

KINGDOM OF CAMBODIA
NATION RELIGION KING

MINISTRY OF HEALTH

TUBERCULOSIS REPORT 2017



March 2018

Prepared by

National Center for Tuberculosis and Leprosy Control

អង្គបទជាតិសាងសង់ក្លេស

ENGLISH VERSION



មជ្ឈមណ្ឌលជាតិកំចាត់រោគរបេង និងរាងសិន

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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.

According to the 2017 WHO Global TB Report, Cambodia had TB incidence of 345 per 100,000 populations, while the mortality rates of 20 per 100,000 populations in 2016.

The followings are the main achievements on TB control in 2017 and direction/targets for 2018 and the years beyond.

2. Tuberculosis Situation in the World

Worldwide, 10.4 million people are estimated to have fallen ill with TB in 2016; of which only 6.3 million new cases of TB were detected and reported to WHO. In the same year, there were an estimated 1.3 million TB deaths among HIV-negative people and additional 374,000 deaths among HIV-positive people. TB is the leading cause of death among infectious diseases, ranking above HIV/AIDS.

Globally, the treatment success rate was 83%.

3. Main Achievements

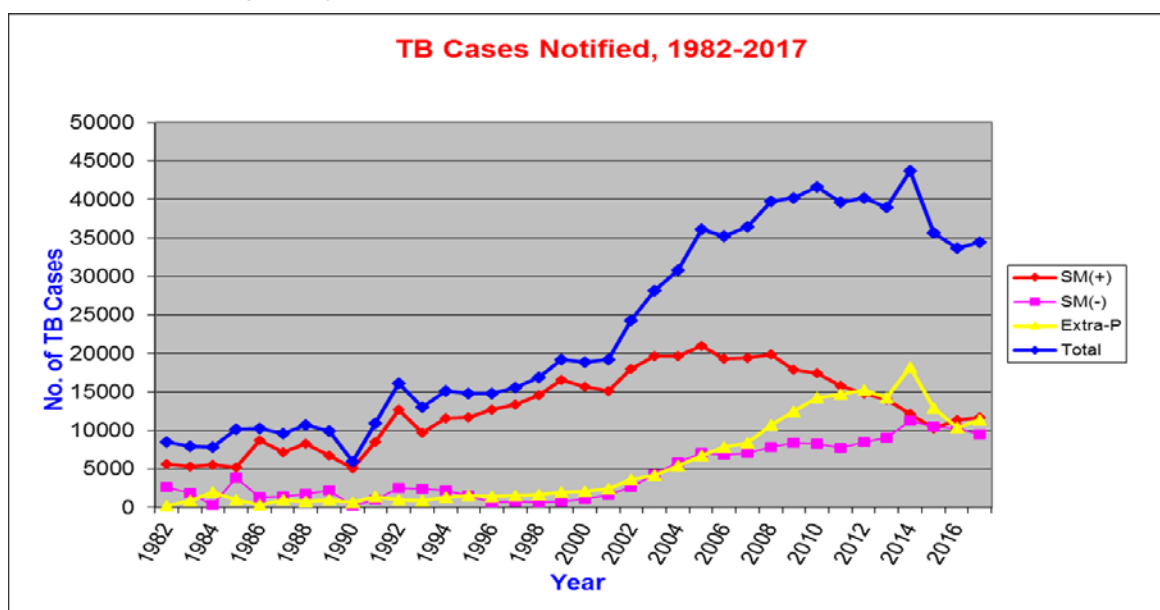
National TB Control Program has achieved the main results as below:

3.1. Service Coverage

The coverage of TB service has been maintaining at 100% in all health centers nationwide. Community DOTS (C-DOTS) has been expanded from 506 health centers in 2008 to 861 health centers in 2017. TB/HIV collaborative activity has been implementing in all ODs in 2017 (compared to only 57 ODs in 2008) while TB in children activity was implemented in 25 ODs. In addition, the TB activities have been implementing in 13 factories and 17 prisons in 2017. MDR-TB treatment sites have increased from 9 in 2010 to 11 in 2017. In total, there are 1,306 health facilities with TB services across the country in 2017.

3.2. Case Detection

In 2017, NTP has detected a total of 34,467 TB cases, of which 11,736 were bacteriologically confirmed New TB cases.



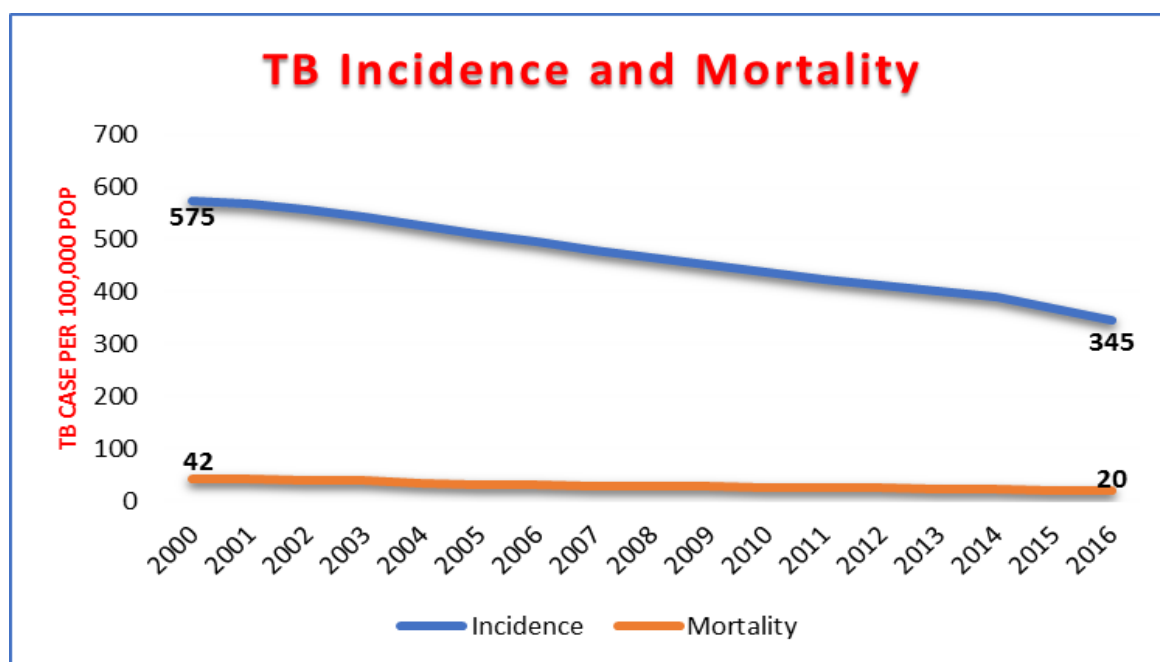
3.3. Treatment

The Treatment Success Rate of TB has been maintained over 90% during the last 20 years. For instance, NTP has achieved 93% of the treatment success rate in 2017 which surpassed the target of 90%.

3.4. Mortality, Incidence, and Prevalence

In the recent years, Cambodia has achieved remarkable results in TB control. The 2017 WHO Global TB Report has shown that TB mortality rate dropped from 42 per 100,000 population (pop) in 2000 to 20 per 100,000

pop in 2016, which equal to 52% reduction. While the incidence has also fallen from 575 per 100,000 pop in 2000 to 345 per 100,000 pop in 2016, which equal to 40% reduction.



Ministry of Health's NTP has already achieved MDG targets 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 main achievements mentioned above, the National TB Control Program has remarkably achieved the results, which related to the main interventions as following:

4.1. Drug Resistance Tuberculosis

The Cambodia NTP started implementing programmatic management for drug resistant TB (PMDT) since 2006 in collaboration with partners, especially World Health Organization (WHO), Cambodian Health Committee Organization (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 second National Drug Resistant Survey has been conducted in 2017 and its laboratory results and final reports are under process.

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

In 2017, there were 1,313 DR-TB suspects tested by Xpert MT/RIF. Of those, 136 MDR-TB cases were detected and treated. This achievement is more than in the previous year (101 MDR-TB cases in 2016). While there were 7 cases as poly/mono-drug resistant in 2017.

The figure below shows drug-resistant TB suspects that were tested by Xpert (figure 1) and drug-resistant TB cases treated during 2007-2017.

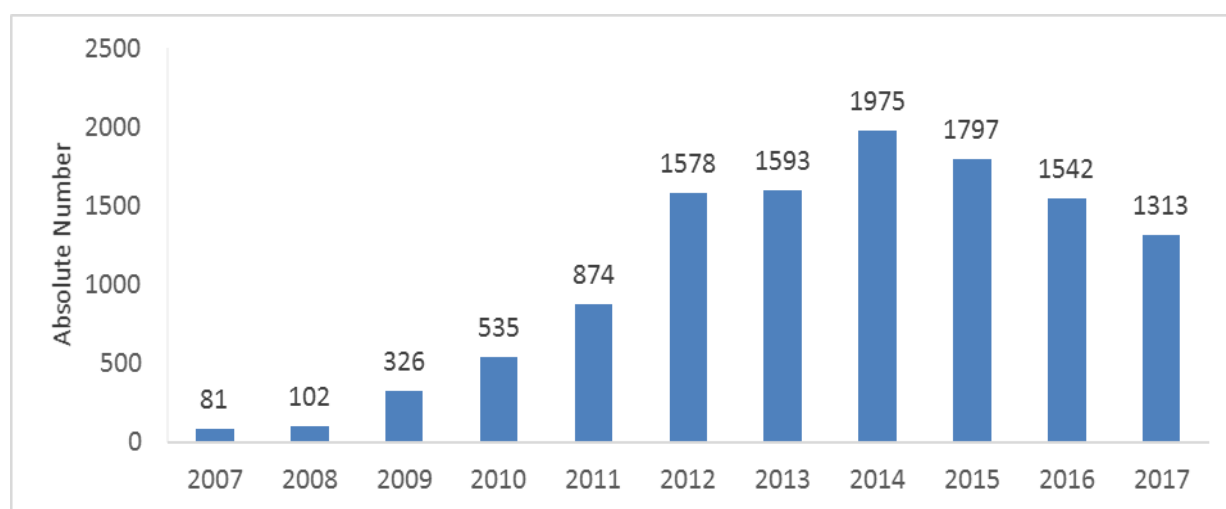


Figure 1: Number of drug-resistant TB suspects that were tested by Xpert

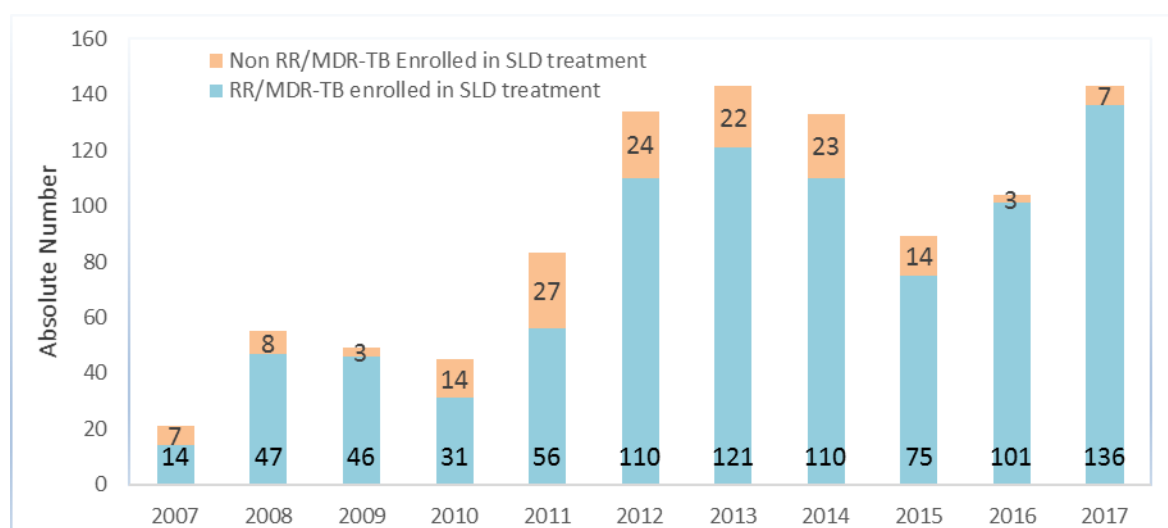


Figure 2: Number of drug-resistant TB cases treated with second-line drugs during 2007-2017

Cambodia has 11 MDR-TB treatment sites with 57 isolation rooms by the end of 2017.

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 had increased from 64% in 2007 to 86% in 2011 cohort (Figure 3). This treatment success rate has declined from 86% in 2011 to 72% in 2015 while the death rate increased from 7% to 16% in the same period.

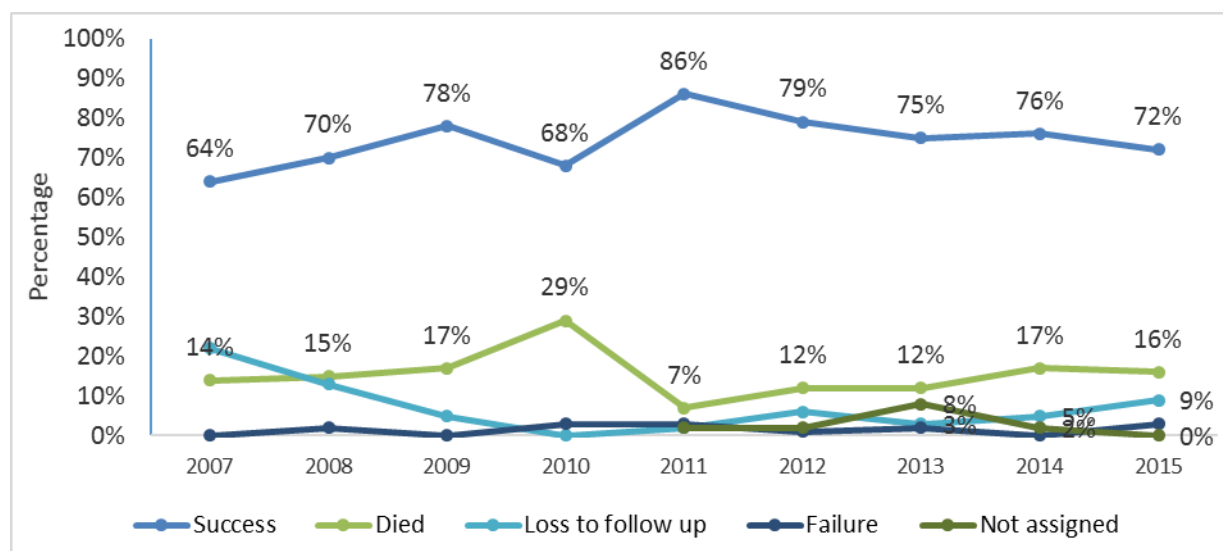


Figure 3: RR/MDR-TB treatment outcome cohort: 2007-2015

We shifted from the long treatment regimen (18-24 months) to shorter treatment regimen (9 months) in December 2017 of which there were estimated about 75% are eligible for shorter treatment regimen.

4.2. Collaborative TB/HIV activities

4.2.1. Meeting / Workshop

In collaboration with National Center for HIV/AIDS, Dermatology and STD (NCHADS), National Center for TB and Leprosy Control (CENAT) jointly conducted Three I's cluster meeting workshop in US-CDC focused provinces at the beginning of the US-CDC project.

The main objectives of the meeting were to monitor and evaluate the progress being made toward Three's Is Strategy and share experiences and good practices among OI/ART sites through the presentation from different sites of OI/ART services.

In 2017, 5 times of 3Is cluster meeting were conducted in 4 cluster sites where 2 times in Battambang cluster site which consists of Battambang, Pursat, Pailin, Banteay Meanchey and Siem Reap provinces; 1 time in Sihanouk cluster site which consists of Sihanouk, Kampot, Kampong Speu and Koh Kong provinces; 1 time in Kampong Cham cluster site which

consists of Kampong Cham, Tbong Khmom, Kampong Thom, Prey Veng and Svay Rieng provinces and 1time in Phnom Penh cluster site which consists of Phnom Penh, Takeo, Kandal, Kampong Chhnang and OI/ART sites in Phnom Penh.

4.2.2. Training

With the financial support from GFATM, National Center for TB and Leprosy (CENAT) in collaboration with National Center for HIV/AIDS, Dermatology and STD (NCHADS), has an opportunity to conduct trainings on TB diagnostic workup for PLHIV to the remaining staff and physicians who work at OI/ART sites. The participants in each training session included PHD TB supervisor, OD TB supervisor and physician and staff of OI/ART team (including TB physicians). In 2017, only one TB/HIV diagnostic workup training course was conducted at Preah Sihanouk province; and the participants were from Modulkiry, Kratie, and Sihanouk OI/ART.

4.2.3. Supervision

A main objective of supervision is to monitor and follow up the performance of collaborative TB/HIV activities and provide job coaching at the sites visited if there is any mistake or misunderstanding during the implementation. The activities were jointly conducted by both national programs in collaboration with US-CDC to provinces where 3Is strategy is being implemented.

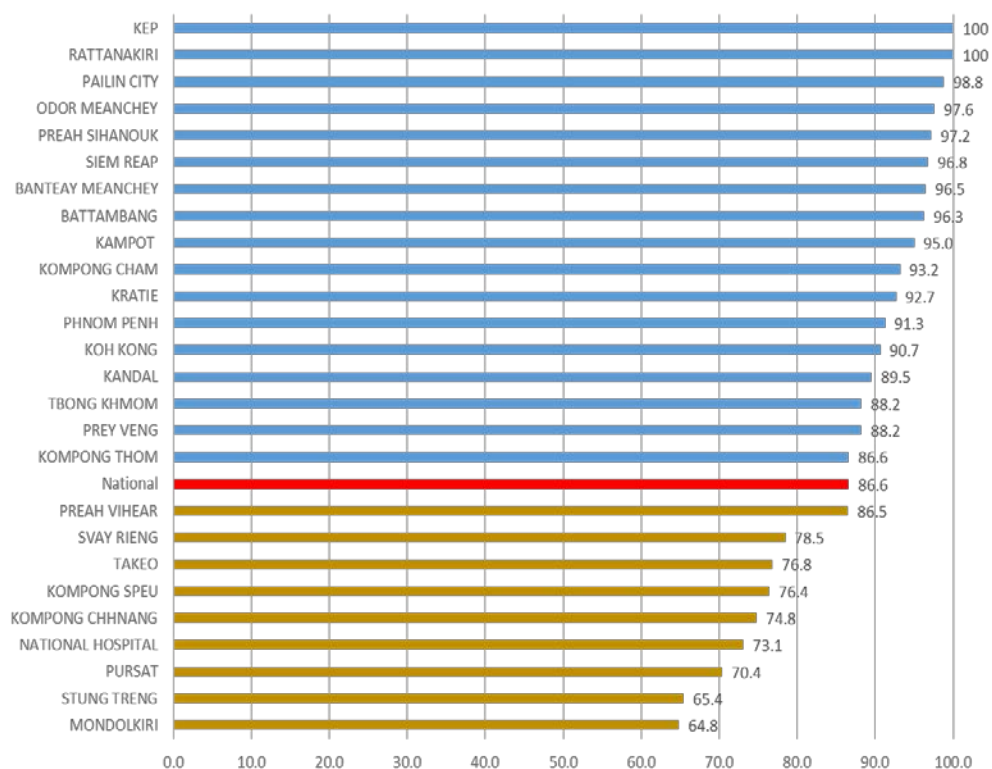
The challenges found to be addressed in the field were: 1) difficult to collect sputum from PLHIV who have symptom screening positive with dry cough; 2) OI/ART site without Xpert machine and no budget of transportation of specimen of PLHIV to Xpert sites; 3) workload for the staff at the field; and 4) shortage in number and knowledge of staff or physicians who are working at OI/ART and TB as well.

4.2.4. TB/HIV Data:

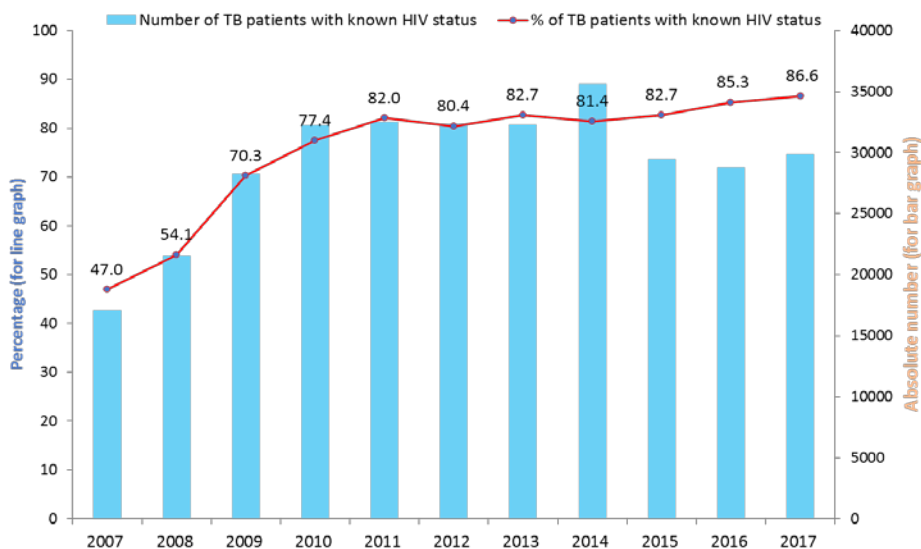
Percentage of registered unknown HIV status TB patients referred and tested for HIV (tested on sites mostly at health centers where the activity has been implemented in the middle of 2014) was increased gradually from 54% in 2008 to 70.59% in 2009, to 79.28% in 2010, to 81% in 2014, to 82.77% in 2015 and to 85% in 2016 and to 86.4% (29,238/33,856) in 2017.

HIV / AIDS Among TB Patients 2017									
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	7,961	7,828	133	6,769	6,705	29	6,676	154	154
2	7,851	7,710	141	7,247	7,119	45	7,074	177	177
3	9,404	9,227	177	7,840	7,607	37	7,570	204	195
4	9,251	9,091	160	8,194	7,837	26	7,811	178	172
total	34,467	33,856	611	30,020	29,238	137	29,101	713	698

Proportion of HIV testing among registered TB patients by different provinces, 2017

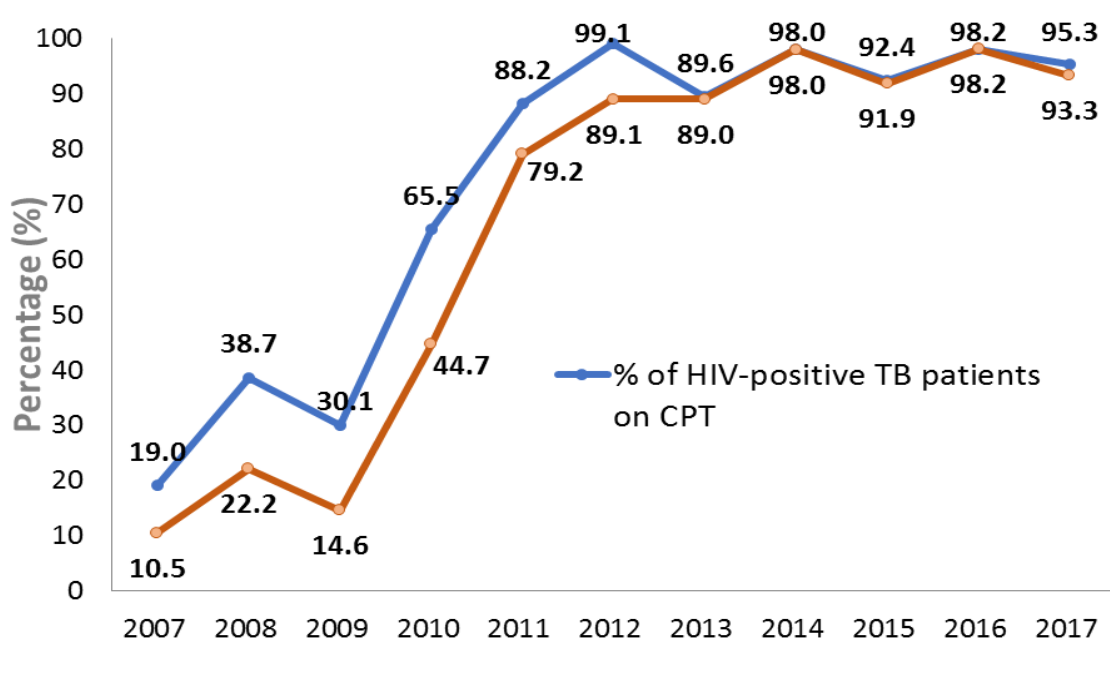


Number and Proportion of registered TB patients with HIV test results from 2007 to 2017



HIV positive TB patients who received Cotrimoxazole Preventive Therapy (CPT) increase from 65% in 2010 to 92% in 2015 and to 98.2% in 2016 and to 95.3% in 2017. Anti-Retroviral Treatment (ART) among TB/HIV patients also increase from 45% in 2010 to 92% in 2015 and to 98.2% in 2016 and to 93.3% in 2017 (Target $\geq 90\%$).

Number and proportion of HIV+ TB patient received CTP and ART from 2007 to 2017



Based on NCHADS report, TB symptom screening among newly HIV positive clients has been increasing from 80% (2,562/3,193) in 2016 to 81% (2,672/3,280) in 2017 but to refer those who have symptom screening positive for TB diagnostic workup is still remain 80% since referral mechanism is well functioning (Xpert machine is not available to all OI/ART sites). 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 and to 2,379 in 2016 and to 2,567 in 2017.

TB Among PLHIV 2017									
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	910	467	721	51	43	2	30	126	629
2	971	566	754	31	29	1	14	75	612
3	1,102	744	794	35	65	4	39	148	487
4	1,187	812	1,006	45	49	37	42	170	839
Total	4,170	2,589	3,275	162	186	44	125	519	2,567

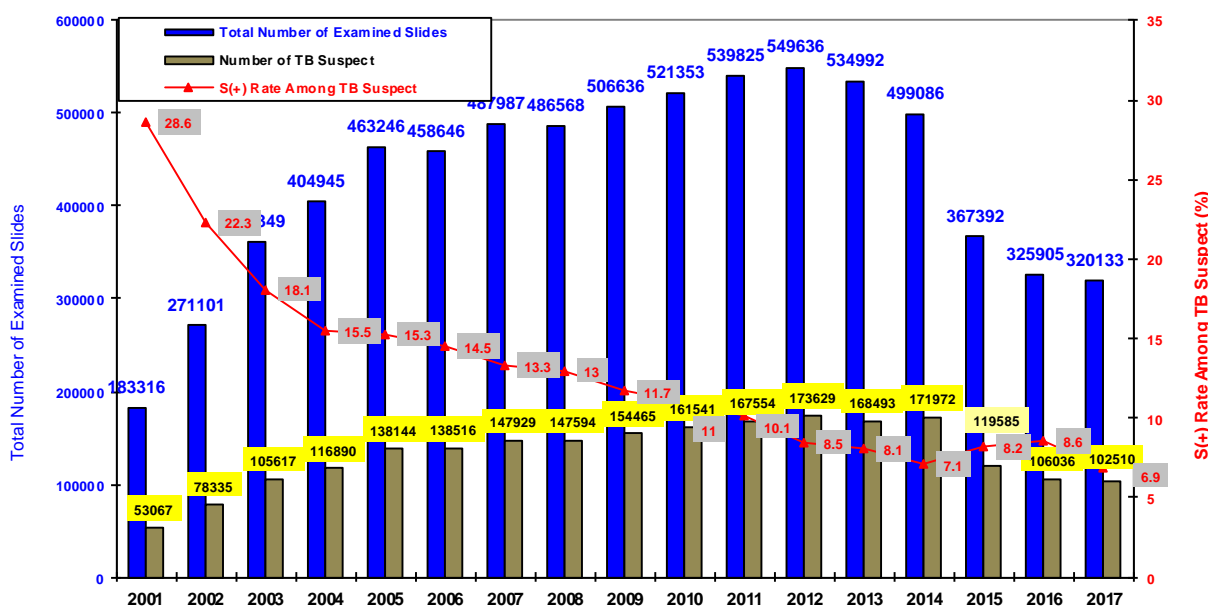
4.3. Diagnosis by Bacteriological Examination

4.3.1. Diagnosis by Smear Microscopy

The total number of slides that National Tuberculosis Program used for TB smear examination in 2017 was 320,133 (detection and follow up), of which 300,202 slides were for detection. The positivity rate among smear examination for case detection was 6.9%.

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 98.8% with false positive and false negative rates of 1.8% and 1.1% respectively for the 3rd Quarter of year 2017.

Below chart is yearly smear microscopy report from 2001 to 2017

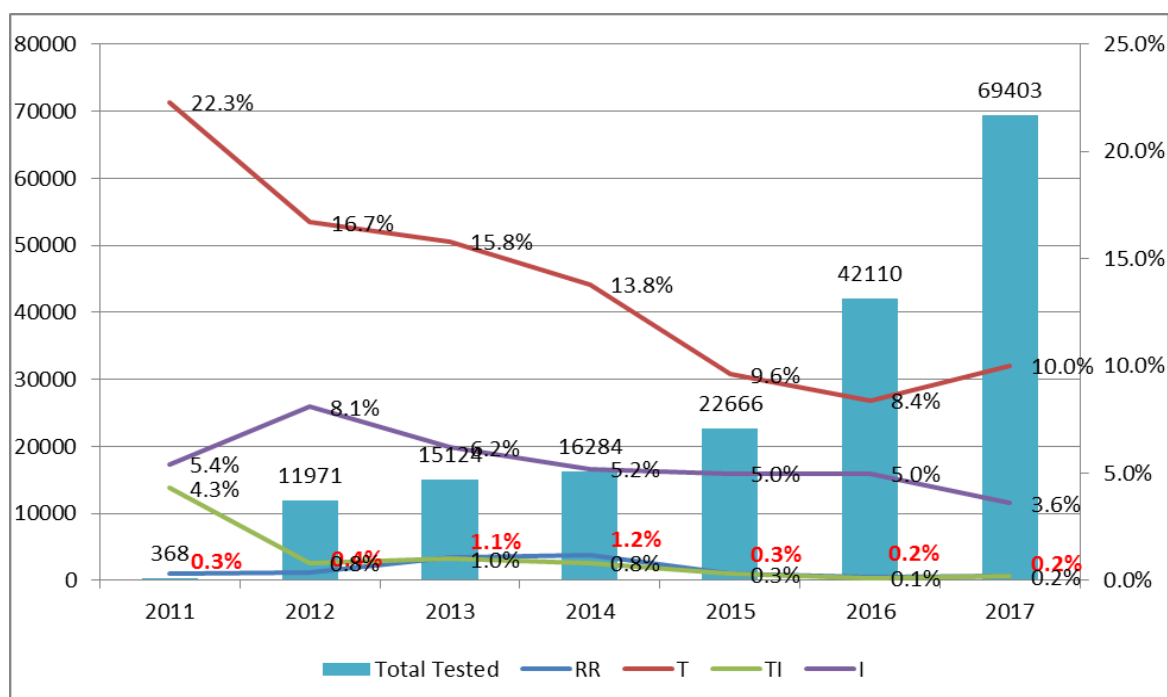


4.3.2. Diagnosis by GeneXpert, Xpert MTB/RIF

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 the World Health Organization in late 2010 and currently the 75 sets have been using. Among these 75 sets, 69 sets (at 64 sites) are used for routine activities. This test is 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 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 increases year by year, i.e. in 2017, national program used 69,403 tests with the results as following: Rate of MTB detected and Rifampicin resistant detected (RR) 0.2%, MTB detected and Rifampicin not detected (T) 10%, MTB detected and Rifampicin resistant indeterminate (TI) 0.2% and test Error (I) 3.6%.

Below chart is yearly Xpert MTB/Rif report from 2011 to 2017



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 the National Center for TB and Leprosy 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 National Center (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 2017, three culture center laboratories (CENAT, Battambang and Kampong Cham) received 3,584 specimens to do culture for TB with positive rate of 23.4%.

4.3.4. Training

In 2017, National TB Laboratory conducted 3 refresher training courses on utilization of GeneXpert machine to 60 participants. These courses were supported by CoAg. CENAT/US-CDC.

4.4. Childhood TB

Childhood TB is one of the priority of NTP. There were 6,757 childhood TB cases nationwide notified and treated in 2017 (See the figure below). We have been using the new pediatric drugs formulation, which is more effective/better than the old one, since August 2017.

After JATA has ended by 2014 its TB CARE I project funded by USAID and implemented in 27 ODs, NTP has maintained and strengthened childhood TB activities in 25 ODs supported by USAID, most of them are former ODs implementing childhood TB under TB CARE I project.

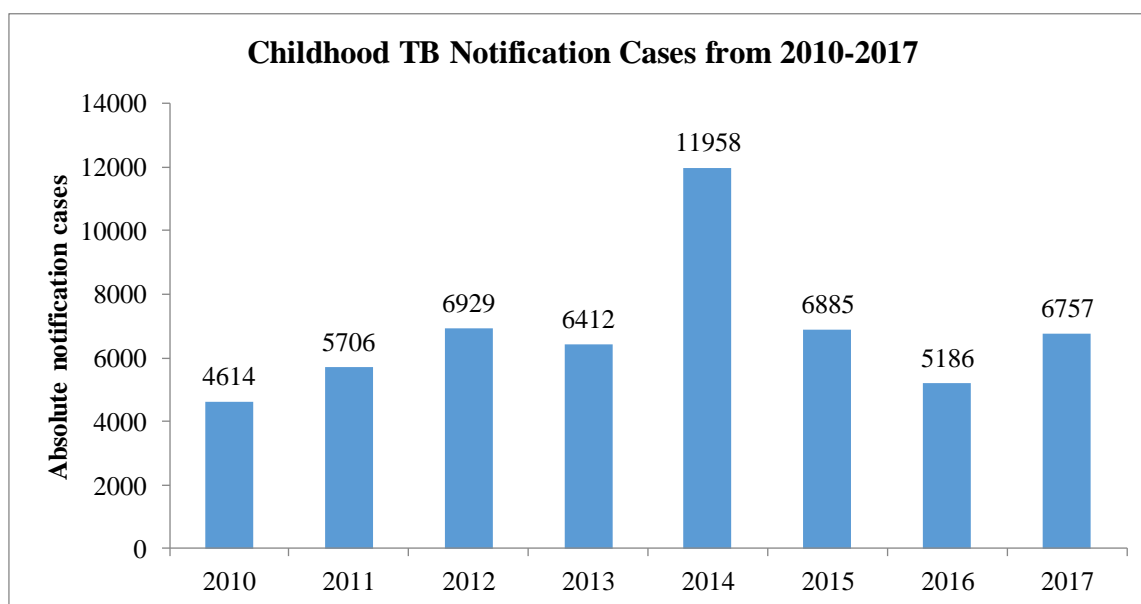


Figure 1: Childhood TB Notification cases in 2010-2017

Currently, childhood TB activities supported by USAID has been implementing by FHI-360 under Challenge TB project collaborated with ECH project. This project has been implementing 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. Challenge TB project collaborated with ECH project supported contact investigation activity to identify TB suspected children and refer them to referral hospital for TB diagnosis. Childhood TB is becoming a routine activity in community and health center/referral hospital. As a result, through contact investigation, the project has notified 3,516 childhood TB cases, which equal to 52 % of the country's total 6,757 childhood TB cases in 2017. The number of children under five years old received IPT increases compared to 2016 (see figure below).

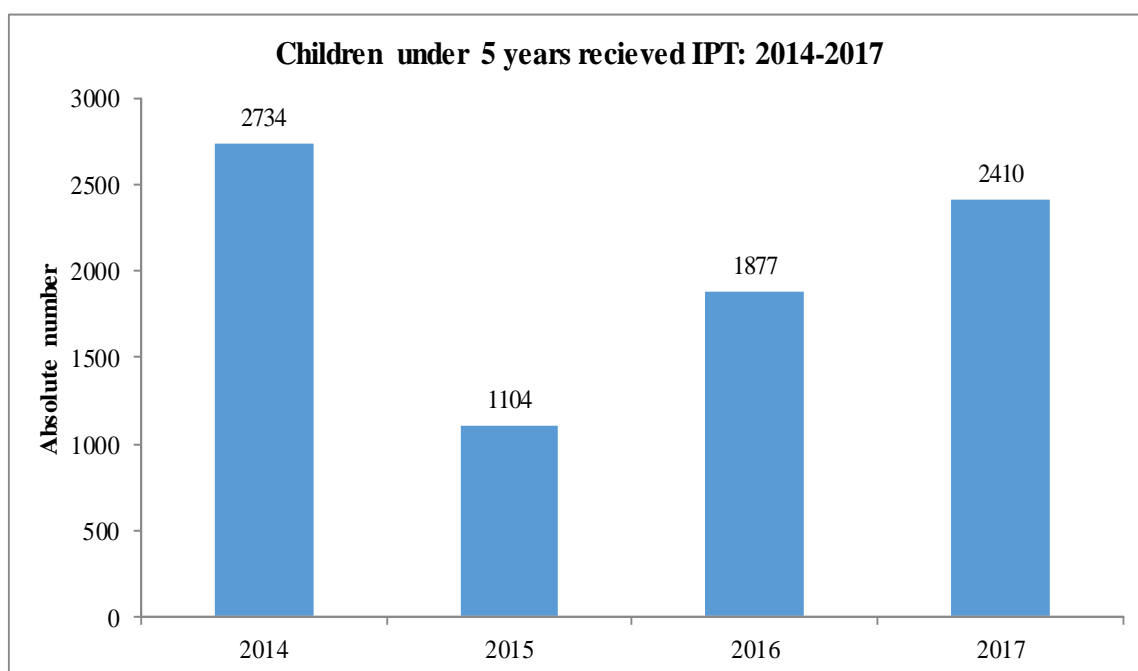


Figure 2: Children under 5 years old received IPT in 2014-2017

Challenge:

Challenge TB and ECH projects that collaborate with NTP will end by March of 2018. Meanwhile, grants for supporting TB program from April 2018 onward remains uncertain and is not yet committed by other partners.

4.5. Financing

The National Tuberculosis Program has clearly identified a 7-year National Strategy 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\$35 million per year. Budget plan for 2017 was developed based on this National Strategy 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 December 2017, The Grant Agreement between Ministry of Economy and Finance as the new Principal Recipient and the 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 will provide fund support to TB program with the total amount of about US\$13.7 million and 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 (SSI) namely CHC, CRS, HPA, OpASHA and RHAC. In 2017, USAID still supported NTP under the two projects, namely “Challenge TB” implemented by FHI-360 and “Empowering Community for Health (ECH)” implemented by RACHA. US-CDC also continued to support NTP.

In addition to these grants from development partners, Royal Government of Cambodia is increasing fund allocation from National Budget to TB program including 30% contribution for purchasing adult TB Drug in 2017. In 2017, NTP received funding support from four main sources, namely National Budget, The Global Fund, USAID/US-CDC, and TB Drugs and equipment from GDF/Stop TB Partnership.

However, the funding that NTP can mobilize may not be sufficient for more aggressive TB control to meet the new direction since some projects will end by 2017.

4.6. Drug and laboratory supplies

Proving highly important in TB Control, TB Drug Management (TBDM) is deemed the core element of the DOTS program. 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. Ensuring uninterrupted of TB drugs, reagents, and consumables 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 through quarterly report of NTP, monthly report of CMS and system management of drugs of DDF in order to ensure the uninterrupted supply and proper management of good quality of anti-TB drugs, reagents and consumables to TB networks.

In 2017, NTP received First Line Drugs (FLD) for treating adult and childhood TB patients 14 shipments (from national budget 01 shipment, under the Global Fund New Funding Model (GF-NFM) grant 04 shipments, and United States Agency for International Development (USAID) under Bridge Financing Project 09 shipments).

Table: First Line Drugs procured in 2017

	Product and formulation	Source			Total Quantity (Tablet or Vial)
		MoH	GF	USAID	
	<i>Adult formulation</i>				
RHZE	Rifampicin/Isoniazid/Pyrazinamide/Ethambutol 150/75/400/275 mg			5,241,600	5,241,600
RH	Rifampicin/Isoniazid 150/75mg			10,483,200	10,483,200
S	Streptomycin 1g			99,000	99,000
	Water for Injection 5ml			99,000	99,000
	Syringe + Needle 5ml			99,000	99,000
Z	Pyrazinamide 400mg			247,296	247,296
H	Isoniazid 300mg		1,460,256		1,460,256
Vit. B6	Vitamin B6 10mg	5,000,000			5,000,000
	<i>Paediatric formulation</i>				
RHZ	Rifampicin/Isoniazid/Pyrazinamid 75/50/150 mg	695,520	1,275,120		1,970,640
RH	Rifampicin/Isoniazid 75/50 mg	1,391,040	2,550,240		3,941,280
E	Ethambutol 100 mg	157,500	139,000		296,500
H	Isoniazid 100mg		336,000	1,567,600	1,903,600

Meanwhile, NTP received First Line Drugs (FLD) for treating adult TB patients from National Budget will be contribute 30% and United States Agency for International Development will also contribute 70% of the annual need.

In addition 2017, NTP received Second Line Drugs (SLD) for drug resistance TB treatment from under the Global Fund New Funding Model (GF-NFM) grant 04 shipments.

Table: Second Line Drugs procured in 2017

	Product and formulation	Source	Total Quantity
		GF	(Tablet, Capsule, Vial, Sac)
Cm	Capreomycin 1g	2,102	2,102
Km	Kanamycin 1g	38,260	38,260
Cs	Cycloserine 250mg	136,000	136,000
Eto	Ethionamide 250mg	361,200	361,200
Lfx	Levofloxacin 250mg	318,600	318,600
PAS	Para Aminosalicic Acid Sodium 5.52g eq. to 4g PAS	27,200	27,200
Mxf	Moxifloxacin 400mg	237,200	237,200
E	Ethambutol 400mg	207,648	207,648
PZA	Pyrazinamide 400mg	279,552	279,552
Cfz	Clofazimine 100mg	49,600	49,600
Lnz	Linezolid 600mg	890	890
H	Isoniazid 300mg	37,632	37,632

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

With the support and collaboration from US-CDC, the NTP successfully performed the following activities related to strengthening TB infection control (TBIC).

In 2017, the NTP were conducted trainings TB IC to Person responsibilities IPC hospital, TB ward and Medicine TB supervision PHD successfully at the 15 hospital province and quarterly supervisory visits to 17 hospital implementation (Hospital CENAT, Hospital Pursat, Hospital Battambang, Hospital MongkolBorey, Hospital Siem Reab, Hospital Pailin, Referral hospital Bakan, Referral hospital Krakor, Referral hospital Krovanh, Referral hospital Mong Russey, Referral hospital ThmorKol, Referral hospital Sampov Lun, Referral hospital Serey Sophorn, Referral hospital PoiPet, Referral hospital ThmorPork, Referral hospital PreakNetPreak, Referral hospital Phnom Srok).

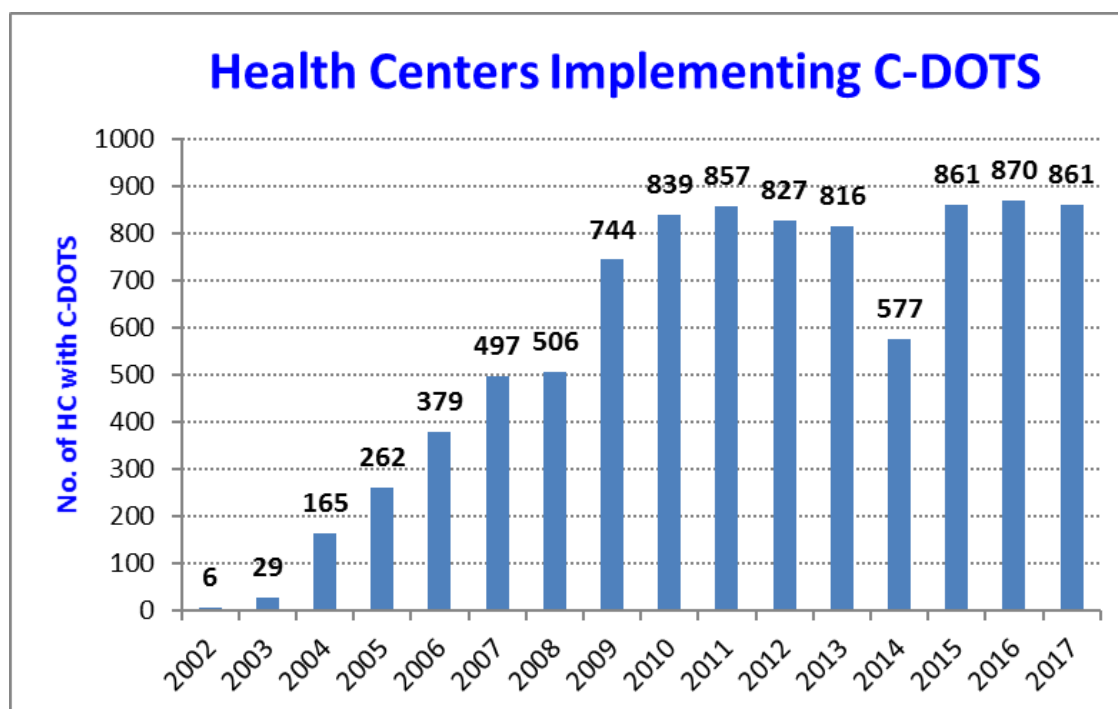
After implementation, NTP reassessed the status of infection control. Areas assessed were in-patient wards and outpatient departments, X-ray units, intensive care units and TB laboratories. Compared with the results from the baseline assessment, the implementing hospitals showed many positive changes. Each hospital had established and reactivated dormant infection control committees. The hospitals were screening TB suspects and patients and separating them systematically at the inpatient wards and outpatient departments (OPDs), most of the TB care areas had doors and windows opened for natural ventilation. The hospitals were maintaining UVGI fixtures and lamps appropriately. Access, donning and storage of N95 masks were adequate. Waiting areas and in-patient and outpatient departments had well-displayed posters on infection control. The hospitals have built sputum collection booths with their local budget.

4.8. Community DOTS

The purpose of the Community DOTS implementation is to improve case finding through referral of TB suspects to Health Center or Referral Hospital by community volunteers and to provide anti-TB drugs to patients who are unable to take anti-TB drugs every day at public health facilities. Strengthening and scaling up the Community DOTS is one of the NTP priorities in order to bring DOTS service closer to the community to achieve case detection and treatment outcome.

As shown in the table below, the number of health facilities implementing Community DOTS varied from year to year according to the support from NGO TB partners and donors.

In 2017 there are 861 health centers implementing Community DOTS in 62 Operational Districts under financial support from Global Fund (5 SRs namely CHC, CRS, HPA, Op-ASHA, and RHAC) and USAID (FHI-360's Challenge TB and RACHA's ECH). The USAID support has phased out in early 2018.



Some constraints and challenges remain our challenges in the implementation of Community DOTS. Insufficient funding support limits the community DOTS implementation at all levels. There is limited motivation for VHSGs/DOT Watchers as well as for TB supervisors and health center staff. The insufficient resources cause limited capacity of frontline TB health workers. This challenge will need us to do more efforts than usual with scarce resources. The different strategies in community DOTS implementation of partners is another challenge. In addition to what mentioned above, there are other challenges such as turn-over of trained TB staff at health center, limited capacity of TB health workers, and seasonal migration of VHSG/DOT Watchers for employment. In order to make community DOTS sustainable, these challenges need to be solved on time.

4.9. Public-Private Mix DOTS

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 in 2015 and 2017 due to lack of funding support from donor.

Table: Summary Table of PPM-DOTS: 2005-2017

Year	Number of province	Number of OD	PPM-DOT implementer	TB Suspects referred from private	TB Suspects received by public	TB patients diagnosed among suspects referred from private	Referral success rate	Yield per referral (all forms)
				(a)	(b)	(c)	(b)/(a)	(c)/(a)
2005	2	3	287	314	242	46	77%	15%
2006	8	15	755	1989	1154	244	58%	12%
2007	11	38	980	5562	2763	533	50%	10%
2008	11	38	1690	4212	1882	301	45%	7%
2009	10	38	1735	9781	5540	769	57%	8%
2010	10	37	1735	7612	4280	851	56%	11%
2011	10	37	1547	5024	2920	691	58%	14%
2012	10	35	1919	4589	3130	763	68%	17%
2013	10	35	1696	6392	3919	660	61%	10%
2014	8	30	1187	3049	2148	465	70%	15%
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0

In response, NTP is making an effort to mobilize resources in order to resume PPM-DOTS activity.

4.10. TB in Congregational Settings

In recent years, the NTP has focused on case finding in congregational settings such as prisons and factories where TB transmission is high.

4.10.1. Prisons

With strong support from the MoH and the Ministry of the Interior, and in close collaboration with the Prison Department and other partners, great progress has been made in prison TB control. The activities include TB health education for prisoners and referral of TB suspects to public health facilities for diagnosis and for subsequent treatment at prison health post with DOTS approach. Table 16 depicts the increasing TB control activities in prison in recent years. The number of prisons implementing TB control activities increased from 8 in 2009 to 26 in 2015 and remains 17 in 2016. In 2016, we have 2 partners were doing TB in prison one is Challenge-TB supported 10 prisons and CARITAS supported 7 prisons and in 2017 CARITAS extended 2 prisons totally 9 prisons and supported 5 Health posts built, 5 TB lab renovated, 7 separated rooms and 6 secure rooms. Through passive and Active case finding, 117 TB cases detected including 1 TB/HIV cases.

Table: TB Control Activities in Prisons: 2009-2017

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

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 that refer TB suspects to health centers for diagnosis, to conduct supportive supervision, and quarterly meeting that aims to motivate staff and to prepare plan for the coming quarters. Currently, 13 factories and enterprises have been providing TB-DOTS services at their workplaces. This activity reduced one factory compared to 2015, due to one factory was closed and the external support from ARC ended.

A summary of TB control activities in factories and enterprises (2007-2015) are shown in table below. The table shows that the number of workers covered by the activities has some fluctuations by from year to year. In recent years, the number of TB suspects referred a bit increase in the range of 70-289 cases and TB cases detected was around 04-24 cases.

Table: TB Control Activities in Factories and Enterprises: 2007-2017

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%

4.11. Hospital Linkages

National Center for Tuberculosis and Leprosy Control (CENAT), with support from Challenge TB (CTB) project, has supported five hospitals to implement the hospital linkage approach, namely Battambang, Maung Russey, Sampov Meas, Kampong Speu, and Korng Pisey. TB symptom screening was introduced in all departments within the hospitals including out-patient (OPD) and in-patients departments (IPD), pediatric and diabetes (DM) clinics. Cough triage has been deployed in all out-patient departments of the five referral hospitals. Cough triage and FAST (Find Actively, Separate Safely and Treat) strategy have been implemented in those five referral hospitals. Patients who are coughing are separated and provided with masks. All presumptive TB patients are referred to TB ward for further investigation. Under CENAT leadership, Challenge TB collaborates with partners to include four main TB symptoms in the IPD and OPD medical forms and cough in the triage form and now these documents are being used in the implementing hospitals.

From January to December 2017, 169,121 clients presented at an OPD and IPD. Of those who have TB sign and/or symptom were then referred for TB diagnosis at TB units within the hospitals. Among the screened patients, 3,218 were diagnosed as TB and put on treatment.

Coverage areas (five referral hospitals): Battambang, Maung Russey, Sampov Meas, Korng Pisey and Kampong Speu.

TB case detection in five hospitals:

Name Hospital	OPD and IPD	TB all forms	Bacteriologically Confirmed TB	Clinically Diagnosed Pulmonary TB	Extra Pulmonary TB
Battambang	41,173	774	211	334	231
Maung Russey	25,027	582	95	403	84
Sampov Meas	32,911	145	26	66	53
Kampong Speu	53,557	660	127	366	167
Korng Pisey	16,453	1057	120	552	385
Total	169,121	3,218	579	1,721	920

C-DOTS: Elderlies

a. Semi-Active Case Finding (Pagoda activity)

Besides routine referral of presumptive TB patients from community to health center for screening and diagnosis, a major focus of CTB in Cambodia is to find missing cases, elderly, using Semi Active Case Finding and Contact

Investigation approaches. Semi ACF activities which is also called “Enhance Case Finding” were conducted among elderlies visiting pagodas. Health Center (HC) staff and Village Health Support Group (VHSG) went together early in the morning to pagodas during holy days to screen elderly and monks for TB and collected their sputum for testing. Rather than referring elderly individuals to distant TB screening centers, sputum samples were collected on-site and transported to laboratory centers for Xpert testing.

In collaboration with NTP, Semi Active Case Findings were conducted in 430 pagodas/mosques. There were 14,368 elderlies, nuns and monks were screened for TB symptom. Of 8,060 with symptom suggestive of TB, 831 people found to have active TB (four were MDR-TB).

b. Contact Investigation

Contact investigation has been conducted by HC staff with assistance of VHSG. HC staff records the names of bacteriologically confirmed TB patients in the contact investigation forms and provides them to VHSG in the respective villages. VHSGs contact people (household and neighbor) who are close contact with index, record them in the record forms and gather them at index house at the day that HC staff goes and conduct contact investigation. 3,338 contact investigations were conducted at community level by HC staff. 49,196 close contacts were screened, of which 12,664 contacts have symptoms suggestive of TB, and 2,482 found to have active TB and put on treatment (1,384 are children) and 2,577 children on IPT.

Childhood TB

CTB has supported the contact investigation (CI) at the community level to identify and refer presumptive TB children to RH for work-up and diagnosis. Children under five who are close contact with smear positive index, ruled-out of having active TB, will get INH preventive therapy.

Childhood TB care has become routine work at both the community and HC/RH level; the HC staff screened children with close contact with smear positive TB patients at index house through contact investigations (CI) and referred them to referral hospital (RH) where TB physicians have been trained in diagnosis and treatment. Children who were close contact to bacteriologically confirmed TB were screened for TB at households in the community.

In order to facilitate this care, in collaboration with CENAT, CTB strengthen capacity of HC and RH staff on clinical management of childhood TB, Tuberculin Skin Test administration (TST), chest x-ray reading skills and Isoniazid Preventive Therapy (IPT) management via training, coaching/on the job training. Joint supervision/monitoring was conducted by NPT and CTB on a regular basis to the CTB supported sites.

Through CI, 2,577 children enrolled for IPT for six months when active TB was ruled out.

Coverage areas: 26 ODs in 10 provinces where childhood TB is implemented, including Battambang, Pursat, Kampong Chhnang, Kampong Thom, Kampong Speu, Prey Veng, Svay Rieng, Kampot, Kampong Cham and Tbong Khmum.

TB case detection in 26 ODs: (12 ODs with full package and 14 ODs focused only on childhood TB)

	Adult	Child < 15	Total
TB cases notified	5,188	3,516	8,704

4.12. Summary of Active Case Finding Project

CATA had implemented Active Case Finding from 12 June 2017 to 23 December 2017, under the grant funded by UNOPS/TB REACH Wave 5. This project was implemented among Elderly aged 55 and over and high-risk population in community. This ACF intervention was implemented in 5 operational districts (OD) in 3 provinces: OD Svay Teap, OD Chipu, OD Svay Reing, OD Kangpisey and OD Thmarkoul. The CATA's mobile team equipped with semi-digital X-ray machine and X-pert MTB/RIF Ultra visited each health center (HC) in the target areas as planned schedule.

An initial team of at least 2 VHSGs and village chiefs per village have been sensitized the communities living in the catchment area of participating health facilities about TB for one to two weeks prior to each of the ACF days. All people aged 55 and over in selected ODs, regardless of TB symptoms were invited to visit the health facility for 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 less than 55 with at least one among four TB symptoms greater than two weeks have been encouraged to avail screening and testing services. 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. During project activities implementing at field, HC, OD and PHD staff will invite to participate in ACF team. Test results have been returned within a day and TB patients started on treatment at the HC under the supervision of National TB Program (CENAT).

A total of 141,708 were screened by VHSGs and 37,534 (56% elderly) referred, which resulted in the symptomatic screening of 34,763 (92.5%) visited health center. 31,228 (63% elderly aged 55 and over) have been screened by CXR which resulting 13.8% active for TB, 3.1% suspect for TB, and 14.3% heal from TB. Only 1.0% were other lung diseases and 0.4% heart diseases.

A total of 5,457 (17.4%) people provided sputum specimens for testing, which resulted in the detection of 425 (7.8%) Xpert tested positive. Only 6 of the Bac+ results (1.4%) were resistant to rifampicin. More than 81.7% of the people tested with the Xpert MTB/RIF assay were aged 55 or over and most of the people tested. The total of TB case all forms was 1,847 included 425 Xpert positives (6 Rifampicin resistant) and 161 EP TB patients starting treatment for TB and being report to NTP.

4.13. Collaborative DM-TB Services

Introduction:

Diabetes mellitus is a known risk factor for tuberculosis (TB), but no studies have been reported from South-East Asia, which has a high burden of TB and a rapidly growing prevalence of diabetes. In 2013, CENAT, NCD and URC in Cambodia conducted a rapid assessment on burden of DM and TB comorbidity in Siem Reap and Prey Veng provinces. The Result showed that the prevalence of DM among TB patients in Siem Reap and Prey Veng was 7% & 5% respectively. This prevalence is higher than the prevalence of DM among general population. The prevalence of TB among DM patients was also high, about 6 folds higher than TB prevalence in general population.

In collaboration with Health and Social Development (HSD), National Center for TB Control (CENAT) has been implemented collaborative TB/DM services for HSD phase I project in Prey Veng province (Pearaing OD) and Siem Reap province (Siem Reap and Sotnikum ODs) in 2014 under funding support from World Diabetes Foundation (WDF).

In 2017, HSD has received funding support from WDF for its phase-2 project to expand more coverage to 4 ODs including Memot, Chheung Prey, Donkeo and Kirivong. In total, we have expanded this work in 5 provinces, in 7 ODs, 7 hospitals and 113 health centres that coverage 1,611 901 population.

Project goal and objectives:

Goal: to reduce mortality and morbidity for patients with co-morbidity of DM and TB through prevention, early detection and improving quality of care

Specific objectives:

- Strengthen public health system capacity in diabetes diagnosis and case management
- Integrate diabetes screening with TB services and TB screening in diabetes service delivery provided by public health facilities
- Increase patients' awareness about diabetes/TB co-morbidity
- Integrated TB-diabetes reporting system

Project Key Partners:

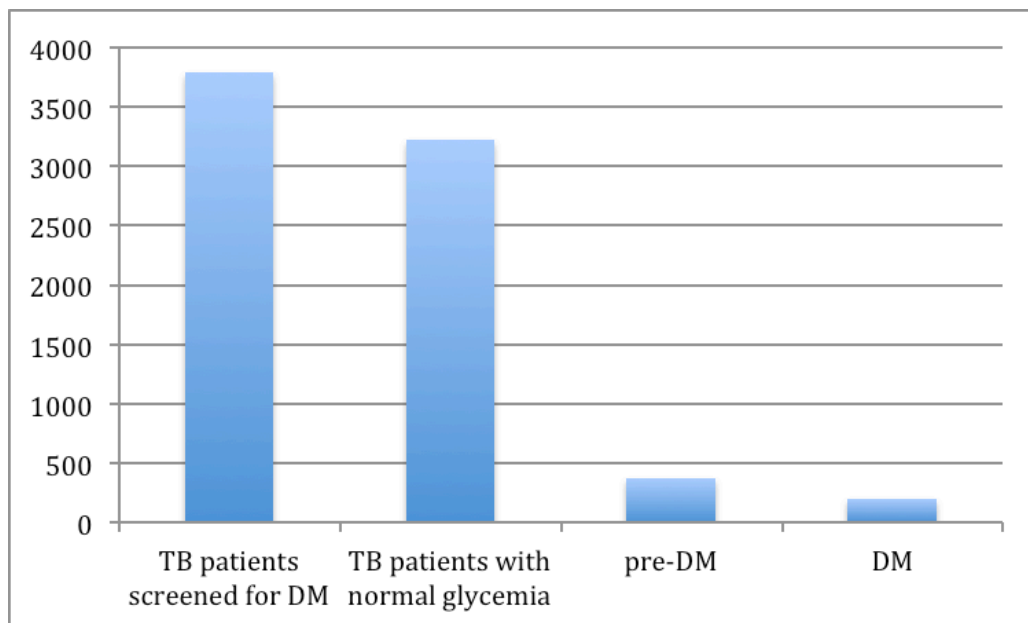
In general, HSD works closely with all relevant partners such as WHO, Ministry of Health, HOPE Centre, Preah Kossamak and others. In addition, this project works in close collaboration with both National NTP and NCD programs particularly with provincial and district team to implement the project activities.



Key results: (From July 2014 to December 2017)

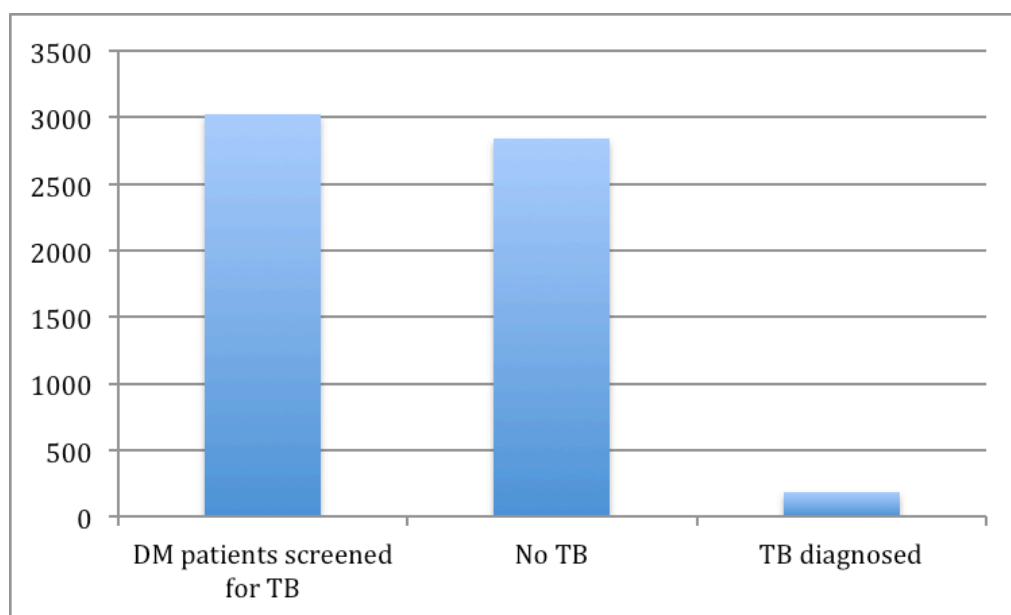
- **Annual Dissemination Workshop:** the dissemination workshop was conducted 2 times and the participants to attend the workshop are from provinces where the project is implemented. The main objective of the meeting is to share experience among implemented sites and discuss to address challenges during the operation and also to raise the way forward for future plan of activities.
- **Supervision and meeting:** this work is very important to monitor and on the job-training as well as problem solving.
- **Capacity building:** DM-TB technical working group (TWG) has been established and met on a regular basis. In addition, the project strengthens capacity of DM data collection and data entry to the existing OD data system.
- **TB patient screened for DM:** Registered TB patients are screened for DM by glycemia test at health facilities. All 3797 TB patients (100%) are tested and 3222 patients (85%) found not to be DM (normal glycemia) and 379 patients (10%) are found to be pre-DM and 196 (5%) TB patients found to be DM.

TB patients screened for DM from Jul 2014-Dec 2017



- DM patient screened for TB:** at diabetes clinic, DM patients are screened for TB symptoms (fever, night sweet, weight loss and cough). For TB suspected cases, more investigation including X-pert and Chest X-ray will be carried out. In total, 3025 DM patients were screened and we found 2838 patients (93.8%) have no TB and 187 patients (6.18%). All co-morbidity TB/DM was referred for appropriate care and treatment.

DM patients screened for TB from Jul 2014-Dec 2017



- **High risk population screened for DM:** In 2017, high risk population including old aged, abnormal BMI and hypertension were screened for DM. So far, project had screened 285 people screened with 69 (24%) pre-DM and 28 (9.8%) DM.
- **Increase patients' awareness about diabetes/TB co-morbidity:**
 - Since the beginning of the project, this project together with PHD and ODs had organised 6 events of World Diabetes Day in 6 ODs. About 150 participants per event were invited to join.
 - Project had conducted 7 community awareness about DM-TB in 7 ODs under coverage. There were 348 persons at risk for DM from the community attended the event.



Nurse performs glycaemic test for during World Diabetes Day 14 Nov 2017

Challenges:

- No clear responsibility at district level
- Financial barrier to DM care and treatment
- Limitation of data management on diabetes
- Limitation on referral system between TB and diabetes
- Limitation human resources at referral and health center level
- Limitation of follow-up system for patients with TB-diabetes co-morbidity

Way forward:

- Share our experience with all stakeholders
- Improve lab monitoring (A1C machine delivery)

- Expand DM screening to high risk group
- Increase community awareness
- Piloting DM service delivery to HCs
- DM foot screening

4.14. Advocacy, Communication and Social Mobilization

Advocacy, Communication and Social Mobilization (ACSM) is an integral part of the TB control program.

In 2017, 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, a very limited number of IEC materials were produced in 2017. However a notable success was that the NTP, in collaboration with partners including GFATM,USAID,FHI360,US-CDC,HSD, Op-ASHA, KHANA, CATA produced IEC materials such as poster , educational leaflet on general TB adult and children awareness, MDR-TB, Prevention Infection Control, TB-Diabetic.

For advocacy purpose, the 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, the NTP will intensify its plans.

4.15. Research

Research activity is one of the national TB control program's priorities. The third national drug resistance survey was started from May to December 2017 and we are waiting for finalization of TB Lab results. This survey was supported by Global Fund, FHI 360/Challenge TB project, and US-CDC.

Also in 2017, NTP and KHANA had developed protocol and conducted an Assessment on Key population and Gender in the national Tuberculosis Response in Cambodia, which was supported by the Stop TB Partnership. This assessment was finished in December 2017.

The National TB Control Program (NTP) is discussing with National University of Singapore and other partners to explore/select the study topics for the period 2018-2019.

4.16. Electronic TB Management Information System

The Electronic TB Management Information System (TBMIS), 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. This includes information on suspected cases, patients, laboratory testing, diagnosis, treatment, and treatment outcomes. The electronic information system

provides timely access to quality data to monitor epidemiological trends and progress in treatment outcomes in addition to information used in planning and allocation of resources.

In November 2016, began piloting the Cambodia TB MIS in 17 operational districts of three provinces: Kampong Cham, Kampong Speu and Svay Rieng (including regional military hospital in Kampong Cham). The development and enhancement of the electronic TB management information system has been supported by the Health Information Policy and Advocacy (HIPA) project, funded by USAID and implemented by Palladium. The current TB MIS system was customized by a Palladium software developer, based off an existing core application, eTB Manager, developed by Management Sciences for Health and first implemented in Cambodia by the USAID funded TBCARE I project. Enhancement of existing system was required to match the current NTP recording format, and further feedback was solicited during meetings and workshops to refine the user requirements. Features incorporated into the enhanced Cambodia TB MIS include (1) allowing the management of both presumptive and TB patients; (2) allowing lab technicians to input the TB lab result; (3) generating the standard report used by NTP and others and; (4) managing user accounts in the system to track most of transactions of the system.

Throughout 2017, regular supportive and monitoring field visits were conducted by NTP and Palladium to provide direct technical assistance on the use of the system and to monitor data entry uptake, including data verification between the paper-based and electronic forms. Seventeen field visit trips were conducted in the three pilot provinces. Additionally, a workshop to review results from the pilot took place from 6 – 7 June 2017, which also included gathering of system requirements for further enhancements.

Between August and September 2017, a team comprised of Cambodia NTP and Palladium formulated the national roll-out plan for the electronic TB MIS. The plan detailed the responsibilities of both partners including, (i) allocation of HIPA resources to support to sixteen training courses for OD and provincial TB supervisors, microscopy center staff and TB ward hospital staff and (ii) allocation of current NFM grant to provide resources for 440 computers and mobile internet modems, in addition to a few other operating costs.

As part of the preparation for national roll-out of the system, a three-day workshop to review the training materials and a training-of-trainer course for TB supervisors of the pilot provinces and NTP staff at the national level, the participant selection was conducted in order to facilitate the upcoming 16 training sessions in the first quarter of 2018. National introduction of the system was scheduled to start from January 2018.

In addition, HIPA has supported the implementation of the drug-resistance module in the TB MIS, which was handed over to CENAT/NTP by the TBCARE I project in November 2015. At the end of 2017, approximately 827 DR-TB cases were registered in the system from the 2011 cohort. Case registration is performed by the TB nurse in all ten functioning DR-TB treatment sites throughout the eight provinces/cities (Battambang, Banteay Meanchey, Kampong Cham, Kampong Chhnang, Kandal, Phnom Penh, Svay Rieng and Takeo).

5. Targets for 2018

National TB Control Programme (NTP) has recently set the targets in line with the End TB Strategy as well as Sustainable Development Goals (SDG) targets in which we aim to reduce about 2/3 (between 2016-2030) of TB incidence and mortality rate by 2030, which means that reduction of incidence rate of at least 65% and of mortality rate of at least 67% compared to 2015 figures.

While the targets for 2018, 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: 35,000 cases (218 per 100,000 population)
- Detect bacteriologically confirmed TB: 12,000 cases (75 per 100,000 population)
- Detect Childhood TB: 7,000 cases
- Detect MDR-TB cases: 140 cases
- Promote intensified case detection through active and semi-active case findings

6. Acknowledgement

With the support from the Royal Government of Cambodia 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 Royal Government of Cambodia 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, UD-CDC, Stop TB Partnership/GDF, TB-REACH, JICA, OIs 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.

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Annual TB conference 22nd



Annual planning workshop on TB control



National Workshop on TB and Diabetes Collaborative Activities



Basic Training on the Use of TB Management Information System



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