovators, formation of a national TB research network for ongoing interactions, development of a prioritized national TB research agenda, attracting and supporting young researchers for TB related work, developing national and international collaborations and contributing to resources mobilization for TB research.

In general, based on the findings and recommendations of the JPR, NTP will review the report and determine the priority, turning it into practical action for improving TB control at the national level.

6. Targets for 2020

NTP has recently set the targets in line with the End TB Strategy as well as SDG targets by 2030, in which we aim to reduce incidence of 80% and mortality rate of 90% in 2030, compared to 2015 figures.

For 2020, Cambodia NTP has the main targets as below:

- Maintain the treatment cure rate of over 85% and success rate of at least 90 %.
- Detect all forms of TB: 34,500 cases
- Detect bacteriologically confirmed TB: 12,000 cases
- Detect Childhood TB: 6,210 cases
- Detect MDR-TB cases: 145 cases
- Promote intensified case detection through active and semi-active case finding activities.

7. Acknowledgement

With the support from the Government and Ministry of Health, NTP has achieved tremendous results. The Royal Government of Cambodia and Ministry of Health of Cambodia has given high priority to TB Control. The above achievements are also contributed by active participation from all healthcare workers across the country with the supports and collaboration from various partners. These partners include local authority, community, volunteer, technical and financial supports from non-governmental and international organizations.

NTP would like to express our sincere thanks to:

- The Government and Ministry of Health for their supports.
- All healthcare workers especially TB staff across the country for their active participation.
- NGO/IO partners especially WHO, Global Fund (GFATM), USAID, US-CDC, ADB, Stop TB Partnership/GDF, TB-REACH, JATA/RIT, IOs and NGOs for their both technical and financial supports to NTP.
- Local authority, community, and volunteer as well as other partners for their supports and collaboration.

Director of CENAT

H.E Dr. Mao Tan Eang, MD, MPH

Editor:

From NTP:

1. **Dr. Mao Tan Eang**
2. **Dr. Tieng Sivanna**
3. **Dr. Huot Chan Yuda**
4. **Dr. Khloeung Phally**
5. **Dr. Prum Chom Sayoeun**
6. **Dr. Khun Kim Eam**
7. **Dr. Pheng Sok Heng**
8. **Dr. Nou Chanly**
9. **Dr. In Sokhanya**
10. **Dr. Peng Vesna**
11. **Dr. Kien Sorya**
12. **Dr. Seng Saorith**
13. **Dr. Long Ngeth**
14. **Dr. Ngoun Chandara**
15. **Dr. Leng Chhenglay**
16. **Dr. Nop Sothearattanak**
17. **Dr. Kim Samoeurn**
18. **Dr. Bith Bunleng**
19. **Mr. Chhoeung Vandet**
20. **Miss. Chan Danet**
21. **Mrs. Ro Kimhong**
22. **Miss. Lay Ratana**
23. **Dr. Song Ngak**
24. **Dr. An Yom**



Printing Supported by GFATM

TABLE OF CONTENTS

Abbreviation	3
1. Introduction.....	5
2. Tuberculosis Situation in the World	5
3. Main Achievements.....	5
3.1. Service Coverage.....	5
3.2. Case Detection	5
3.3. Treatment	6
3.4. Mortality and Incidence of Tuberculosis	6
4. Main Interventions.....	7
4.1. Drug Resistance Tuberculosis.....	7
4.1.1. MDR-TB Suspect Screening, Diagnosis, and Treatment.....	7
4.1.2. MDR-TB Treatment Outcome	8
4.2. Collaborative TB/HIV activities	10
4.2.1. Training	10
4.2.2. Supervision	10
4.2.3. TB/HIV Data:.....	11
4.3. Diagnosis by Bacteriological Examination	14
4.3.1. Diagnosis by Smear Microscopy	14
4.3.2. Diagnosis by GeneXpert, Xpert MTB/RIF.....	15
4.3.3. TB Culture and Drug Susceptibility Testing	15
4.3.4. Training	16
4.4. Childhood TB	16
4.5. Financing	17
4.6. Drug and laboratory supplies	18
4.7. TB Infection Control.....	20
4.8. Community DOTS	20

4.9. Public-Private Mix DOTS	21
4.10. TB in Congregational Settings.....	22
4.10.1. Prisons.....	22
4.10.2. Factories and Enterprises	23
4.11. Summary of Active Case Finding Project.....	23
4.12. Collaborative DM-TB Services.....	24
4.12.1. Workshop and partners	24
4.12.2. Achievement of TB/DM Collaborative Activities with HSD:	25
4.13. Advocacy, Communication and Social Mobilization	27
4.14. Research.....	28
4.14.1. Third national drug resistance survey	28
4.14.2. Research project to strengthen pediatric tuberculosis services:	28
4.14.3. Cambodia Patient Pathway Analysis:.....	28
4.14.4. Research on “All-oral shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB) (ShORRT_Cambodia):.....	28
4.14.5. Cambodia Committee for TB Research	29
4.14.6. Other activities related to TB research:	29
4.15. Electronic TB Management Information System	29
5. Summary of TB Joint Program Review	31
6. Targets for 2020	36
7. Acknowledgement	37

Abbreviation

aDSM	Active drug safety monitoring and management
ART	Antiretroviral therapy
CARITAS	CARITAS
CATA	Cambodia Anti-Tuberculosis Association
CDA	Community Development Association
CENAT	The National Leprosy Control Programme of Cambodia
Challenge TB	Challenge Tuberculosis
CHC	Cambodian Health Committee
DOT	Directly Observed Therapy
ECH	Empowering Communities for Health
FHI-360	Family Health International 360
GFATM	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HbA1c	Hemoglobin A1c
HC	Health Center
HIPA	Health Information Policy Advocacy
HP+	Health Policy Plus
HSD	Center for Health and Social Development
IPT	Isoniazid Preventive Therapy
JATA	Japan Anti-Tuberculosis Association
JPR	Join Program Review
KHANA	Khmer HIV/AIDS NGO alliance
MDG	Millennium Development Goal
MRD-TB	Multi-drug-resistant tuberculosis
MSF-B	Médecins Sans Frontières Belgium
MSF-F	Médecins Sans Frontières France
NCHADS	The National Centre for HIV/AIDS Dermatology and STDs
NTP	The national TB Program
OD	Operational District
OI	Opportunistic infections
OpASHA	Operation ASHA

PMDT	Programmatic management for drug resistant TB
PPM	Public-Private Mix
Pre-XDR-TB	Pre-Extensively Drug-Resistant Tuberculosis
RACHA	Reproductive and Child Health Alliance
RH	Referral Hospital
SDG	Sustainable Development Goal
ShoRRT	Shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis
TB	Tuberculosis
TB/CARE I	Tuberculosis Care I
TPT	TB Prevention Therapy
USAID	United States Agency for International Development
US-CDC	United States Centers for Disease Control and Prevention
UV	Ultra Violet
VHSG	Village Health Support Group
WHO	World Health Organization
XDR-TB	Extensively Drug-Resistant Tuberculosis

1. Introduction

The Ministry of Health of Cambodia has given high priority to TB Control. With the support and encouragement from the Royal Government of Kingdom of Cambodia led by the Prime Minister, **Samdech Akka Moha Sena Padei Techo Hun Sen**, as the Honorable Chairman of the National Anti-Tuberculosis Committee, as well as the involvement from all partners, TB control in Cambodia has achieved the remarkable results in the last recent years. This achievement has been recognized by the World Health Organization (WHO) and other key partners.

In 2015, WHO reclassified the countries with high burden of tuberculosis in which there are 30 countries with high burden of TB in the new list compared to 22 high burden countries in the previous one. By the end of 2015, Cambodia was one of the 9 countries among 22 TB high burden countries that have successfully achieved Millennium Development Goal (MDG). Despite this great achievement, based on the new classification, Cambodia is still one of the 30 countries with high burden of TB in the world. However, Cambodia is no longer country with high burden of TB/HIV and not high burden of MDR-TB.

According to the 2019 WHO Global TB Report, Cambodia had TB incidence of 302 per 100,000 populations, while the mortality rate was 18 per 100,000 populations in 2018.

The followings are the main achievements on TB control in 2019 and direction/targets for 2020 and the years beyond.

2. Tuberculosis Situation in the World

Worldwide, 10 million people are estimated to have fallen ill with TB in in 2018; of which only 7 million new cases of TB were detected and reported to WHO. In the same year, there were an estimated 1.2 million TB deaths among HIV-negative people and additional 251,000 deaths among HIV-positive people. TB is the leading cause of death among infectious diseases, ranking above HIV/AIDS.

3. Main Achievements

3.1. Service Coverage

The coverage of TB service has been maintaining at 100% in all referral hospitals (RHs) and health centers (HCs) nationwide. Community DOTS (C-DOTS) has been expanded from 506 HCs in 2008 to 644 HCs in 2018 and in late 2019, we expanded to other 356 HCs in 30 ODs. So, since late 2019, C-DOTS has been implementing in 76 ODs (1,000 HCs). TB/HIV collaborative activity has been implementing in all ODs in 2019 (compared to only 57 ODs in 2008) while TB in children activity was implemented in 76 ODs. In addition, the TB activities have been implementing in 12 factories and 19 prisons in 2019. MDR-TB treatment sites have increased from 9 in 2010 to 11 in 2019.

3.2. Case Detection

In 2019, the National Tuberculosis Program (NTP) has detected a total of 30,017 TB cases, of which 10,092 were bacteriologically confirmed new TB cases.

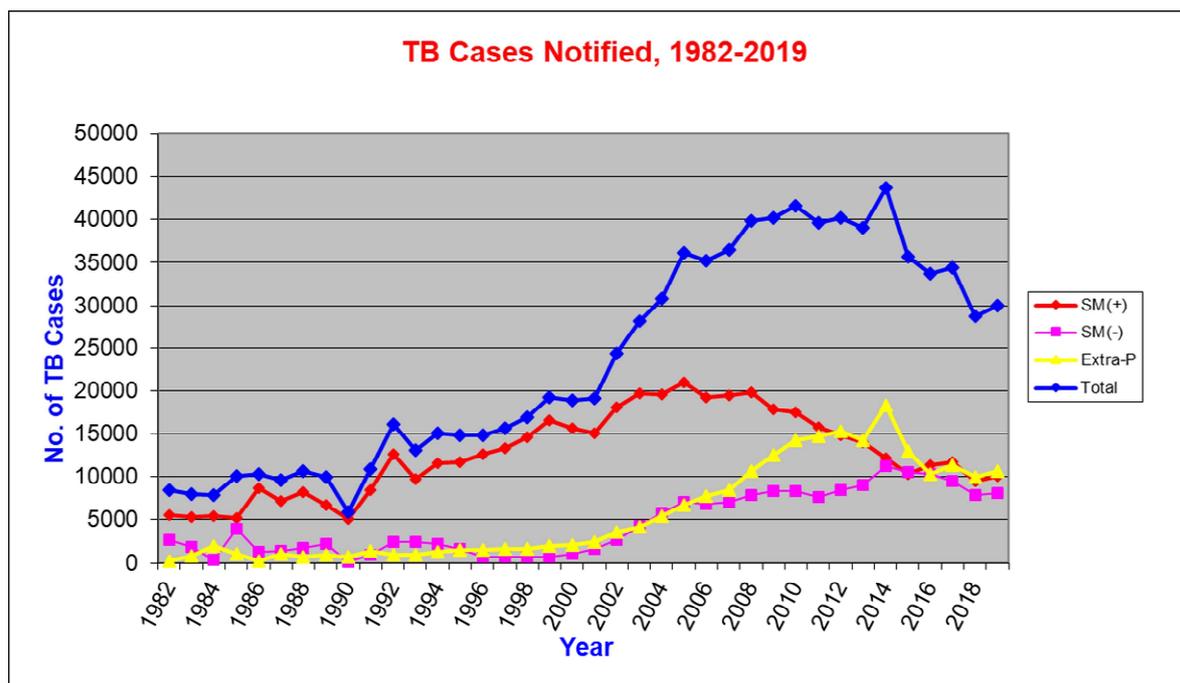


Figure 1: TB case notified from 1982 - 2019

3.3. Treatment

The Treatment Success Rate of TB has been maintained over 90% during the last 21 years. For instance, NTP has achieved 93% of the treatment success rate in 2019 which surpassed the target of only 90%.

3.4. Mortality and Incidence of Tuberculosis

In the recent years, Cambodia has achieved remarkable results in TB control. The 2019 WHO Global TB Report has shown that TB mortality rate dropped from 42 per 100,000 populations (pop) in 2000 to 18 per 100,000 pop in 2018, which equal to 57% reduction. While the incidence has also fallen from 575 per 100,000 pop in 2000 to 302 per 100,000 pop in 2018, which equal to 47% reduction.

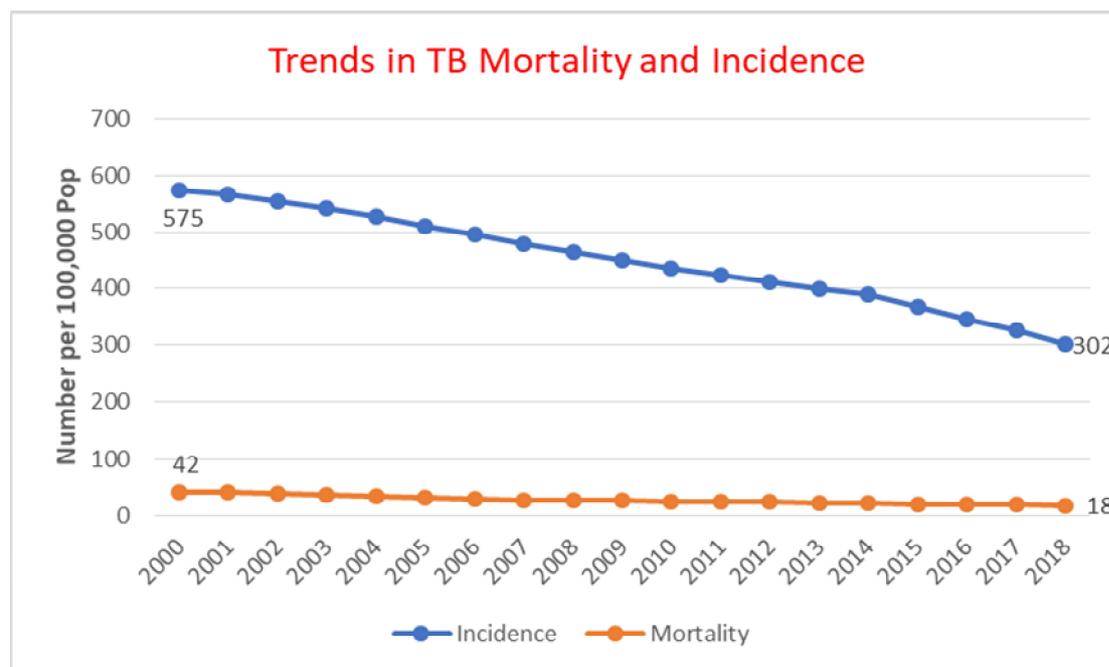


Figure 2: Trend of TB mortality and incidence from 2000 – 2018

Ministry of Health’s NTP has already achieved MDG targets (1990 - 2015) in reversing incidence, reduction of prevalence and death rate due to TB by 50% since 2011; that’s four years earlier than scheduled.

4. Main Interventions

In addition to the key achievements as mentioned above, NTP also achieved significant results relating to the interventions against tuberculosis as follow:

4.1. Drug Resistance Tuberculosis

The Cambodia NTP started implementing programmatic management for drug resistant TB (PMDT) since 2006 in collaboration with partners, especially WHO, Cambodian Health Committee (CHC), Médecins Sans Frontières-France (MSF-F), and Médecins Sans Frontières-Belgium (MSF-B), US-CDC, and USAID. The second National Drug Resistant Survey (NDRS) conducted in 2006-2007 showed that the proportion of Multi-Drug Resistant TB (MDR-TB) were 1.4% and 10.5% among new and previously treated TB cases respectively. The third National Drug Resistant Survey has been conducted in 2017. The primarily result of the 3rd DR survey shows that the estimated prevalence of RR cases among the captured BC cases is 0.9% for new cases and 9.4% for previously treated cases and estimated prevalence of RR by DST among smear-positive cases is 1.1% for new cases and 12.4% for previously treated cases.

4.1.1. MDR-TB Suspect Screening, Diagnosis, and Treatment

In 2019, there were 1,474 DR-TB suspects tested by Xpert MT/RIF. Of those, 135 RR/MDR-TB cases were detected and treated which was achieved of 100% compared to the target (135/135). The figure below shows drug-resistant TB suspects that were tested by Xpert (Figure 3) and drug-resistant TB cases treated during 2007-2019.

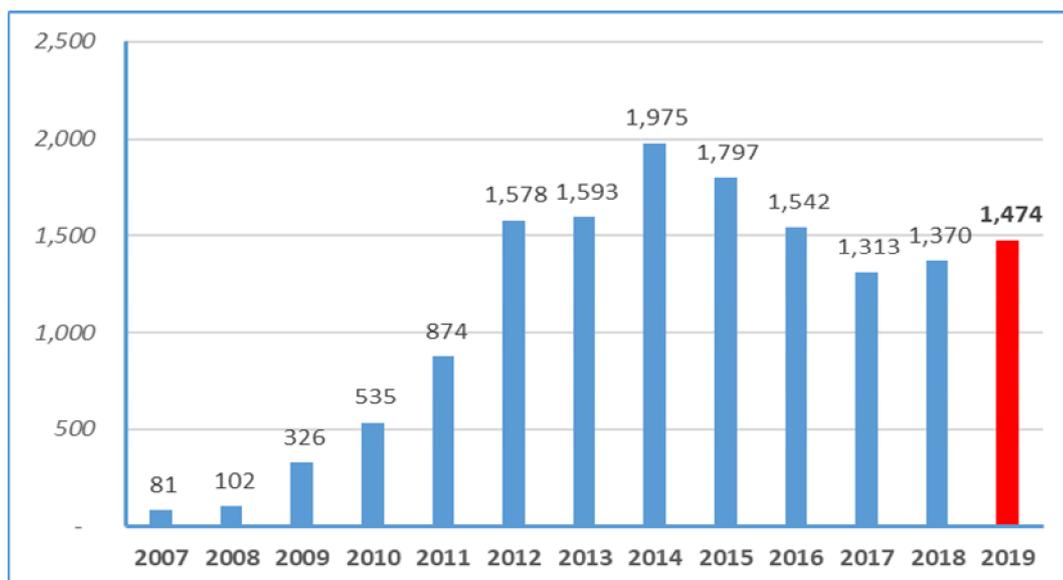


Figure 3: Number of drug-resistant TB suspects tested by Xpert from 2007 - 2019

Cambodia has 11 MDR-TB treatment sites with 57 isolation rooms by the end of 2019.

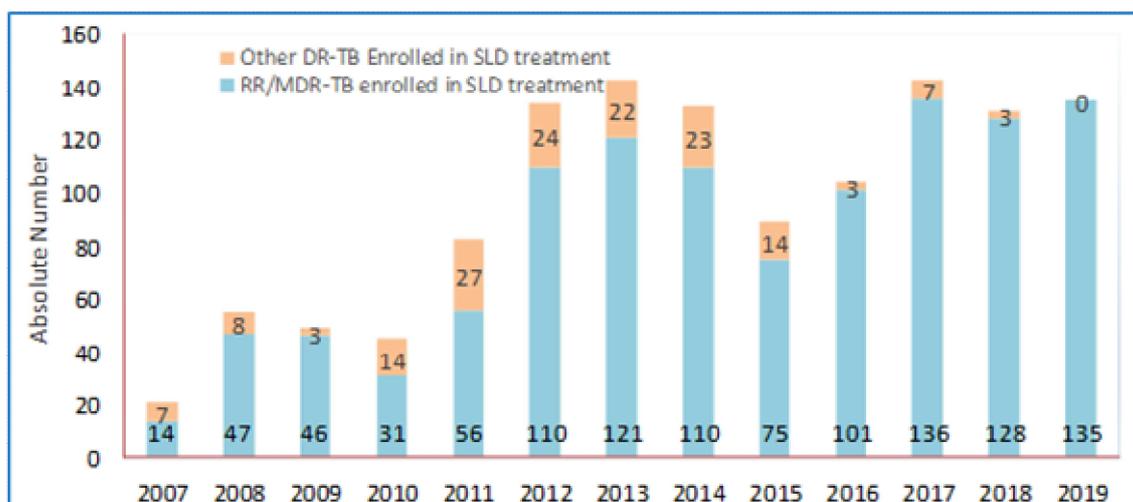


Figure 4: Number of drug-resistant TB cases treated with second-line drugs during 2007-2019

4.1.2. MDR-TB Treatment Outcome

The treatment success rate among RR/MDR-TB patients initiated on MDR-TB regimen (long regimen) in Cambodia was higher than an average of global level, which was only 54%. The treatment success rate varies from year to year; and it was 71% in 2017 cohort while the death rate also varies from one year to another (Figure 5). In the cohort of 2017, 10 cases were received shorter treatment regimen (9-11 months), in which

8 cases (80%) were cured, 1 case was switched to longer individualized regimen and 1 was lost to follow-up.

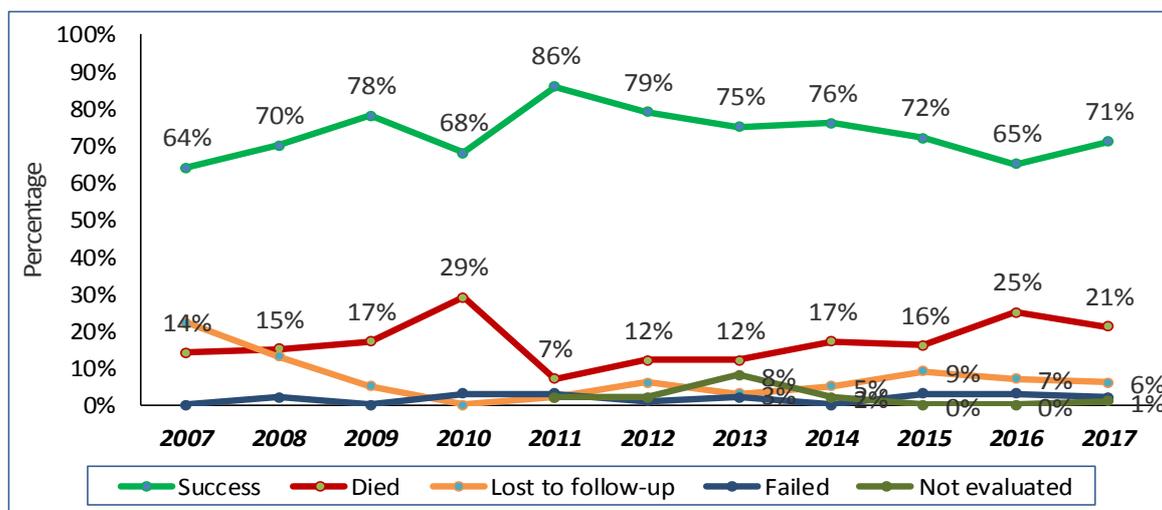


Figure 5: RR/MDR-TB treatment outcome cohort: 2007-2017

Moreover, in response to the new WHO consolidated guidelines on drug-resistant tuberculosis treatment in 2019, we have revised its own country guidelines for PMDT aligned with the latest global recommendations. The main changes in this documentation include the revised case finding algorithms for presumptive DR-TB that more comprehensive and tailored to the epidemiology and program reference of Cambodia. The new recommendations signal an important departure from previous approached to the treatment of MDR/RR-TB. Fully all-oral regimens are prioritized and are the preferred options for most of patients and injectable agents are no longer among the most effective medications to consider when designing the longer regimen. Patients who are eligible for the 9-11 months standardized shorter regimen with an injectable may still prefer, but Kanamycin will be systematically replaced by Amikacin based on the latest WHO recommendation.

As the result we have provided a comprehensive 5 days training course on the new PMDT guidelines to all clinicians and nurses from all MDR-TB treatment sites, including all provincial TB supervisors and laboratory officers as well. During 2019, among 135 MDR-TB patients enrolled for treatment, 87 cases (64%) received shorter treatment regimen and 48 cases (36%) received longer individualized treatment regimen, in which 34 cases were put on all-oral longer regimen with new drug such as Bedaquiline and or Delamanid containing treatment regimens. This year, 21 cases were confirmed for Pre-XDR-TB using line probe assay tests to detect second line drugs such as fluoroquinolones and second line injectable drugs. In 2019 there are 41 cases received new drug Bedaquiline, and 5 cases on Delamanid in their treatment regimens.

Regarding the PMDT transition plan 2019-2021, National Center for Tuberculosis and Leprosy (CENAT) will allocate a proportion of RR-/MDT-TB patients on all-oral shorter treatment regimen (9months) on operational research to be in line with WHO recommendation advised to phase out use of the injectable-containing shorter regimen in the future. Hence, with technical support from WHO/TDR, we have developed a protocol

on all-short oral regimen and was approved by the National Ethics Committee for Health Research (NECHR) and this research will be implemented in 2020.

So far, NTP, in collaboration with relevant partners, has trained health workers, doctors, nurses, practitioners in 11 drug-resistant TB clinics and provincial TB administrators from 25 provinces and cities on the new TB instruction program guidelines in order to build their capacity to manage performance related to the diagnosis and treatment using new formula including monitoring report by active drug safety monitoring and management (aDSM).

Yet we have challenges in strengthening and improving quality of care especially for MDR-TB patients in special situations or patients who presents with resistance to second line drugs such as XDR-TB or Pre-XDR-TB cases by special focusing on the appropriate use of active drug safety monitoring and management (aDSM) and regular patient monitoring to assess regimen effectiveness, including patient-centered care and support as well.

4.2. Collaborative TB/HIV activities

4.2.1. Training

With the financial support from GFATM, CENAT in collaboration with National Center for HIV/AIDS, Dermatology and STD (NCHADS) conducted refresher trainings on TB diagnostic workup for PLHIV to staff working at IO/ART service. In 2019, there are 2 courses conducted at Kampong Cham province (23th to 24th May 2019 and 25th to 26th September 2019). The objective of the TB diagnostic workup training is to strengthen TB diagnostic capacities for staff working at OI/ART services and TB services and to provide TB prevention therapy with INH.

4.2.2. Supervision

A main objective of supervision is to monitor and follow up the performance of collaborative TB/HIV activities and provide job coaching at sites visited if there is mistake or misunderstanding during the implementation.

The challenges found to be addressed in the field are: (1): difficult to collect sputum from PLHIV who have symptom screening positive with dry cough; (2): Challenge of transportation of specimen of PLHIV to Xpert machine; (3): workload for the staff at the field; and (4): mal-distribution of INH 100mg and 300mg from Central Medical Store (CMS) to some OI/ART sites where INH 100mg should reserve for children rather than to provide for adult PLHIV (we will distribute INH 300mg to replace INH 100mg to be used for PLHIV).

4.2.3. TB/HIV Data:

HIV / AIDS among TB Patients 2019									
Quarter	Number of TB cases registered for treatment (including HIV+)	Number of TB Cases Registered for treatment (excluding HIV+)	Number of Known HIV+ before TB treatment	Number of TB Cases Referred to VCT for HIV testing	Number of TB Cases tested for HIV at VCT	HIV+	HIV -	CPT	ARV
1	7,714	7,576	138	7,472	7,037	33	7,004	164	164
2	7,389	7,240	149	7,145	7,012	35	6,977	178	178
3	7,800	7,648	152	7,351	7,213	28	7,185	179	179
4	7,114	6,948	166	6,893	6,424	39	6,385	204	204
total	30,017	29,412	605	28,861	27,686	135	27,551	725	725

Table 1: HIV/AIDS among TB patients in 2019

Percentage of registered unknown HIV status TB patients referred and tested for HIV (tested on sites mostly at HCs where the activity has been implemented in the middle of 2014) was increased gradually from 47% in 2007 to 82% in 2011, 94% in 2018, and increased to 94.2% in 2019.

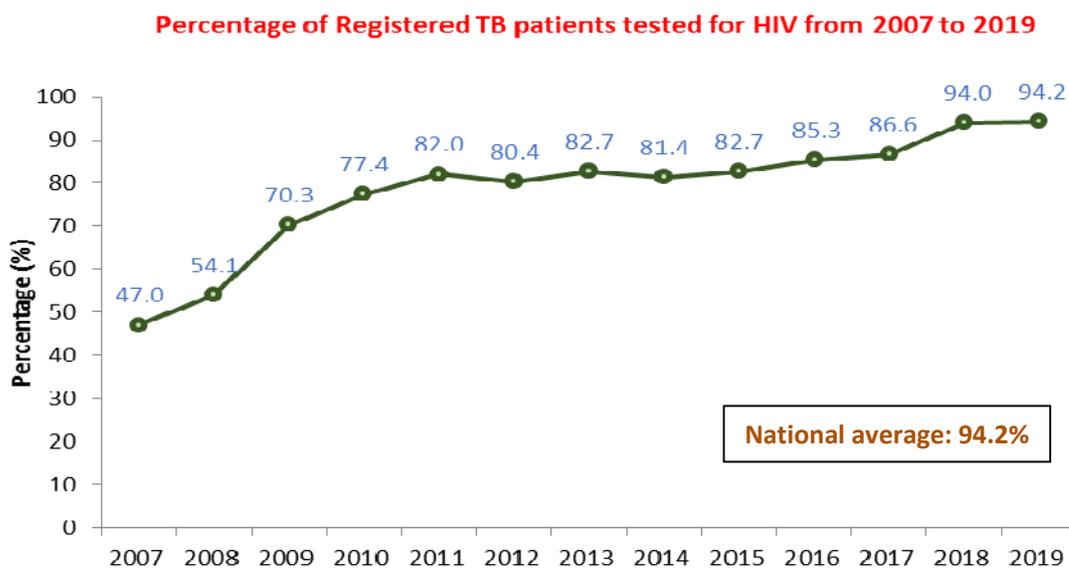


Figure 6: Percentage of Registered TB patients tested for HIV from 2007 - 2019

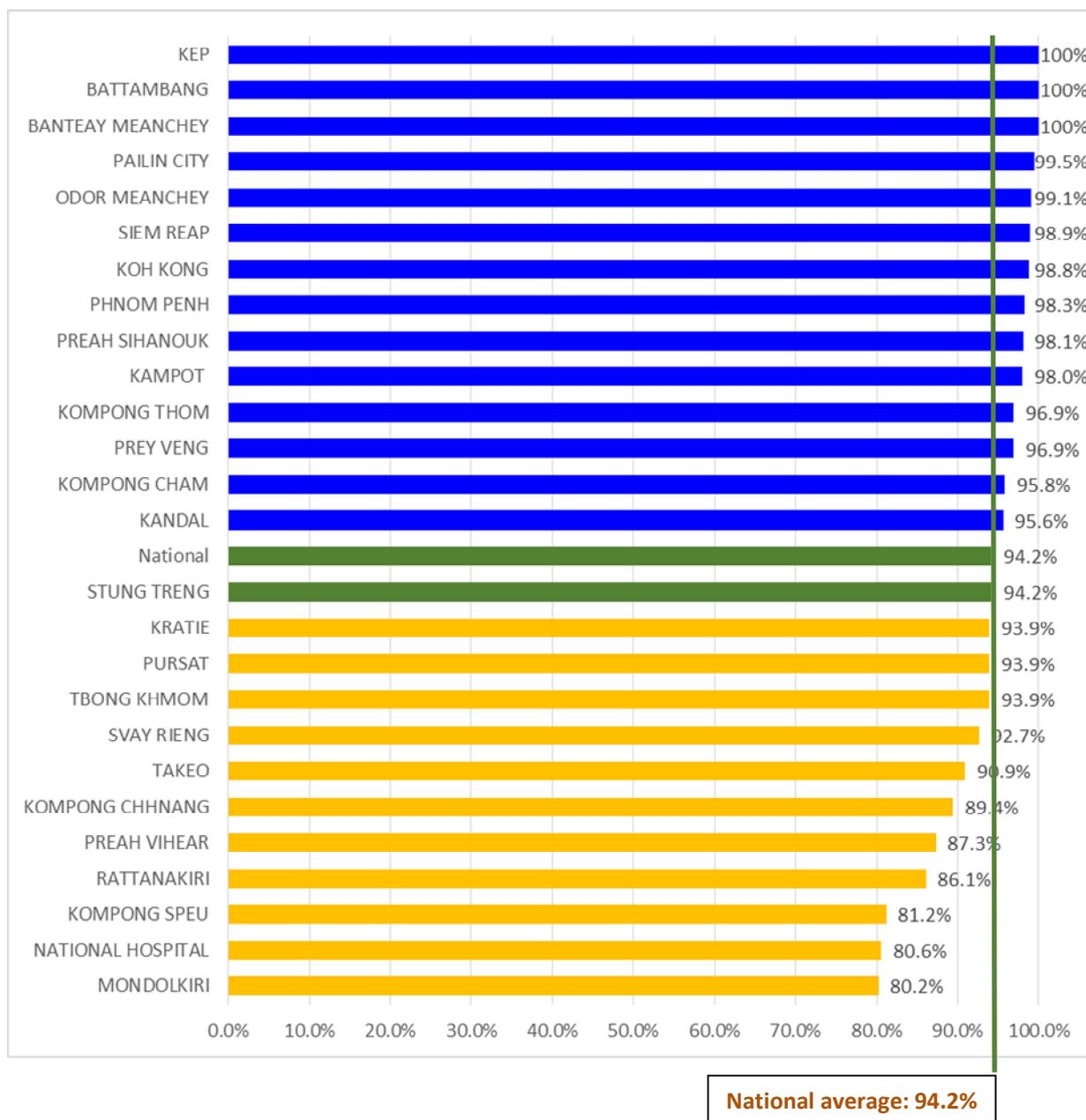


Figure 7: Proportion of HIV testing among registered TB patients by different provinces, 2019

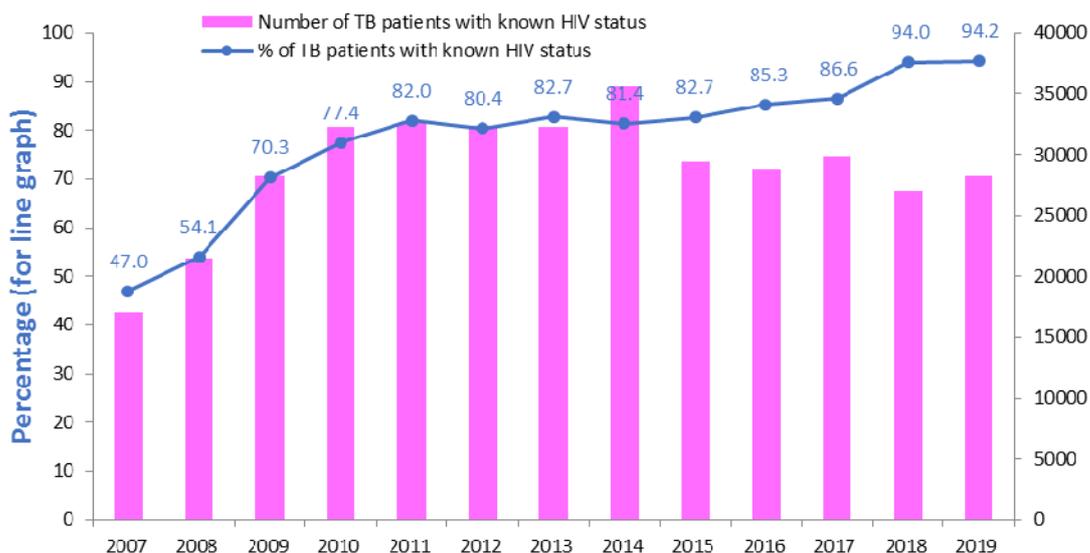


Figure 8: Number and Proportion of registered TB patients with HIV test results from 2007 to 2019

HIV positive TB patients who received Cotrimoxazole Preventive Therapy (CPT) increase from 65% in 2010 to 92% in 2015, to 98.2% in 2016, to 95.3% in 2017, to 88.4% in 2018 and to 98.0% in 2019. Anti-Retroviral Treatment (ART) among TB/HIV patients also increase from 45% in 2010 to 92% in 2015, to 98.2% in 2016, to 93.3% in 2017, to 91.2% in 2018 and to 98.0% in 2019.

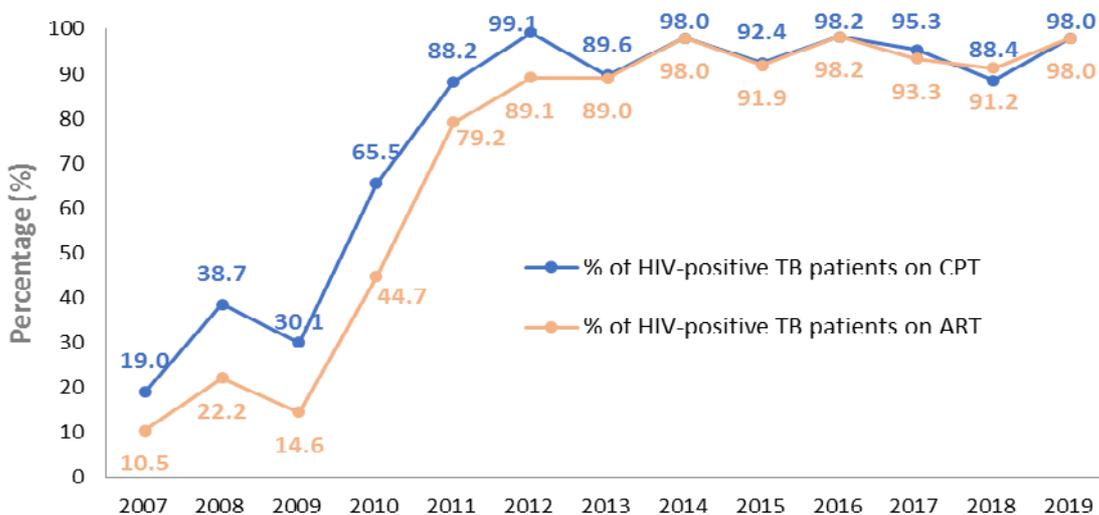


Figure 9: Percentage of HIV+ TB patient received CPT and ART from 2007 to 2019

INH Preventive Therapy for people living with HIV/AIDS who are not likely having TB disease is increasing from 172 in 2010 to 1,043 in 2011. Since the mid of 2014 we start introduce IPT for all PLHIV (new and ART clients) the number of PLHIV who are unlikely to have TB disease is increasing from 767 in 2014 to 954 in 2015, to 2,379 in 2016, to 2,567 in 2017, to 2,778 in 2018 and to 13,111 in 2019. Referral of newly HIV positive clients for TB screening at OI/ART services is around 90% in 2019.

TB among PLHIV 2019									
Quarter	Number of HIV + clients registered at VCCT	Number of HIV+ clients at VCCT referred to OI/ART service for TB screening	Number of HIV+ clients screened TB at OI/ART	PTB		EPTB		Total	Number of HIV+ received IPT
				BK+	BK-	BK+	BK-		
1	561	524	535	29	18	0	50	97	1,301
2	894	806	492	38	24	4	19	85	3,429
3	494	370	364	17	24	0	47	88	6,421
4	831	696	302	27	18	5	26	78	1,960
Total	2,780	2,396	1,693	111	84	9	142	348	13,111

Table 2: TB among PLHIV 2019

4.3. Diagnosis by Bacteriological Examination

4.3.1. Diagnosis by Smear Microscopy

The total number of slides that NTP used for TB smear examination in 2019 was 298,827 slides (detection and follow up), of which 275,935 slides were for detection. The positivity rate among smear examination for case detection was 4.3%.

To strengthen the quality of sputum examination, NTP has conducted the crosschecking by re-examining the read slides. This is one of the laboratory quality assurance activities. Results showed that agreement rate was 99.4% with false positive and false negative rates of 0.0% and 0.6% respectively for the 3rd Quarter of year 2019.

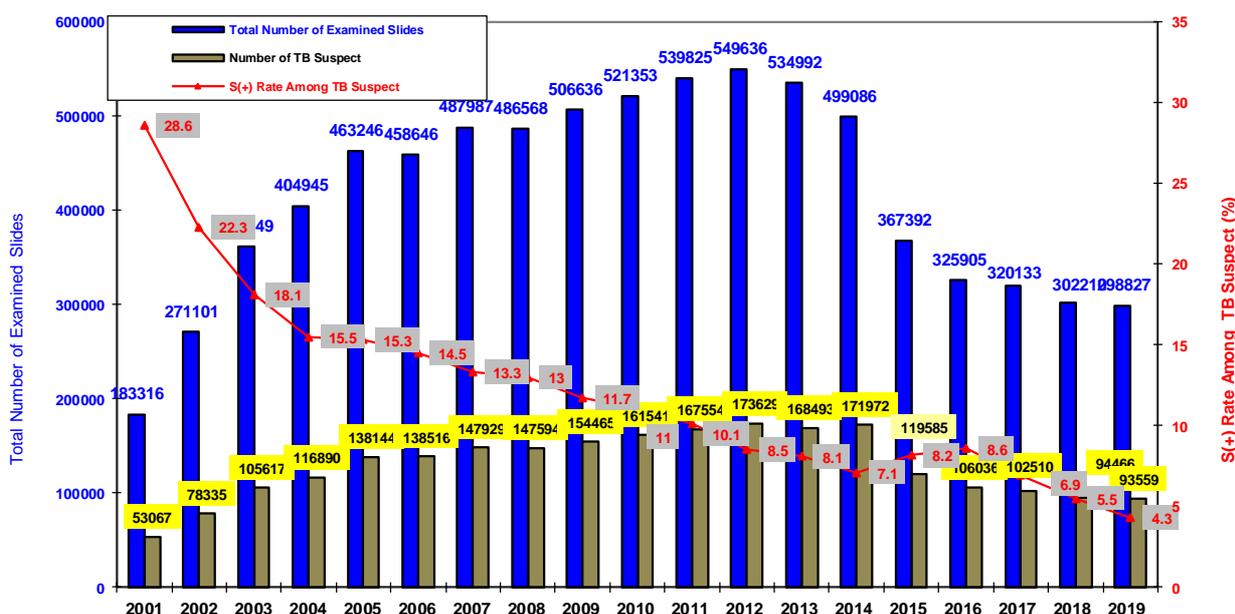


Figure 10: Smear microscopy report from 2001 to 2019

4.3.2. Diagnosis by GeneXpert, Xpert MTB/RIF

New diagnostic tool is GeneXpert machine, which had the tests called Xpert® MTB/RIF has put into operation in the country in 2011 after an official authorization from WHO in late 2010 and currently the 78 sets have been using. Among these 78 sets, 69 sets (at 64 sites) are used for routine activities. In addition, in late 2019, NTP in collaboration with IPC through TB-Speed procure GeneXpert Edges that can be used at front line health facilities. Those GeneXpert Edges will be piloted in 2020. These tests are simple, highly effective and gets results faster for less than two hours.

This new test is not only detected susceptible TB but it also can detect Rifampicin resistant. Based on their specific characteristic, NTP decided to roll out these machines to use for case detection among the group of presumptive MDR-TB, the group of PLHIV, the group of new smear positive cases, the group of high risk population (elderly over 55 years old, close contact with smear positive PTB, Diabetic, and PLHIV) and for Active Case Finding activities. The utilization of tests varied from year to year, i.e. in 2019, national program used 71,488 tests with the results as following: Rate of MTB detected and Rifampicin resistant detected (RR) 0.3%, MTB detected and Rifampicin not detected (T) 12.2%, MTB detected and Rifampicin resistant indeterminate (TI) 0.3% and test Error (I) 3.8%.

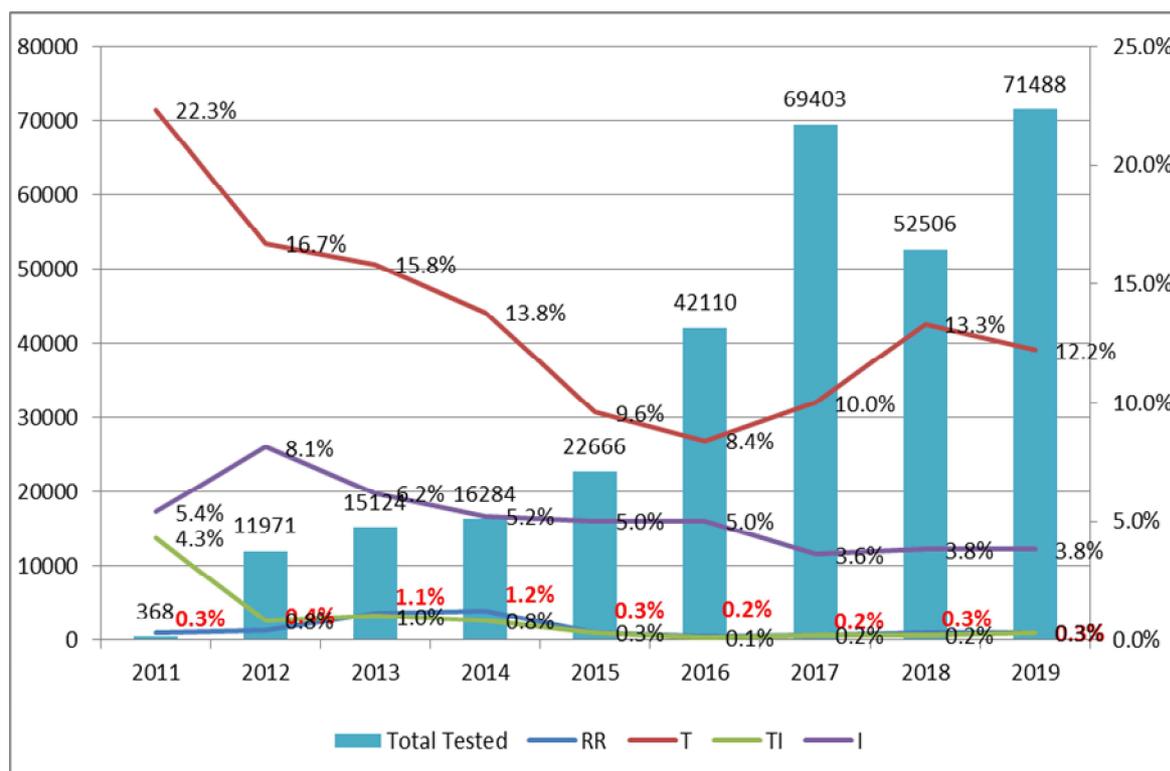


Figure 11: Test by Xpert MTB/Rif report from 2011 to 2019

4.3.3. TB Culture and Drug Susceptibility Testing

In late 1999, NTP with the technical assistance from JICA introduced TB culture with solid medium. Step by step later on, the capacity to culture on liquid medium (MGIT)

and rapid method to make identification for MTB started up in 2011 at CENAT Control, Battambang TB Laboratory and 2014 at Kampong Cham TB Laboratory. The first line Drug Susceptibility Testing by using liquid medium (MGIT) was evaluated and introduced at CENAT and later at Kampong Cham TB Laboratory (2014). The second line Drug Susceptibility Testing by using liquid medium (MGIT) was evaluated by the supranational TB reference laboratory from Research Institute of Tuberculosis of Japan (RIT) and was put into service since 2014.

In 2019, three culture center laboratories (CENAT, Battambang and Kampong Cham) received 3,974 specimens to do culture for TB with positive rate of 9.5%.

4.3.4. Training

In 2019, National TB Laboratory conducted 4 refresher training courses on utilization of GeneXpert machine. These courses were supported by Global Fund 2 courses with 42 participants and by WHO 2 courses with 62 participants. In addition, National TB Laboratory conducted others 2 refresher training courses on smear microscopy with 38 participants were supported by Global Fund.

4.4. Childhood TB

Childhood TB remains one of the priorities of NTP. There were 6,247 childhood TB cases nationwide (all ODs) notified and treated in 2018 (see the figure below). Since August 2017, NTP has been using the new pediatric drug formulation for childhood cases, which is more effective and better than the old one.

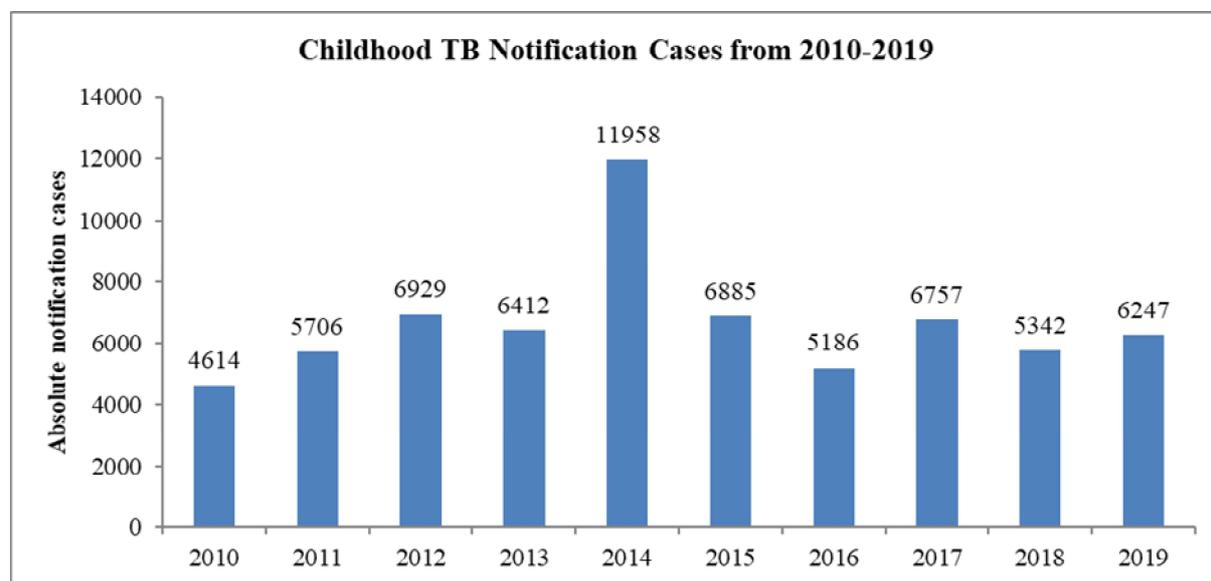


Figure 12: Childhood TB Notification cases in 2010-2019

After JATA ended its USAID-TB/CARE I project implemented in 27 ODs in 2014, NTP had maintained and strengthened childhood TB activities in 25 ODs supported by USAID, and most of them were former ODs implementing childhood TB previously covered by JATA. By 2017, childhood TB activities supported by USAID were implemented by FHI-360 under Challenge TB project collaborated with ECH project of RACHA. The childhood TB activities in 25 ODs of the 10 provinces namely Battambang,

Pursat, Kampong Chhnang, Kampong Thom, Kampong Speu, Prey Veng, Svay Rieng, Kampot, Kampong Cham, and Tbong Khmum were ended by the end of first quarter of 2018.

Challenge TB project in collaboration with CHC supported contact investigation activity to identify TB suspected children and refer them to RH for TB diagnosis. Childhood TB is becoming a routine activity in community and HC/RH. Currently this activity has been implemented five NGO partners that received fund from the Global Fund in 76 ODs. The number of children received IPT drops at 3,033 cases (see figure below).

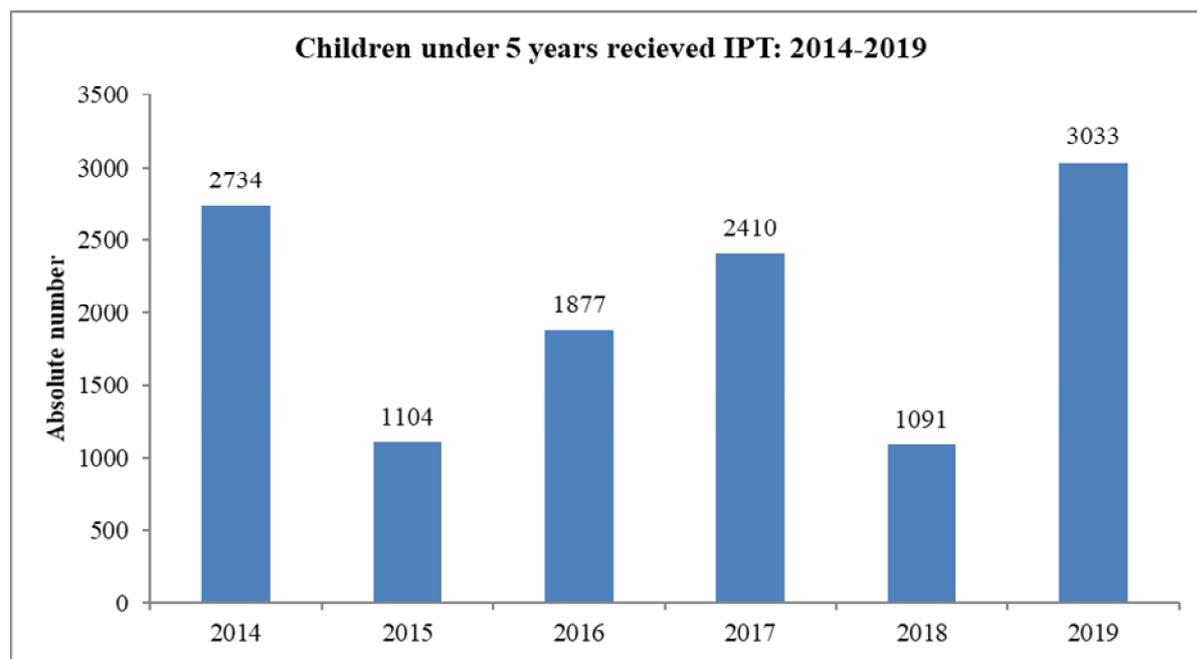


Figure 13: Children under 5 years old received IPT in 2014-2019

4.5. Financing

NTP has clearly identified a 7-year National Strategic Plan (2014-2020) by thoroughly consultation with all concern partners and financial gap was also clearly shown. In average, the need of NTP is about US\$20 million per year. Budget plan for 2019 was developed based on this National Strategic Plan. NTP is trying to negotiate with all potential partners for program financing.

From April 2009 to the end of 2014, National Center for Tuberculosis Control has become a Principal Recipient (PR) for the Global Fund to Fight with AIDS, Tuberculosis and Malaria (GFATM) for TB grant round 7 and managed the financing of 11 Sub-Recipients (11SRs). From 2015 to 2017, CENAT still continue as a PR for The Global Fund under New Funding Model (NFM) with the total funding amount about US\$15.6 million and managed the financing of 5 Sub-Recipients (5SRs).

In late 2017, Ministry of Economy and Finance that became the new Principal Recipient from Global Fund has been signed for the three-year Global Fund project cover from January 2018 to December 2020. In this project, the Global Fund initially support TB program with the total amount of about US\$13.7 million and additional US\$2.7 million

was provided in September 2019, so in total fund that is committed to support by GF about US\$16.4 million for the year of 2018-2020. This grant fund implemented by CENAT itself and as Sub-Implementer (SI) for TB program, CENAT also manages grant implementation of all Provincial Health Departments and five Sub-Sub-Implementers (SSIs) namely: CHC, CRS, HPA, Op-ASHA and RHAC.

Also in 2019, there are four major donors supporting NTP namely US-CDC, USAID, ADB, and TB REACH. In addition, under the support from USAID through TB Local Organization Network Project (TB LON), NTP in collaboration with KHANA, CHC and HSD has started a 5 year project called Community Mobilization Initiatives to End Tuberculosis (COMMIT).

In addition to these grants from development partners, Royal Government of Cambodia is increasing fund allocation from National Budget to TB program including 70% contribution for purchasing adult TB Drugs in 2019.

In summary, NTP received funding support in 2019 from seven main sources namely National Budget, The Global Fund, USAID, US-CDC, ADB, TB REACH and CHAI.

However, since the funding of some projects have reduced in 2018-2019, NTP will remain facing budget shortage over the coming years in order to more aggressively control TB to meet the new direction

4.6. Drug and laboratory supplies

Proving highly important in TB Control, TB Drug Management (TBDM) is deemed the core element of TB control. An uninterrupted supply of anti-TB drugs, reagents, and consumables is necessary for the sustained provision of quality TB diagnostic and treatment services through DOTS in all service delivery facilities nationwide and leads to better treatment success and reduces TB deaths.

NTP closely collaborates with Ministry of Health (MoH)'s Department of Drug and Food (DDF) and Central Medical Store (CMS); and TB partners to thoroughly monitor stock situation, distribution and utilization of anti-TB drugs. This is done especially through quarterly report of NTP, monthly report of CMS (MoH) in order to ensure the uninterrupted supply and proper management of good quality of anti-TB drugs, reagents and consumables to TB networks.

In 2019, NTP received First Line Drugs (FLD) for treating adult and childhood TB patients 12 shipments: from national budget 06 shipment, under the Global Fund New Funding Model (GF-NFM) grant 03 shipments, and United States Agency for International Development (USAID) 03 shipments.

	Product and formulation	Source			Total Quantity (Tablet or Vial)
		NB	GF	USAID	
	<i>Adult formulation</i>				
RHZE	Rifampicin/Isoniazid/Pyrazinamide/Ethambutol 150/75/400/275 mg	3,563,616		3,292,800	6,856,416
RH	Rifampicin/Isoniazid 150/75mg	3,144,960		8,131,200	11,276,160
S	Streptomycin 1g	62,000			62,000
E	Ethambutol 400mg	585,312			585,312
Z	Pyrazinamide 400mg	34,272			34,272
H	Isoniazid 300mg	1,204,224		706,272	1,910,496
	<i>Paediatric formulation</i>				
RHZ	Rifampicin/Isoniazid/Pyrazinamid 75/50/150 mg		825,720		825,720
RH	Rifampicin/Isoniazid 75/50 mg		1,265,376		1,265,376
E	Ethambutol 100 mg		220,700		220,700
H	Isoniazid 100mg	336,000		856,100	1,192,100

Table 3: First Line Drugs procured in 2019

In addition, 2019, NTP received Second Line Drugs (SLD) for drug resistance TB treatment 4 shipments of which from under the Global Fund New Funding Model (GF-NFM) grant 02 shipments and United States Agency for International Development (USAID) 02 shipments.

	Product and formulation	Source		Total Quantity (Tablet, Capsule, Vial, Cont.)
		GF	USAID	
Cm	Capreomycin 1g	670		670
Km	Kanamycin 1g	8,930		8,930
Cs	Cycloserine 250mg	39,500		39,500
PAS	Para Aminosalicic Acid Sodium	1,600		1,600
Mxf	Moxifloxacin 400mg	42,400		42,400
PZA	Pyrazinamide 400mg	94,080		94,080
INH	Isoniazid 300mg	4,032		4,032
Bdq	Bedaquiline 100mg		15,228	15,228
Cfz	Clofazimine 100mg	29,800		29,800
Lnz	Linezolid 600mg	10,730		10,730

Table 4: Second Line Drugs procured in 2019

NTP always sends its officers to attend regular drug management meetings organized by relevant departments of Ministry of Health to report TB drug management activities of the national program and obtain information on the current national drug management update.

4.7. TB Infection Control

In 2019, due to limited financial resource, a very limited TB infection control (TBIC) activities have been done. However, NTP closely collaborated with partners including GFATM, USAID, FHI360, HSD, OpASHA, KHANA, CATA. NTP successfully implemented some key activities to reassessed the status of infection control with a positive result, i.e. 15 hospital had established and reactivated dormant infection control committees and setting up action plan for TBIC in the hospitals. Moreover, the screenings for presumptive TB and for TB patients were timely done at OPD and IPD and separated them systematically. Most of the TB care areas keep doors and windows opened for natural ventilation and air flow. The hospitals were maintaining UVGI fixtures and lamps appropriately. Access, utilization and storage of N95 masks were adequate appropriate and waiting areas, in-patient and outpatient departments have well-displayed posters on infection control. The hospitals have built sputum collection booths with their local budget.

In upcoming 2020, to overcome the limitations in the available funds and to further strengthen the TB Infection Control activities in the country, NTP will intensify its plans

4.8. Community DOTS

The main purpose of Community DOTS implementation is to improve case finding through referral of TB suspects as well as to ensure daily DOTS for TB treatment at community. Strengthening and scaling up the Community DOTS is one of NTP's priorities in order to bring DOTS service closer to the community to achieve case detection and treatment outcome; and to contribute to speeding up the progress towards the goal of ending the TB epidemic by 2030. As shown in the figure below, the number of health facilities implementing Community DOTS varies from year to year according to the support from NGO TB partners and donors. After Challenge TB project of FHI-360 under the USAID support has phased out from the second quarter of 2018, the Community DOTS remain only in areas supported by the Global Fund in 644 HCs in 46 ODs in 2018 and in late 2019, we expanded to other 356 HCs in 30 ODs. So since late 2019, C-DOTS has been implementing in 76 ODs (1,000 HCs) by the five sub-sub-implementers. During this year, as a result of community DOTS implementation, we detected 9,665 TB cases which equal to 32% of total TB cases in the country.

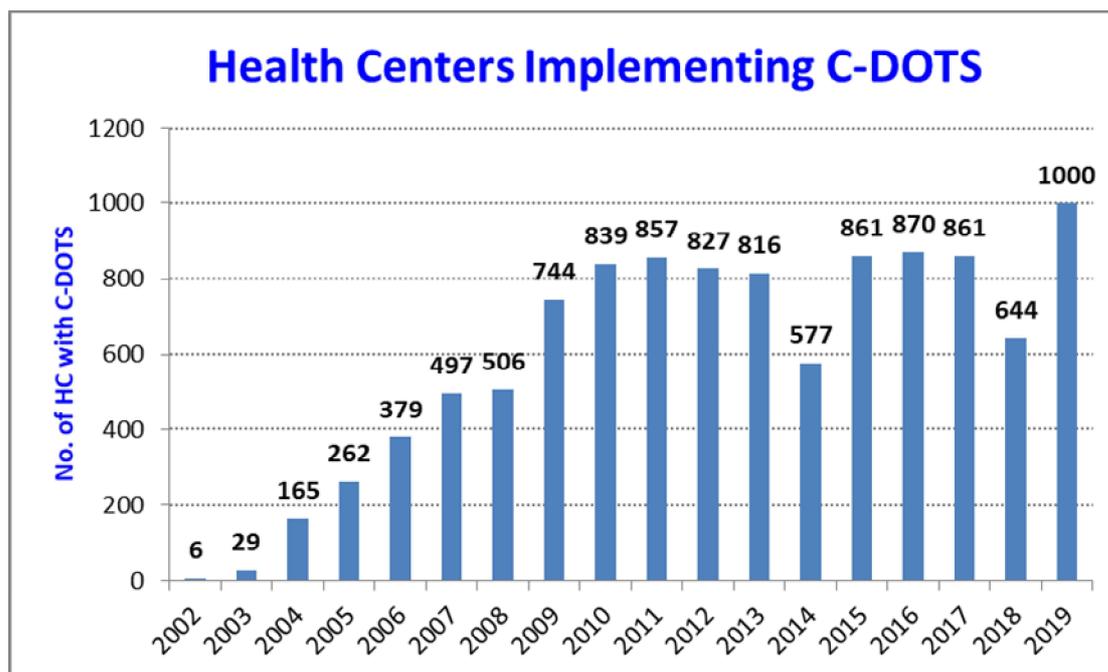


Figure 14: Health Centers Implementing C-DOTS

Some constraints and obstacles remain our challenges in the implementation of Community DOTS. Insufficient funding support limits the community DOTS implementation at all levels. The insufficient resources cause limited capacity of frontline TB health workers, especially funding for detection TB cases at households or at communities. We have limited resources to support VHSG / DOT watchers, as well as TB supervisors and health center staff. This issue is still a concern in the future when more works needed to be achieved with limited fewer human resources. In addition, we also facing other challenges such as turn-over of trained TB staff, limited capacity of TB health workers at HFs, and seasonal migration of VHSGs and/or DOT Watchers for employment seeking and these challenges need to be solved timely in order to make community DOTS sustainable.

4.9. Public-Private Mix DOTS

The provision of TB service through Public-Private Mix DOTS (PPM-DOTS) is collaboration between NTP and public and private healthcare providers to promote DOTS service. This approach aims to strengthen the referral of TB suspects from the private sector (including pharmacy, consultation room, private clinics etc.) to public health facilities for appropriate TB diagnosis and treatment. In collaboration with many NGOs and International partners, NTP has intensified the implementation of PPM-DOTS since its start in 2005 up to 2014. TB CARE I project that supported this activity has ended at the end of 2014 and this activity had not been continued from 2015 till 2019 due to lack of funding support.

On the other hand, other activities have been strengthened, particularly the band of import 1st line TB drugs and TB test in the markets.

4.10. TB in Congregational Settings

In last recent years, NTP has been focusing on TB control activities in congregational settings such as prisons and factories where TB transmission may be high.

4.10.1. Prisons

With strong support from the Ministry of Health and the Ministry of the Interior, and in close collaboration with the Prison Department and other partners, great progress has been made in TB control activities in prison. The activities include TB health education for prisoners and referral of TB suspects to public health facilities for tuberculosis diagnosis and subsequent treatment at prison health post with DOTS approach. Below table depicts the increasing TB control activities in prison in the recent years. The number of prisons implementing TB control activities increased from 8 in 2009 to 26 in 2015. In 2019, there were two partners doing TB control activities in prison, including Global Fund supporting 10 prisons and CARITAS supported 9 prisons. Through passive and active case finding, 107 TB cases (50 cases through routine case finding and 57 cases through active case finding) were detected including 02 TB/HIV co-infection cases.

Year of Implementation	Number of Prisons	TB Cases Detected	TB/HIV Cases Detected
2009	8	203	26
2010	11	315	26
2011	19	342	19
2012	19	368	8
2013	22	299	7
2014	26	229	12
2015	26	191	4
2016	17	139	2
2017	17	117	1
2018	19	120	10
2019	19	107	2

Table 5: TB Control Activities in Prisons: 2009-2019

4.10.2. Factories and Enterprises

Factory and enterprises are ideal for TB transmission as employees work together in close area and have high interaction with others. NTP in collaboration with Occupational Health Department of Ministry of Labor and Vocational Training, and with the support from partners especially from CATA, has been implementing DOTS pilot project in 6 factories and enterprises in 2007. The main activities are to strengthen capacity of health staff who are working at infirmary of factories and enterprises, to refer TB suspects to HCs for diagnosis, to conduct supportive supervision, and quarterly meeting that aims to motivate staff and to prepare plan for the coming quarters. In 2019, 12 factories and enterprises have been providing TB-DOTS services at their workplaces as in 2018.

TB control activities in factories and enterprises (2007-2019) are shown in table below. The table shows that the number of workers covered by the activities fluctuate from year to year. In recent years, the number of TB suspects referred were between of 100 -150 cases and TB cases detected were from 05 to 17 cases.

Year of implementation	Number of workers	TB suspects referred	TB cases detected	Yield per population (per 100 000)	Yield per referral (%)
	(a)	(b)	(c)	(c)/(a)	(c)/(b)
2007	10900	44	6	55	14 %
2008	22701	149	22	97	15 %
2009	15740	102	10	64	10 %
2010	21077	99	24	114	24 %
2011	25171	107	15	60	14 %
2012	25881	127	16	62	13 %
2013	22575	145	17	75	12 %
2014	19402	139	11	57	8 %
2015	20402	144	14	69	10 %
2016	18443	68	10	54	15%
2017	18443	293	13	70.48	4.4%
2018	16843	321	5	30	2%
2019	14926	303	7	47	2.3%

Table 6: TB Control Activities in Factories and Enterprises: 2007-2019

4.11. Summary of Active Case Finding Project

In 2019, NTP has implemented Active Case Finding in:

- 7 ODs by identifying 283 TB cases of which 156 cases are bacteriologically confirmed TB among 8,589 people screened.
- 3 prisons (in Takeo, Kampong Chhnang and Siem Reap provinces) by identifying 57 TB cases of which 2 cases are MDR-TB.

In addition, CATA had implemented Active Case Finding from 14 January 2019 to 28 December 2019, under the grant funded by TB REACH Wave 5 scale up and NUS. This project was implemented among Elderly aged 55 and over and high-risk population in community. This ACF intervention was implemented in 12 operational districts (OD) in 10 provinces: OD Sampovloun, OD Stung Treng, OD Ponheikrek, OD Sithorkandal, OD Kamchaymea, OD Remeihek, Koh Thom, OD Koh Andeith, OD Angkor Chey, OD Kampong Trach OD Oudong and OD Boribo (NUS). As the result, a total of 2,097 TB cases were identified (Table 7). The CATA’s mobile team equipped with semi-digital Xray machine and X-pert MTB/RIF Ultra visited each HC (HC) in the target areas as planned schedule.

In each village, a team of at least 2 volunteers (VHSG) with village chief sensitized communities living in the catchment area about TB within one to two weeks prior to each of the ACF days at each HC. All people aged 55 and over, regardless of TB symptoms were invited to visit the health facility for chest Xray screening. Small transport enablers also provided to those in need to improve participation. VHSG outreach efforts focused on people aged 55 years and over, but people aged less than 55 with at least has one among four TB symptom greater than two weeks have been encouraged to come for screening and testing. All people visiting the ACF day were screened by both a multi-TB symptoms questionnaire and chest X-ray. Any person with either TB symptoms and/or an abnormal chest X-ray were asked to submit a spot sputum specimen for testing with the Xpert MTB/RIF Ultra. HC, OD and PHD staff will invite to participate in ACF team. Test results have been returned within a day to HC and TB patients started on treatment at the HCs under the supervision of National TB Program (CENAT). Below table is the results of the ACF in 2019:

Process indicators	January to December 2019		
	Actual Result (AR)		
	>55	Other	Total
# Screened by VHSGs	117422	66311	183,733
# Visited HC	30392	19798	50,190
# Screened by CXR	30243	18880	49,123
# Tested Xpert	4871	1434	6,305
# Bact+	451	190	641
# All Forms	1486	711	2,197

Table 7: Results of Active Case Findings

4.12. Collaborative DM-TB Services

4.12.1. Workshop and partners

With financial support from Global Fund and good collaboration with Department of Preventive Medicine and other implementing partners, CENAT conducted the 4th National Workshop on TB and DM on 20th December 2019 at Siem Reap province. There are 140 participants from CENAT, MoH, partners such as (HSD, MoPoTsyo, KHANA, Community Development Association (CDA), CHC and other partners), OD/PHD TB supervisors, DM clinicians and PHD director/deputy directors. The main objectives of the workshop are (1) to sensitize and highlight the burden of TB-Diabetes comorbidity at global, regional and local levels, (2) to share lesson learnt on TB-DM activities among implementing partners and (3) to strengthen the collaborative TB-DM activities. The expected outputs of the workshop were to make aware of the burden of TB-DM comorbidity and enhance collaboration and coordination among these two programs. We made effort, during the discussion, to identify and prioritize challenges and find local and appropriate solution. Many discussions focusing on DM activities to help for TB screening and most of the DM clinics lack of human resources to screen TB and need internal management to arrange more staff to do this screening and training.

Health and Social Development (HSD) has been implementing the project on case finding among co-morbidity DM-TB funded by the World Diabetes Foundation (WDF) under the leadership of CENAT and MOH department Preventive Medicines in close collaboration with implementing partners in 5 provinces, 7 ODs, and 113 HCs that coverage 1,611 901 population.



Figure 15: Workshop on TB-DM on 20-Dece-2019 at Siem Reap province

4.12.2. Achievement of TB/DM Collaborative Activities with HSD:

- Project supported refresher training on DM, TB, DM-TB and DM complication care to 18 medical doctors, to 244 nurses of the target HCs and RHs. The project also supported refresher training on DM, TB to 28 peer educators.

- Total number of TB patients screened for DM were 3,019 in 7 ODs (HCs and RHs) through glycaemic test. The total number of DM patients screened for TB were 3,080 and 157 were diagnosed as TB-DM.



Figure 16: Refresher training on DM, TB and DM foot complication care to the target OD, RH and HC staff in Takeo and Siem Reap province in 2019

- HSD worked in close collaboration with Department of Preventive Medicine (DPM), National TB Program (CENAT) and five target Provincial Health Departments (PHD) to organize the World Diabetes Day (WDD) in November 2019. WDD has been organized in five target ODs: Memot, Sotnikum, Daun Keo, Pearaing and Cheung Prey under the main slogan “We prevent our family from Diabetes”. Blood sugar tests were done for 408 participants and blood test’s result is shown in figure 18 below:



Figure 17: Screening for DM in community

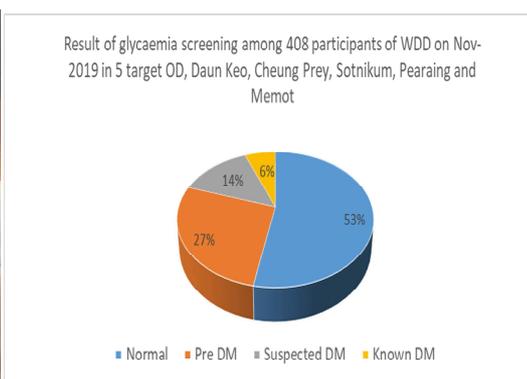


Figure 18: Result of DM screening in community

- Supervision and review meeting: A quarterly supervision was conducted to 7 DM clinics, 7 TB clinics and 60 HCs by DPM, CENAT, OD and HSD team. The quarterly meeting have been organized at the 7 target ODs (a time per quarter per OD) under the leadership of OD chief, OD supervisor for TB/Diabetes and HC staff.

- Supply materials and equipment, 2019
 - 308 boxes of glucose strips test (box of 25 strips) to 113 HF, 7 TB clinics in target RHs
 - 28 boxes of HbA1c strip tests have been provided to all 7 laboratories at RHs, 4 boxes (25 strips/box) to each hospital.



Figure 19: Distribution of DM screening materials and other materials

- Experience & lessons learned
 - Strong collaboration/support from DPM and CENAT and other relevant partners;
 - Supervision team from NCD, CENAT & HSD to strengthen TB and DM service;
 - TB screening for diabetes was worked as routine;
 - Established technical working on TB-Diabetes co-morbidity
 - Developed guideline on TB-Diabetes co-morbidity case management
- Challenges
 - Limited referral system between TB and diabetes (many cases were not followed up, not used referral slip, not noted “TB patient” on referral slip)
 - Limited human resource at RH and HC level
 - Limited information on DM-TB co-morbidity management at private clinic
- Way forward
 - Continue to screen DM among TB and vice versa
 - Improve DM- TB co-morbidity management
 - Continue to share experience with all stakeholders/implementing partners
 - Increase community awareness on DM, DM-TB co-morbidity

4.13. Advocacy, Communication and Social Mobilization

Advocacy, Communication and Social Mobilization (ACSM) is an integral part of the TB control program. In 2019, the activities NTP always ensure that various ACSM approaches are included in the contents of refresher trainings, workshops and Health education to general population at Health Centre, Communities: Buddhist, School, Patient home etc.

Due to financial resource constraints in 2019, a very limited number of IEC materials were produced in 2019. However, the NTP has been working hard with relevant partners including GFATM, USAID, FHI-360, HSD, OpASHA, KHANA, PSI, CATA produced IEC materials such as poster, educational leaflet on general TB adult and children awareness, MDR-TB, Prevention Infection Control, TB-Diabetic.

In 2019, PSI partnered with the National TB Program conducted a research in Pailin and Battambang (Thmor Koul OD) entitled “**why are people aged 55 or older giving up more than adults**”.

At the mean time, for advocacy and for improving knowledge among general population, NTP has raised awareness of TB on the World TB Day at all levels throughout the country.

To overcome the limitations in the available funds and to further strengthen the ACSM activities in the country, NTP will intensify its plans.

4.14. Research

4.14.1. Third national drug resistance survey

Research activity is one of the national TB control program (NTP)’s priorities. The third national drug resistance survey was started from May to December 2017. This survey is supported by different sources, mainly by Global Fund, FHI-360/Challenge TB project, and US-CDC. In 2018, samples were collected and analyzed in laboratory. In late 2019, the primarily result of the 3rd DR survey shows that estimated prevalence of RR cases among the captured BC cases is 0.9% for new cases and 9.4% for previously treated cases and estimated prevalence of RR by DST among smear-positive cases is 1.1% for new cases and 12.4% for previously treated cases. Final result is expected to be released in early 2020. This result indicates that between 2007 – 2017 the prevalence of DR-TB remains stable. These results reflex a great success of MDR-TB control in Cambodia.

4.14.2. Research project to strengthen pediatric tuberculosis services:

In 2019, NTP and Institute Pasteur of Cambodia under TB-Speed project has continued the implementation of the research project to strengthen pediatric tuberculosis services for enhanced early case detection, which was supported by the UNITAID and INITIATIVE 5%. This research will be finished in 2021. Besides, NTP has been discussing and preparing a study on TB preventive therapy using 3HP involving multi-countries project in collaboration with CHAI. This project entitled “Evaluating the scale up of short course TB preventive therapy (3HP) among people living with HIV (PLHIV) and child household contacts of TB patients at sentinel sites in Cambodia (IMPAACT4TB)”.

4.14.3. Cambodia Patient Pathway Analysis:

In quarter 4 2019, NTP in collaboration with WHO and relevant stakeholders has developed research protocol on “Cambodia Patient Pathway Analysis”. The protocol is being revised and the implementation is expected to be in 2020.

4.14.4. Research on “All-oral shorter treatment regimens for multidrug- and

rifampicin-resistant tuberculosis (MDR/RR-TB) (ShORRT_Cambodia):

The research protocol on All-oral shorter treatment regimens for multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB) has been developed and approved by Cambodian National Ethic Committee for Health Research in late 2019. This research is undertaken under the collaboration between NTP and WHO/TDR. This research will be implemented in 2020.

4.14.5. Cambodia Committee for TB Research

NTP has been collaborating with relevant partners such as NIPH, UHS, WHO, US-CDC, USAID, IPC, NUS, and international and local NGOs to establish Cambodia Committee for TB Research (CCTBR) in the aim to strengthen TB research which is the 3rd pillar to end TB by 2030. As a result, NTP has organized meetings and draft ToR for the CCTBR. NTP expects that this committee will be established and formally operated in 2020.

4.14.6. Other activities related to TB research:

- The national TB control program is discussing with National University of Singapore and other partners to explore/select the study topics for the period 2020-2021.
- In addition, in December 2019, NTP and relevant stakeholders organised a meeting to conduct SWOT analysis on TB research and to identify topics for TB research priority. As a result, several research topics have been identified and prioritised.

4.15. Electronic TB Management Information System

TB-MIS is a web-based tool that enables decision-makers to monitor the status of TB treatment by integrating data across key aspects of TB control. It was developed and managed by CENAT with technical assistance from the USAID funded Health Information Policy Advocacy (HIPA) project. TB-MIS was customized by local programmers using the existing core application e-TB MANAGER¹ to fit the case management flow of Cambodia's TB program. The system captures the registration of DS-TB cases of all health facilities from the paper-based recording forms into web-based application.

¹ e-TB Manager is a web-based tool for managing the information needed by national tuberculosis control programs (NTPs). It integrates data across all aspects of tuberculosis (TB) control, including information on suspected cases, patients, medicines, laboratory testing, diagnosis, treatment, and outcomes. It is developed by Management Science for Health (msh) with open source tools to enable countries to customize the program to fit particular country needs without requiring specific licensing. Uses a comprehensive application programming interface that allows third-party software to integrate with e-TB Manager. It has been applied in East, South and West Africa, Europe and Central Asia, South Asia, Latin America and the Caribbean.

Data entry is done by the OD TB supervisor while the progress monitoring and technical support is done by provincial TB supervisors and team of National TB Program with back-up support by HIPA and HP+. This includes information on TB cases, both DS-TB and MDR-TB, medicines, laboratory testing, diagnosis, treatment, and outcomes. The TB-MIS was successful piloted in three provinces – Kampong Cham, Svay Rieng and Kampong Speu provinces, leading to the national rollout in 2018 in 100 ODs, 114 RHs and 103 separate microscopy centers in Cambodia. HIPA ended on Sept 30, 2018. However, due to request from the leader of CENAT to continue the project, USAID agreed to extend its support HP+ from October 2018 to present in order to ensure full institutionalization of the TB-MIS system and to build CENAT staff’s capacity to provide ongoing technical support to health facilities.

An Addition, Joint Team HP+ and CENAT conducted field visit to follow up TB activities for strengthening capacity of TB supervisors both PHD and OD. Meantime, team also provided on the job training to nine OD-TB supervisors and 132HC’s staff attended – 73 health’s staff from all ODs in Tboung Khmum Province, 38 health’s staff from OD Kratie in Kratie Province and 21health’s staff from OD Kampong Thom in Kampong Thom province where those health center’s staff are willing to learn and entering their own TB data into TB-MIS. 106 HCs who received training out of 1212 HCs (9%) performed TB-MIS by using existing resources available such as computers, internet connection, staff commitment. Among 132 users there were 126 users have been accessing and generated report from TB-MIS.

Beside field visit, team also provide daily technical support to health staff via email, phone call, telegram and team view who has issues need to solve immediately. Moreover, there are 99 ODs out of 101 ODs (97%) nationwide access TB-MIS, 94 ODs out of 99 ODs (95%) have been generated TB indicator report from TB-MIS.

HP+ Cambodia team have worked closely with CENAT team to review the existing template of entry form, and reporting format to improve the quality of data accuracy and completeness of TB program report to supporting strategic planning and decision-making. The national TB Program (NTP) has prioritized gaps such as adding some parameters for tracking the migration and Isoniazid Preventive Therapy (IPT) which is modified into TB Prevention Therapy (TPT). The TPT module includes:

1. Screening closed contact;
2. Treatment;
3. Monitoring/follow up;
4. Outcome of Treatment;
5. TPT indicator report.

A CENAT and HP+ team will pilot the new TPT module in three provinces – Kampot, Tboung Khmum and Siem Reap in April 2020. As part of preparing for piloting, the team start is developing the training curriculum and materials to provide Training of Trainer to CENAT staff in order to strengthen the capacity of NTP staff’ to support the use all TB-MIS functions. We will mobilize resources in order to build capacity of the staff to implement TB-MIS system in the whole country from 2021 onward.

5. Summary of TB Joint Program Review

Cambodia has conducted 3 rounds of Joint Program Reviews (JPR) in 2006, 2012 and 2019. The purpose is to review the performance of the program on the achievement, challenges/gaps and to provide the strategic recommendation to the program. The last one was carried out from 17 and 28 June 2019. There were 23 international and 69 national TB experts participated in the review and gathered information through desk reviews of documents and records, field visits and interviews, and consultations with a wide range of stakeholders.

The objectives of the third JPR were to:

- Review the National TB Programme of Cambodia;
- Note the accomplishments since the last JPR of 2012;
- Identify gaps, constraints and challenges to making progress;
- Make recommendations to help make rapid progress towards ending TB in the country; and
- Inform the development of the next ten-year strategic plan to be prepared keeping in view the TB-related sustainable Development Gold (SDG) target of ending TB in Cambodia.

The finding has highlighted that the program has made major progress towards Ending TB with clear evidence of a 45% decline in the prevalence for bacteriologically confirmed TB from 2002 to 2011². Since 2000, 500,000 TB patients have been cured and 400,000 deaths have been averted. TB incidence in Cambodia has declined from 575 in 2000 to 423 in 2011, and 302 per 100 000 population in 2018.³ MDR-TB levels are kept well under check and the HIV epidemic is also on a steady decline. The treatment success rate among TB patients has been consistently over 90%. Notably, Cambodia has made pioneering innovations in approaches to systematic screening and active case finding to increase TB case detection. In short, the foundations to meet the national commitments – the End TB Strategy and TB-related SDG targets, and actions agreed in the Moscow Declaration and the first United National High Level Meeting (UNHLM) on TB – are all in place.

The country is gearing up to Universal Health Coverage (UHC) and social protection prioritizing poor populations. The TB programme has a strong and stable leadership for several years. There are clear policies, strategies, plans and guidelines for an effective TB response. There is demonstrated willingness and readiness to adopt and scale up innovations to End TB, and importantly, there have been durable national and international partnerships to share the enormous task of ending TB.

Having noted the considerable progress made, the JPR team identified several challenges facing the country's TB response. The prominent among them include the following:

² CENAT report, TB prevalence survey 2011

³ WHO annual global TB report 2019

- A top challenge for a comprehensive TB response has been **deficient funding** which is currently limiting progress and will continue to hamper further progress towards meeting committed national TB targets. The current and projected levels of finances are clearly insufficient to implement the country's national strategic plan that ends in 2020 and beyond. Large funding gaps persist as does a heavy dependence on donor funding.
- Another major and persistent problem has been that **as many as one third of the estimated TB cases in the country go undetected or unreported**. The main reasons for this include inadequate access to recommended sensitive tools for TB case detection – chest X-ray for screening and rapid molecular testing for diagnosis; non-engagement of private practitioners; incomplete engagement of public and private hospitals; and limited geographic coverage of systematic screening and active case finding interventions. Notably, TB is not a notifiable disease in Cambodia; this may also be a reason for under-notification.
- Although the National TB Programme has very strong and long-standing partners contributing substantially to the national TB response, their engagement is confined to **time-bound and resource-limited projects tied up to funding availability from donors**. Cessation of funding has led to interruption or termination of several projects including those addressing important issues such as increasing TB case detection through innovative approaches.
- **Many important initiatives** such as private provider engagement, hospital engagement, active TB case finding, workplace TB management though successful, have either been **discontinued** (public-private mix for instance) or have limited geographic coverage.
- On the demand side, about a third of patients may face **catastrophic costs due to TB**, especially non-medical expenses such as transport and wage loss, adding to economic burden.
- Importantly, **TB prevention** – starting with preventive treatment of people living with HIV (PLHIV) and children and infection control measures – need country wide scaling up and finally,
- Multisectoral engagement is essential to end TB. To that effect, CENAT has initiated and established collaboration with departments within the Ministry of Health (MOH) and with other relevant ministries. However, these multisectoral initiatives are modest in their scope and nature.

Based on the key success, programmatic strength and gaps, the review has provided clear set of recommendation to the ministry of the health and the TB program as following:

- a. **To the Ministry of Health, Kingdom of Cambodia**
 - **Secure and sustain enhanced funding to End TB in Cambodia**

The Ministry of Health (MOH) need to make the case for investment in TB to contribute to the economic development of Cambodia considering that the current financing of the national TB response is only a half of what is required and the estimated future funding will also be insufficient to meet committed national targets for TB reduction. The MOH should work with the Ministry of Economy and Finance (MEF) to ensure that government financing for a multisectoral TB response is increased and sustained. This is essential also to reduce overreliance on external donors

– **Set up and use a high-level mechanism for a national multisectoral effort to End TB**

Since addressing drivers of the TB epidemic necessitates inputs from multiple sectors beyond health, ending TB in Cambodia will require a very high level of political commitment. This JPR inferred that beyond the currently existing and functioning committees and platforms, there is a scope to set up a high-level and high-profile mechanism, possibly under the leadership of **Samdech Akka Moha Sena Padei Techo Hun Sen**, Prime Minister of Cambodia. Convening power and authority of a high-level mechanism may be essential to elicit sustained collaboration and coordinating with other ministries such as finance, labour and education as well as those responsible for migrant populations and prison health services.

– **Sustain strong leadership of CENAT and support partnerships with all stakeholders**

A stable and strong leadership by CENAT spanning several years deserves much credit for the significant progress Cambodia has achieved in tackling TB. In order to address shortcomings identified in this JPR and coordinate sustained efforts that are still required to scale up and diversify the TB response, the current leadership needs further strengthening. At the same time, MOH needs to meet requirements of properly trained human resources for an expanded TB response especially for implementation of new and innovative strategies and tools. In this regard, one of the greatest strengths of NTP has been working in partnerships with all stakeholders including civil societies and communities which have contributed substantially to programme implementation. These partnerships will have to be further strengthened for scaling up successful initiatives and commencing new ones.

– **Make TB a notifiable disease and regulate sale and use of all anti TB medicines**

Under-notification of diagnosed TB cases is an important cause of the problem of “missing” TB cases worldwide. For this reason, TB case notification is mandatory in most countries. In Cambodia too, not all public and private hospitals notify all TB cases to the national TB programme. Further, while Cambodia has been successful in restricting availability and use of first line anti-TB medicines in the public sector, some of the second-line TB medicines especially quinolones are widely available in private pharmacies and used for treating health problems other than TB. Therefore, resistance to quinolones has been shown to be high in the country. In view of this, MOH needs to extend and effectively enforce current regulatory measures for TB to:

- making notification of TB cases mandatory for all care providers
- regulating the sale and use of all anti-TB medicines including second line drugs used in the treatment of drug-resistant TB.
- **Ensure social protection for people with TB and their families**

Evidence indicates that TB patients and their families bear a substantial financial burden due to TB and these are due especially to the non-medical expenses such as those for transport and loss of wages. For a section of poor people with TB and their families these costs reach catastrophic proportions and lead to their further impoverishment as a result of TB. Cambodia's Health Equity Fund has a benefit package for TB patients which is currently available to identified poor TB patients. Considering that TB is largely a disease of poverty and a tracer for progress on the Sustainable Development Goals, the JPR team strongly recommends that all TB patients, by default, should be eligible to receive the benefit package that reimburses providers for providing TB care and compensates indirect costs of TB care to the patients and affected families.
- b. To CENAT and Partners**
 - **Provide universal access to quality chest X-ray and rapid test for TB case detection**

WHO advises using chest X-ray as a screening tool and Xpert MTB/RIF as the diagnostic tool for early TB case detection. While Cambodia has plans to progress in that direction, currently there are issues related to availability, access and quality of chest X-rays. Furthermore, most X-ray machines use conventional film-based technology. With regards to Xpert MTB/RIF, besides availability of the machines at the OD level, an efficient system to transport sputum samples from peripheral health centres needs also to be in place. Access to Xpert MTB/RIF is not available in about a third of ODs while a specimen transport system for community screening exists in less than half ODs. This JPR recommends CENAT to improve ease of access to Xpert MTB/RIF including sample transport and to scale-up the network of functional X-ray machines through repair, maintenance, upgrade to digital technology; and procurement of additional Xray machines, especially digital ones, and more Xpert MTB/RIF machines.
 - **Expand active case finding with attention to key populations**

Community outreach for systematic screening for TB and active case finding (ACF) is essential to find missing TB cases. Cambodia has demonstrated that ACF not only contributes substantially to TB case detection but can also be cost-effective as demonstrated for targeted household and neighbourhood contacts. Despite this, ACF coverage is currently limited to 14 of 102 ODs, and 9 out of 28 prisons while TB screening activities are limited to 46 of 102 ODs. This JPR lauds Cambodia's pioneering effort in community outreach to increase TB case detection and supports scaling up of ACF across the country including systematic screening of key populations such as PLHIV, elderly people, migrant populations and prison inmates.
 - **Engage private providers and strengthen hospital involvement**

Engaging private pharmacies and private practitioners in identifying and referring people with TB and strengthening TB management in public and private hospitals

through internal coordination and networking with peripheral health centres have been shown to help early detection and notification of all TB cases and improved case management. These initiatives, however, have been limited largely to time-bound projects dependent on external funding. As a result, currently, private providers are not engaged in TB case detection and all hospitals do not notify all TB cases presenting to them. This JPR recommends scaling up engagement of private care providers through proven and innovative approaches based on diverse country experiences in other Asian countries, and involvement of all public and private hospitals, making them integral to the national TB response.

– **Scale up preventive TB treatment and infection control**

The End TB Strategy gives great importance to TB prevention. Specifically, it includes treatment of Latent TB Infection (LTBI) and infection control. We observed that Cambodia has some way to go with regards to TB prevention. Only 21% of newly enrolled PLHIV and 44% of child contacts under 5 years are on preventive treatment. Infection control and prevention (IPC) in health facilities, undertaken to protect patients, health care workers (HCW) and visitors is not yet adequately implemented. This JPR recommends phased scale up of active contact tracing approaches and preventive TB treatment, including implementation of a plan for transition to new LTBI regimens, and IPC in general and across the country.

– **Pursue innovation and research**

Epidemiological, clinical and operational research in Cambodia has been of great value to not just the national but also the global TB response. Examples include two consecutive national prevalence surveys, drug resistance surveys and various studies related to ACF. National and local innovations such as specimen transport systems, use of mobile technology for patient and provider support, digital TB registers and an electronic monitoring and evaluation system have shown to improve programme implementation in Cambodia as in many other countries. Institutionalizing TB research and innovation will add great value to Cambodia's TB response. This JPR team has a number of specific recommendations to pursue innovation and research including creating a platform for TB researchers and innovators, formation of a national TB research network for ongoing interactions, development of a prioritized national TB research agenda, attracting and supporting young researchers for TB related work, developing national and international collaborations and contributing to resources mobilization for TB research.

In general, based on the findings and recommendations of the JPR, NTP will review the report and determine the priority, turning it into practical action for improving TB control at the national level.

6. Targets for 2020

NTP has recently set the targets in line with the End TB Strategy as well as SDG targets by 2030, in which we aim to reduce incidence of 80% and mortality rate of 90% in 2030, compared to 2015 figures.

For 2020, Cambodia NTP has the main targets as below:

- Maintain the treatment cure rate of over 85% and success rate of at least 90 %.
- Detect all forms of TB: 34,500 cases
- Detect bacteriologically confirmed TB: 12,000 cases
- Detect Childhood TB: 6,210 cases
- Detect MDR-TB cases: 145 cases
- Promote intensified case detection through active and semi-active case finding activities.

7. Acknowledgement

With the support from the Government and Ministry of Health, NTP has achieved tremendous results. The Royal Government of Cambodia and Ministry of Health of Cambodia has given high priority to TB Control. The above achievements are also contributed by active participation from all healthcare workers across the country with the supports and collaboration from various partners. These partners include local authority, community, volunteer, technical and financial supports from non-governmental and international organizations.

NTP would like to express our sincere thanks to:

- The Government and Ministry of Health for their supports.
- All healthcare workers especially TB staff across the country for their active participation.
- NGO/IO partners especially WHO, Global Fund (GFATM), USAID, US-CDC, ADB, Stop TB Partnership/GDF, TB-REACH, JATA/RIT, IOs and NGOs for their both technical and financial supports to NTP.
- Local authority, community, and volunteer as well as other partners for their supports and collaboration.

Director of CENAT

H.E Dr. Mao Tan Eang, MD, MPH

Editor:

From NTP:

1. **Dr. Mao Tan Eang**
2. **Dr. Tieng Sivanna**
3. **Dr. Huot Chan Yuda**
4. **Dr. Khloeung Phally**
5. **Dr. Prum Chom Sayoeun**
6. **Dr. Khun Kim Eam**
7. **Dr. Pheng Sok Heng**
8. **Dr. Nou Chanly**
9. **Dr. In Sokhanya**
10. **Dr. Peng Vesna**
11. **Dr. Kien Sorya**
12. **Dr. Seng Saorith**
13. **Dr. Long Ngeth**
14. **Dr. Ngoun Chandara**
15. **Dr. Leng Chhenglay**
16. **Dr. Nop Sothearattanak**
17. **Dr. Kim Samoeurn**
18. **Dr. Bith Bunleng**
19. **Mr. Chhoeung Vandet**
20. **Miss. Chan Danet**
21. **Mrs. Ro Kimhong**
22. **Miss. Lay Ratana**
23. **Dr. Song Ngak**
24. **Dr. An Yom**



Printing Supported by GFATM