

The Kingdom of Cambodia

Joint Review of the National TB Programme 2012

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Abbreviations

3Is	infection control, intensified case-finding, isoniazid preventive therapy
ACF	active case-finding
ACSM	advocacy, communications and social mobilization
AFB	acid-fast bacilli
AIDS	acquired immune deficiency syndrome
ART	antiretroviral treatment
ATT	anti-tuberculosis treatment
CAP	College of American Pathology
C-DOTS	community DOTS
CENAT	National Center for Tuberculosis and Leprosy Control
CHAI	Clinton Health Access Initiative
CI	confidence interval
CHC	Cambodia Health Committee
CMDG	Cambodia's Millennium Development Goals
CMS	Central Medical Store
COC	continuum of care
CPT	co-trimoxazole preventive therapy
CXR	chest X-ray
DDF	Department of Drugs and Food
DFID	Department for International Development–United Kingdom
DHS	demographic and health survey
DOT	directly observed treatment
DOTS	directly observed treatment–short-course
DRS	drug resistance surveillance
DST	drug susceptibility testing
EPTB	extrapulmonary tuberculosis
EQA	external quality assurance
FDC	fixed-dose combinations
FHI 360	Family Health International 360
FLD	first-line drugs
FNAB	fine-needle aspiration biopsy
GDF	Global Drug Facility
GDP	gross domestic product
GLC	Green Light Committee
HC	health centre
HCMC	Health Centre Management Committee
HCW	health-care worker

HEF	health equity fund
HFN	high-false negative
HIV	human immunodeficiency virus
HMIS	health management information system
HSP2	Second Health Strategic Plan
HSSP2	Second Health Sector Support Programme
IC	infection control
ICF	intensified case-finding
IEC	information, education and communication
IMR	infant mortality rate
INH	isoniazid
IOM	International Organization for Migration
IPC	Institut Pasteur de Cambodge
IPT	isoniazid preventive therapy
JATA/RIT	Japan Anti-Tuberculosis Association/Research Institute of Tuberculosis
JICA	Japan International Cooperation Agency
JPR	joint programme review
KAP	knowledge, attitudes and practice
KNCV	KNCV Tuberculosis Foundation
LMIS	logistics, management, information system
MCH	maternal and child health
MDR-TB	multidrug-resistant tuberculosis
M&E	monitoring and evaluation
MMR	maternal mortality rate
MNCH	maternal, neonatal and child health
MOH	Ministry of Health
MSF	Médecins Sans Frontières
MTB	mycobacterium tuberculosis
NADID	National Drug Inventory Database
NCD	noncommunicable disease
NCHADS	National Centre for HIV/AIDS, Dermatology and STDs
NSDP	National Strategic Development Plan
NTM	non-tuberculosis mycobacteria
NTRL	National Tuberculosis Reference Laboratory
OD	operational district
OI	opportunistic infection
OPD	outpatient department
OSDV	on-site data verification
PAC	Pharmacy Association of Cambodia
PHD	Provincial Health Department
PLHIV	people living with HIV
PMDT	programmatic management of drug-resistant tuberculosis
PPM	private–public mix
PTB	pulmonary tuberculosis
RACHA	Reproductive and Child Health Alliance
RIT	Research Institute of Tuberculosis
RHAC	Reproductive Health Association of Cambodia

SHCH	Sihanouk Hospital Center of Hope
SLD	second-line drug
SNRL	supra-national reference laboratory
SOP	standard operating procedure
SWiM	sector-wide management
TB	tuberculosis
TME	tuberculosis monitoring and evaluation
TRP	Technical Review Panel
TST	tuberculin sensitivity test
UNGASS	United Nations General Assembly Special Session on HIV/AIDS
URC	University Research Corporation
USAID	United States Agency for International Development
US-CDC	United States Centers for Disease Control and Prevention
VCT	voluntary counselling and testing
VHSG	village health support group
WB	World Bank
WHO	World Health Organization

Executive summary

The Kingdom of Cambodia can take pride in its efforts to control tuberculosis (TB), with case-finding doubling in 10 years from 20 000 in 2001 to more than 40 000 in 2011 cases annually. This was achieved through basic TB control measures and the involvement of local communities. The National Tuberculosis Programme (NTP) has achieved consistently high cure rates, with documented evidence of the effectiveness and health impact of the NTP. National prevalence surveys in 2002 and 2011 showed a 45% reduction in bacteriologically positive cases over 15 years, with significant and rapid reduction, especially in young, wage-earning adults. The potentially disastrous impact of HIV on TB has been significantly reduced and the levels of multidrug resistance kept low. Cambodia has pioneered the banning of ineffective serological tests for TB, and the commercial importation and sale of anti-TB drugs. The NTP has prepared a comprehensive *National Health Strategic Plan for Tuberculosis Control in the Kingdom of Cambodia 2001–2015*. The majority of the recommendations made during the previous Joint Programme Review (JPR) in 2006 have been carried out.

These results were made possible through strong leadership of the National Center for Tuberculosis and Leprosy Control (CENAT) and continued funding from the Cambodian Government, which at all levels consulted articulated TB as a priority. Significant external financial support, notably from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and the United States Agency for International Development (USAID), has been essential.

This review concludes that the improvements in the epidemiology of TB in Cambodia have been largely the result of TB control efforts. To accelerate the decline in the TB burden in coming years and achieve levels closer to that of neighbouring countries, such as Thailand and Viet Nam, core programme implementation needs to be strengthened further. Good, motivated staff at central, provincial and operational district (OD) levels needs to be retained. The NTP should continue to emphasize community DOTS and boost routine surveillance and the analysis and use of data. It should regularly review its work through internal joint programme reviews, and joint monitoring and evaluation with effective dissemination of findings, including the challenges that such findings pose to the NTP and country. A new national strategic plan, with multi-year operational and budget plans, for TB control in Cambodia should be developed, mainstreaming project activities and, to the extent possible, benefiting from pooled funding.

Challenges for TB control in Cambodia

1. Significant threat to the financial sustainability of TB control

There is a high dependency on external funding, and diminishing contributions from the Global Fund and other sources mean available funding for TB control from all sources combined will halve from about US\$12 million in 2011 to US\$ 6 million in 2014.

2. Need to maximize access to high-quality, rapid diagnosis for all

Current diagnostic techniques need to be performed better, especially sputum smear preparation and examination, or made more accessible (chest radiography). It takes too long to get diagnostic results to patients (both smear positive and negative). This needs to be improved. The use of new technologies should be expanded, notably the MTB-Rif or GeneXpert test (Cepheid, Sunnyvale, California, United States of America) and mobile phones for relaying results rapidly to health workers and patients. Very high rates of TB in prisoners and the elderly demand improved access to diagnosis and treatment for these groups. Current active case-finding activities need to be evaluated further to confirm their utility.

3. Children with TB are underserved by the programme

CENAT's 2008 guidelines for the management of childhood TB are only implemented in a minority of operational districts (ODs). Preventive therapy is not provided to young children who are household contacts of infectious cases; yet this seems highly feasible using existing community structures. Mild forms of disease, such as TB adenitis, are likely being over-diagnosed by active case-finding efforts. More severe forms of disease, such as extensive lung involvement or disseminated disease, are under-diagnosed, mainly due to limited access to chest radiography. Paediatric referral hospitals see many complicated cases missed by the NTP. High numbers seen at Kantha Bopha Hospitals are difficult to verify due to poor engagement with the NTP and CENAT, and in significant parts of the country children are referred to these hospitals by the public sector without being recorded as suspects. Their outcome is unknown to CENAT. No data were available on contact investigations for these referrals.

4. Need for a systematic, evidence-based approach to evaluate and implement new approaches that have been piloted

In line with global directions, multiple projects trying out new approaches to TB control have proliferated as Cambodia has successfully competed for funding, but the projects have not been fully and systematically evaluated. Furthermore, a mechanism is needed to ensure operationalization of successful and cost-efficient pilots into routine programme activities.

Main recommendations

A. To Ministry of Health

Strengthen medium- and long-term financial sustainability of TB control

1. Increase the government contribution to TB control to help close the financing gap. The Government should re-introduce budget lines for anti-TB drugs so that it becomes responsible for their procurement and supply.
2. Do not give up on the Global Fund. Prepare for the next call for funding proposals, learning lessons from the unsuccessful Round 10, demonstrating programme impact and defining clearly the gaps that could be filled by strategic investments in key interventions. Obtain external technical assistance from a health financing/TB expert for a period of 6–8 weeks, once the new Global Fund proposal modalities are published in early 2013. Build TB into other funding and implementation platforms, e.g. maternal and child health (MCH), hospitals, Health Equity Fund (HEF) and Hospital Management Information System (HMIS), and expand TB/HIV collaboration. Strengthen national-level strategic planning in order to make partner, donor and nongovernmental organization commitments more efficient across operational districts.
3. Find efficiencies and costs savings by the review of expenditures and costs and better coordination of supervisory activities that should be linked more directly to on-the-job training and more targeted active case-finding and advocacy.

B. To CENAT and its partners

Expand access to high-quality, rapid diagnosis for all through collaboration with all partners, including the private sector

1. Improve smear quality by training and mentoring in sputum collection, smear preparation and transport, and quality assurance.
2. Make access to chest radiography much easier for those of all ages suspected of TB.
3. Expand use of GeneXpert technology and decentralize to the level where the machines will be most effectively utilized, solving the problem of calibration and developing a proactive plan to troubleshoot problems.
4. Rapidly expand use of liquid culture and drug susceptibility testing (DST), primarily for confirmation of the diagnosis of multidrug-resistant TB (MDR-TB), and introduce DST for second-line drugs (SLD). In the meantime, one further round of drug-resistance surveillance should be conducted in 2013–2014.
5. Scale up routine contact investigation and the provision of preventive therapy to young and vulnerable children. Further improve routine TB screening among people living with HIV, especially in clinics specializing in opportunistic infections (OI), elderly, prisoners, diabetic clinics, outpatient departments (OPDs) in hospitals and migrants.
6. Ensure results of diagnostic tests get back to health-care workers (HCWs) and patients more quickly and more consistently, e.g. by using mobile phones.
7. Critically review impact and cost-effectiveness of current active case-finding activities, and either incorporate them into routine programme activities, if found to have high impact and be cost effective, or stop them and reallocate their resources to more effective activities.

Give children access to high-quality TB diagnosis and treatment

1. Develop a strategy and protocol for maternal, neonatal and child health (MNCH) and TB linkage, and scale up TB screening and suspect referral from MNCH programmes and Road to Health activities, engaging a broad constituency of stakeholders.
2. Expand use of Community DOTS (C-DOTS) to refer child suspects and provide preventive therapy with isoniazid preventive therapy (IPT) to those household contacts needing it.
3. Promote the implementation of CENAT 2008 guidelines for diagnosis and treatment of childhood TB with minor revisions, e.g. to make diagnosis of TB adenitis more specific.

Develop a systematic, evidence-based approach to continuously evaluate and improve service delivery approaches

1. Expand and apply an evidence base to inform optimal strategies for active case-finding, advocacy and communication, and paediatric TB control, after their piloting.
2. Continue to measure and demonstrate the impact and cost-effectiveness of approaches contributing to case detection and management such as C-DOTS, private-public mix (PPM) and the intensified case-finding, isoniazid preventive therapy and infection control (3Is).
3. Once an approach has been found to have impact and be cost effective, set up mechanisms to ensure systematic national-level implementation, monitoring and evaluation within the TB programme.
4. Strengthen routine surveillance, monitoring and evaluation with progressive roll-out of electronic data management, including monitoring and evaluation (M&E) training, progressively expanding to province, district and health centre levels. Ensure M&E for C-DOTS are systematically integrated in the CENAT M&E system.
5. Exploit linkages with the National Centre for HIV/AIDS, Dermatology and STDs (NCHADS) and national HMIS to improve the quality and breadth of data collected.

Introduction

This review is the second Joint Programme Review (JPR) of the Cambodia National Tuberculosis Programme (NTP), following the first review in 2006. The World Health Organization (WHO) recommends that such reviews be carried out every five years or so, and a major stimulus for this review was the financial gap the NTP will face beginning in 2014. The Ministry of Health and the Cambodia National Center for Tuberculosis and Leprosy Control (CENAT) are commended for being proactive in trying to address this problem in a timely fashion.

Terms of reference for the JPR, 2012

- Review the progress of the National TB Programme of Cambodia since the last JPR (2006);
- Recommend measures to improve the programme further;
- Recommend ways to address the serious funding gap emerging in 2014;
- Disseminate the findings of the review during a dissemination workshop; and
- Publish a comprehensive report jointly by all partners.

Methodology of the JPR, 2012

External and international TB experts and internal TB stakeholders were selected by CENAT and the Stop TB Medical Officer of the WHO country office, mostly from those agencies and stakeholders that are engaged in TB work in Cambodia. Dr Paul Nunn, an independent consultant with extensive experience in WHO but without prior experience in Cambodia, was selected as team leader. In addition to CENAT, representatives of the following institutions and agencies were included:

- Cambodia Health Committee (CHC)
- United States Centers for Disease Control and Prevention (US-CDC)
- Clinton Health Access Initiative (CHAI)
- Damien Foundation
- Family Health International (FHI 360)
- Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund)
- Macalester College, Minnesota, United States of America
- Médecins Sans Frontière, United Kingdom (MSF-UK)
- Reproductive and Child Health Alliance (RACHA)
- Reproductive Health Association of Cambodia (RHAC)
- Research Institute for Tuberculosis (RIT) and Japanese Anti-Tuberculosis Association (JATA)
- Royal Dutch Tuberculosis Foundation (KNCV)
- Sihanouk Hospital Center of Hope (SHCH)
- University of Sydney, Australia

- University Research Corporation, United States of America (URC)
- United States Agency for International Development (USAID)
- World Health Organization (WHO)

Initial presentations on the TB environment and situation in Cambodia were made and discussed. Thereafter, some team members met representatives of key development agencies in Phnom Penh. Then, international and national experts and local staff members were divided into eight teams (see Table 1). These teams conducted field visits, which took place on 6–9 August 2012 for most teams. Field visit reports were presented on 13 August. Thematic presentations were made on 14 August. A dissemination workshop was held on 15 August in the presence of the Minister of Health, Dr Mam Bun Heng, during which the main draft recommendations were presented.

Table 1. Review teams with the themes covered and operational districts (OD) visited

Team	Theme(s) covered	OD (Province) visited
Team 1	Diagnostic services	Kampong Thom OD (Kampong Thom)
Team 2	Drug procurement and supply management, standardized treatment	Kampong Chhnang OD (Kampong Chhnang)
Team 3	Monitoring, evaluation and impact measurement	Kirivong OD (Takeo)
Team 4	Health systems and financing, human resources	Kien Svay OD (Kandal)
Team 5	TB/HIV collaborative services	Sampov Meas OD (Pursat)
Team 6	Drug-resistant TB, infection control, quality of hospital care	North OD (Phnom Penh)
Team 7	C-DOTS, PPM-DOTS, civil society organizations, advocacy and communications	Chamcar Leu OD (Kampong Cham)
Team 8	Active case-finding and vulnerable populations	Angkor Chum OD (Siem Reap)

Background

Demographic, geographic and socioeconomic features

In 2012, Cambodia had a population of about 14.7 million people, 80% of whom were dwelling in rural areas. The population continues to grow, but the growth rate declined from 2.5% to 1.5% between 1998 and 2008. Average household size is 4.7 people. Phnom Penh is the capital city with an official population of about 2 million, although, unofficially, approximately 3 million people may be living in and around the capital. There are 24 provinces.

Geographically, Cambodia is dominated by the Mekong River, whose tributaries run throughout the country. In addition it has a coastline opening to the Gulf of Siam to the south-west. Its neighbouring countries are the Lao People's Democratic Republic, Thailand and Viet Nam.

Following a turbulent and extraordinarily violent period in the 1970s, the country has been stable and peaceful with a Government led by the Cambodian People's Party since the United Nations-sponsored elections in 1993.

In 2012, Cambodia had a population of about 14.7 million people, 80% of whom were dwelling in rural areas.

Cambodia's economy depends heavily on rain-fed agriculture, especially rice cultivation, which employs 70% of the workforce and contributes 40% of gross national product (GDP).

Table 2. Basic economic and health economic data

Gross domestic product (GDP)	US\$ 11.3 billion (ranked 106th in the world)
GDP per capita	US\$ 830
Population below poverty line	25.7% (World Bank, 2010)
Gini index	44.4 (43rd, globally, and increasing)
Persistence to last grade of primary school, female	63% (2008)
Ratio of females to males in tertiary education	53 (2008)
Total health expenditure per capita	US\$ 42 (2009)
Total health expenditure as % of GDP	5.9% (2009)
Public health expenditure as % of total health expenditure	27.3% (2009)
Public health expenditure as % of total government expenditure	9.3% (2009)
Out-of-pocket expenditure on health per capita	US\$ 28

(Cambodia Socio-Economic Survey 2009 Secondary Analysis, Ministry of Health)

Table 3. Basic health indicators and targets

Indicators	2000		2010		CMDG 2015
	Result	Target	Result	Target	Target
Infant mortality rate (IMR) per 1000 live births	58	N/A	45	60	50
Under-5 mortality rate per 1000 live births	124	N/A	54	75	65
Maternal mortality rate (MMR) per 100 000 live births	437	N/A	206	350	250
Births attended by skilled health personnel	32%	N/A	71%	70%	87%
HIV and AIDS prevalence	1.9%	0.7%	0.8%	0.7%	<0.6%
Malaria – fatalities per 100 000	4.7	2.7	2.4	1.2	0.78
Prevalence all forms of TB per 100 000	923		660		626
Married women using modern birth-spacing methods	19%	N/A	35%	40%	60%

Source: Cambodia Demographic and Health Survey 2010, Ministry of Health & National Institute for Statistics.
CMDG=Cambodia's Millennium Development Goals

Cambodia is classified by the World Bank as a low-income country, but if its current economic growth continues, it can expect to reach low-middle-income country status within the next five years. Two thirds of health expenditures are still out-of-pocket payments, although the government contribution to total health expenditures is about 27% and has been rising by about 15% per year in recent years.

Overview of health situation

The life expectancy at birth for males was 60.4 years in 2008 and for females was 64.3 years, representing continuation of significant rises since the 1990s. Infant and under-5 mortality rates have been improving (see Table 3), with reductions in the indicators for the main communicable disease epidemics, namely, HIV/AIDS, malaria and tuberculosis. As the population ages and embraces a more Western lifestyle and diet, noncommunicable diseases (NCDs) are becoming more prominent, notably diabetes and hypertension.

History of TB control

Modern TB control began in Cambodia with the introduction of directly observed treatment–short course (DOTS), the WHO strategy for TB control, in 1994. But this effort was initially restricted to referral hospitals. Health centres became involved in 1999, with major expansion taking off in 2001. By the end of 2004, all health centres were DOTS-capable. Further decentralization started with the Community DOTS (C-DOTS) programme in 2002, and resulted in significant expansion of TB control with a doubling of case-finding from 2002 to 2010 (see Figure 3). By 2012, over 80% of health centres were running C-DOTS programmes. The NTP, through collaboration with multiple partners, has established TB/HIV collaborative activities in all 77 ODs, starting in 2003. In addition, the NTP has set up Private–Public Mix DOTS (PPM–DOTS) in 37 ODs and TB activities in 19 prisons, starting in 2005. Management of multidrug-resistant TB has reached 11 treatment sites, starting in 2006. Active case-finding in ODs with high TB burdens and vulnerable communities started in 2005, and has been especially active in three provinces. National guidance documents on childhood TB and infection control were prepared in 2008 and 2010, respectively.

A comprehensive *National Health Strategic Plan for Tuberculosis Control in the Kingdom of Cambodia, 2011–2015* was published in May 2011 and covers virtually all the activities listed in *The Stop TB Strategy*, launched by WHO in 2006. While it gives a useful picture of the gaps in the NTP and some of the challenges anticipated, the five objectives cover a very wide range of activities.

Modern TB control began in Cambodia with the introduction of directly observed treatment–short course (DOTS), the WHO strategy for TB control, in 1994.

The NTP has succeeded in attracting significant external funding, notably from USAID, particularly through its TB CARE project and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) rounds 2, 5 and 7, as well as from the Japanese International Cooperation Agency (JICA), US-CDC, WHO and the Stop TB Partnership through TBREACH project.

TB epidemiology and programme impact

The falling prevalence of TB and its causation

Cambodia is unique among developing countries in that it has had two national prevalence surveys carried out using comparable methods. The surveys were carried out by CENAT with technical support from JICA and JATA, as well as WHO. The first survey was conducted after DOTS had been established in all referral hospitals, and the second in 2011 after C-DOTS had covered most of the country. Therefore, the two surveys provide an accurate assessment of the health impact of TB control by C-DOTS in the nine years from 2002 to 2011. In that time, the prevalence of smear-positive TB fell from 440 to 272 per 100 000 population of 15 years of age and above, a reduction of 38%, while the prevalence of bacteriologically positive TB fell from 1497 to 820 per 100 000 population of 15 years and over, a reduction of 45%. The disease prevalence surveys are the basis for WHO's 2012 revised estimates for Cambodia's TB burden, with declines in TB incidence, mortality and prevalence starting around 2000 (see Figure 1). Should nothing unforeseen happen, the NTP will have met the target of Millennium Development Goal TB incidence target and the Stop TB targets for prevalence and mortality reductions (see Figure 1) by 2015.

These decreases are large and statistically significant. However, they still leave Cambodia with a TB problem significantly bigger than that of neighbouring and comparable countries (see Table 4).

Table 4. Summary of TB epidemiological situation of Cambodia and comparable countries (2011)

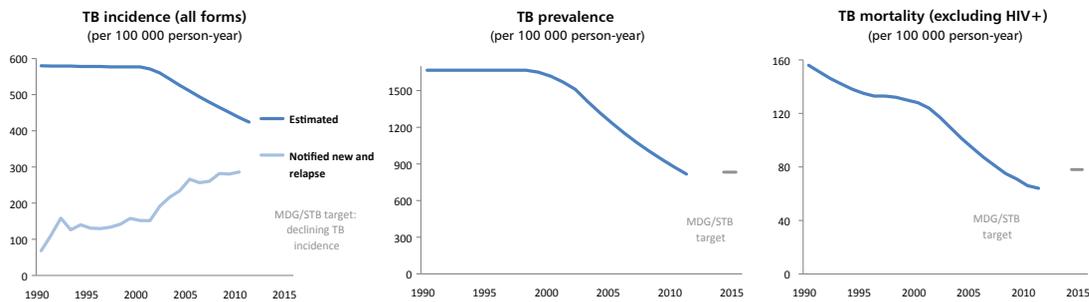
	Cambodia	Thailand	Viet Nam	Myanmar	Rwanda
Population (millions)	14	70	89	48	11
Notification rate/100 000)	270	95	111	283	61
Estimated prevalence/100 000)	817	161	323	506	117
Estimated incidence/100 000)	424	124	199	381	94

Source: World Health Organization. Global Tuberculosis Report 2012. WHO, Geneva. WHO/HTM/TB/2012.6

The health impact part of the JPR focused on the overall question: Were the TB control measures responsible for the reduction in TB prevalence evident in the 2002 and 2011 prevalence surveys?

The surveys provide additional information. Most importantly they illustrate that the burden of disease has fallen most markedly in the young adult population (see Figure 2a). In support of

Figure 1. WHO 2012 estimates of TB burden, Cambodia



Source: World Health Organization. Global Tuberculosis Report 2012. WHO, Geneva. WHO/HTM/TB/2012.6

the decrease being the result of programme efforts, programme data show that notifications have risen especially in this group (see Figure 2b), while the prevalence/notification ratio has fallen the least among the elderly. As a result, the typical picture of a developing country TB epidemiology with the bulk of disease among young adults has shifted in the interval between the surveys to a more developed country pattern with two thirds of the disease burden among those over 45 years of age—reflecting predominantly reactivation of infections acquired in the past, while the incidence of new infections is likely falling (see Figure 1). While reductions in prevalence between the two surveys were seen in all age groups, the elderly are still left with a very high disease burden in 2011: 3% of the over-65 age group have bacteriologically positive TB, and 1% have smear-positive TB (see Figure 2a).

Around 80% of the participants in the 2011 survey with symptoms sought care, mostly in the public sector, and this was also true of the elderly. However, the elderly were less likely to have their TB diagnosed than younger patients.

Figure 2. Declines in TB prevalence and new case notifications from 2002 to 2011, Cambodia, nationwide

Figure 2a. Prevalence surveys

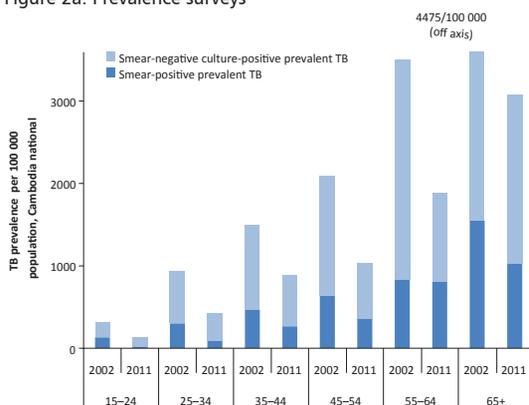
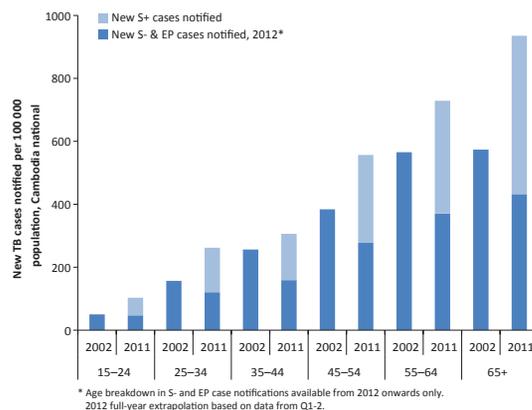


Figure 2b. CENAT routine surveillance



Note: Age breakdown in smear-negative(S-) and extra-pulmonary (EP) case notifications was available from 2012 onward only. The graph therefore uses S- and EP notification data from Q1-2 of 2012, extrapolated to the full year of 2012, to replace the unknown 2011 age breakdown.

Sources: (2a) Adapted from the Second National Tuberculosis Prevalence Survey Cambodia, 2011.

(2b) National Center for Tuberculosis and Leprosy Control

The falls in prevalence were larger in individuals with the classic symptoms of cough or haemoptysis and those without these symptoms: 59% versus 6% within the subset of smear-positive prevalent cases. Larger reductions were also seen in smear-positive cases than in the smear-negative (culture-positive) TB cases in the younger ages (see Figure 2a). Reducing TB among the smear-positive symptomatic population is the aim of the DOTS strategy, which reinforces the notion that programme efforts have been responsible for the decreases. However, the down side of this is that insufficient smear-negative TB cases and those without the classic symptoms are being diagnosed by the NTP (see Figure 2b). In some age ranges, notifications were almost exclusively among the smear-positive cases in 2002. While the proportion of smear-negative TB cases diagnosed nationwide had increased significantly by 2011 to 33% (from 7% in 2000), it was still far short of the 60% of TB cases with smear-negative, culture-positive disease found in the 2011 prevalence survey (see Figure 2a). A similar situation has been found recently in China, Myanmar, the Philippines and Viet Nam.

These results emphasize the problem found in all developing countries, that the current diagnostic test for TB smear microscopy is unable to detect over half of the TB cases. The diagnostic algorithm attempts to make up for this defect by incorporating an indirect approach to diagnosis of smear-negative TB, but this is clearly insensitive. In part, this is because two thirds of patients do not have the classic symptoms of cough for longer than two weeks. The smear negative and the asymptomatic (or atypically symptomatic) are therefore challenging groups to detect. New ways to do so are addressed in Section 2 of the thematic areas on diagnostic approaches.

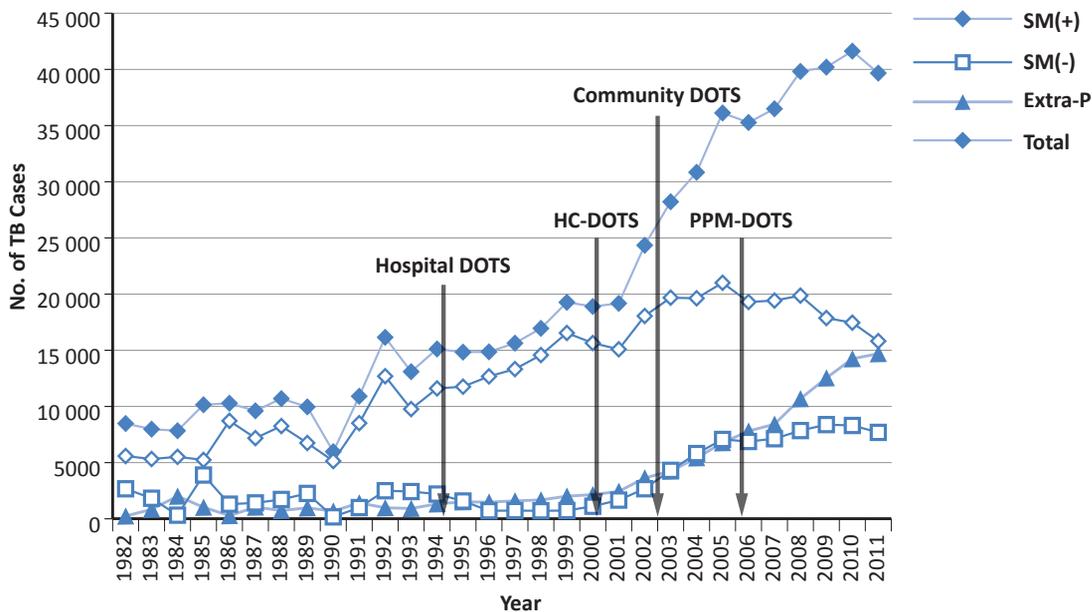
TB fell from 1497 to 820 per 100 000 population of 15 years and over, a reduction of 45% in nine years.

The decline of prevalent TB was evident in both urban and rural areas, but the surveys were neither designed nor sufficiently powered to assess trends within individual provinces. The two prevalence surveys are consistent with data from other surveys from the 1980s that also show that prevalence rates have been steadily declining in Cambodia. A survey carried out in 2005 revealed that the prevalence of TB is significantly less in Phnom Penh than in rural areas. This is in contrast, for example, to the situation in Yangon, Myanmar, where the rates are high in the capital. This may be because of the “healthy migrant effect” with a higher proportion of young adults and children in the capital’s population in Cambodia as compared with Myanmar.

Almost certainly contributing to the decline in TB, HIV prevalence has been decreasing steadily since a peak in 1996–1999. This is likely the achievement of Cambodia’s HIV/AIDS programme, NCHADS. The general population prevalence of HIV fell from an estimated nearly 2% in 1996–1999 to 1.8% in 2002 and 0.6% in 2011–2012. This fall was mirrored among TB patients, where HIV infection fell from a peak of 11.8% in 2003 to 6.3% in 2009. However, the magnitude of the HIV impact on TB has always been fairly small: TB/HIV is not, and never has been, a key driver of the TB epidemic in Cambodia. The fall in HIV can, therefore, only explain a small proportion of the decline in TB prevalence.

Socioeconomic conditions in Cambodia have also improved significantly in the last 20 years or more, and are likely also to have had an impact on TB prevalence. GDP tripled between 1994

Figure 3. Case notifications of total TB, smear-positive TB, smear-negative TB and extrapulmonary TB, 1982–2011 with important interventions and side graph of numbers of health centres offering DOTS and C-DOTS



Source: Ministry of Health, Kingdom of Cambodia. Tuberculosis Report 2011

and 2010,¹ although inequality, as measured by the Gini index, increased 20% between 1994 and 2007. Poverty has generally fallen in this period, but during the global economic and financial crisis that began in 2007 increased in some areas. One of the most important ways in which economic improvement supports health is through nutrition. The overall prevalence of undernourishment fell from 38% in 1990–1992 to 25% in 2006–2008.² Table 3 shows improvements in many basic health indicators. Without a formal study, it is impossible to quantify the extent to which economic or nutritional improvements contribute to reductions in TB, but it seems unlikely that they will have outweighed the impact of specific TB control measures.

Drug resistance

A drug resistance survey from 2006–2007 showed MDR-TB in 1.4% (95% confidence interval [CI]: 0.8%–2.5%) of new cases, and 10.5% (95% CI: 4.8%–19.6%) among previously treated cases. MDR-TB rates were 0% and 3.1% (95% CI: 0.6%–8.9%) respectively in a 2000–2001 survey. From routine surveillance in 2010 and 2011, <1% of new TB patients tested and 25%–30% of retreatment cases tested were confirmed to have MDR-TB. However, drug resistance screening still covers only a small proportion of MDR suspects. Available data therefore suggest that MDR rates may have remained low, although more systematic routine screening and/or a new MDR survey would be needed to confirm this.

¹ Cambodia Development Resource Institute. Annual Development Review 2011–2012

² World Bank. World Development Indicators, 2012

Case notifications

Case notifications doubled between 2001 and 2011 (see Figure 3), which is likely to be the result of health centres offering first DOTS and then C-DOTS. Since 2005, however, smear-positive notifications have stabilized and started to fall. Smear-negative cases, in contrast, continue at a stable or slightly increasing rate, while extrapulmonary notifications started to rise since the mid-2000s, probably reflecting the onset and expansion of active case-finding of TB adenitis, especially in children (0–14 years). There are legitimate concerns that the rise in extrapulmonary TB may represent over-diagnosis in some provinces, although both smear-negative and extrapulmonary TB are likely to be under-diagnosed in other provinces, depending on varying practices for suspect referral and back-reporting (Section 6, Thematic Areas – Childhood TB).

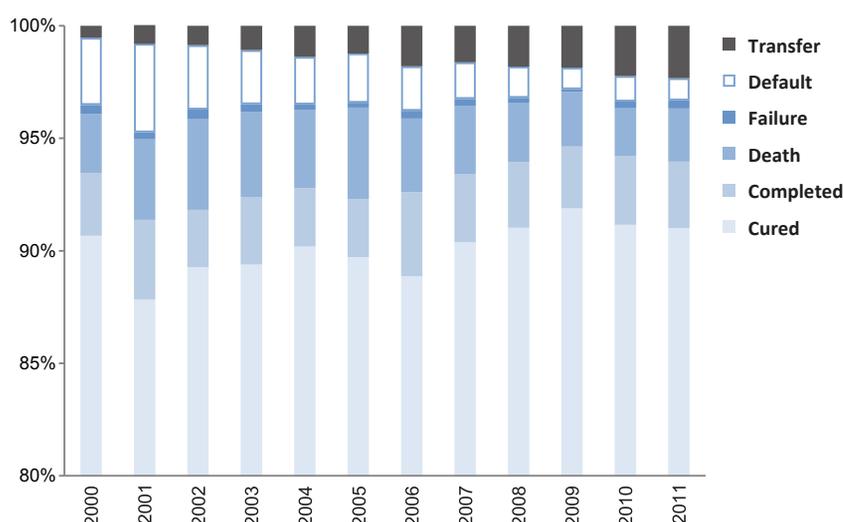
A crucial question is whether the recent flattening of case notifications, and, in particular the fall in smear-positive notifications represent a falling off of case-detection efforts or an underlying improvement in the prevalence of TB, especially smear-positive TB.

Programme coverage, quality and outcomes

In support of the decline in notifications representing underlying improvements in the epidemiology of TB are:

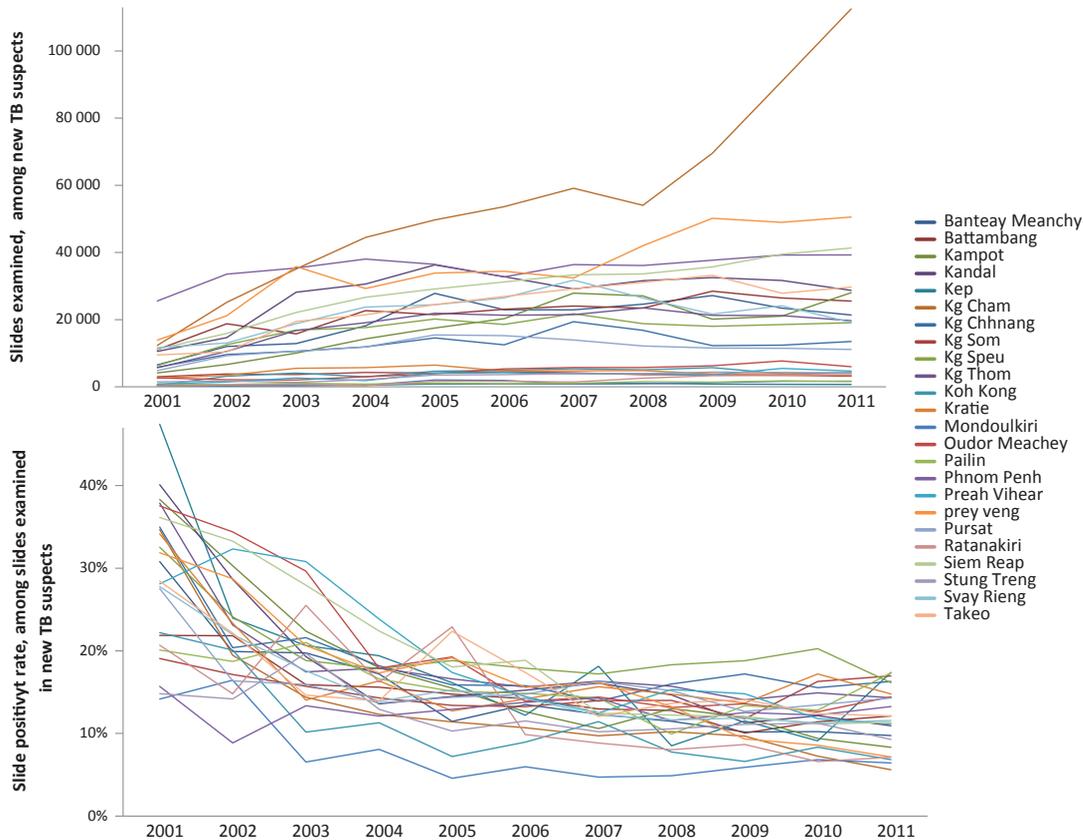
1. Diagnostic efforts have generally improved between 2002 and 2011, with more microscopes, slide examinations, chest X-rays and external quality assurance (EQA). That said, within individual ODs, diagnostic efforts vary considerably from year to year, following changes in projects and external funding. These fluctuations make it essential to focus impact assessment on trends over multiple years, rather than on single-year fluctuations.
2. CENAT consistently records high rates of cure and treatment completion, with improvements noted from 2006 onward and with reductions in deaths and defaults, although this is partly offset by an increase in transfers (see Figure 4). This pattern is likely

Figure 4. Recorded treatment outcomes of new smear-positive cases, national average



Source: National Center for Tuberculosis and Leprosy Control

Figure 5. (5a, up) Microscopy slides examined among new TB new suspects, and (5b, down) corresponding slide positivity rates, by province.



Source: National Center for Tuberculosis and Leprosy Control

to represent the impact of C-DOTS. In 2011, 66 of 77 ODs recorded a combined rate of cure and successful treatment completion over 90%. This is unusually high compared to other countries, and the review team was informed that in 2012 misclassifications had been observed of a few patients who died during DOTS being recorded as cured.

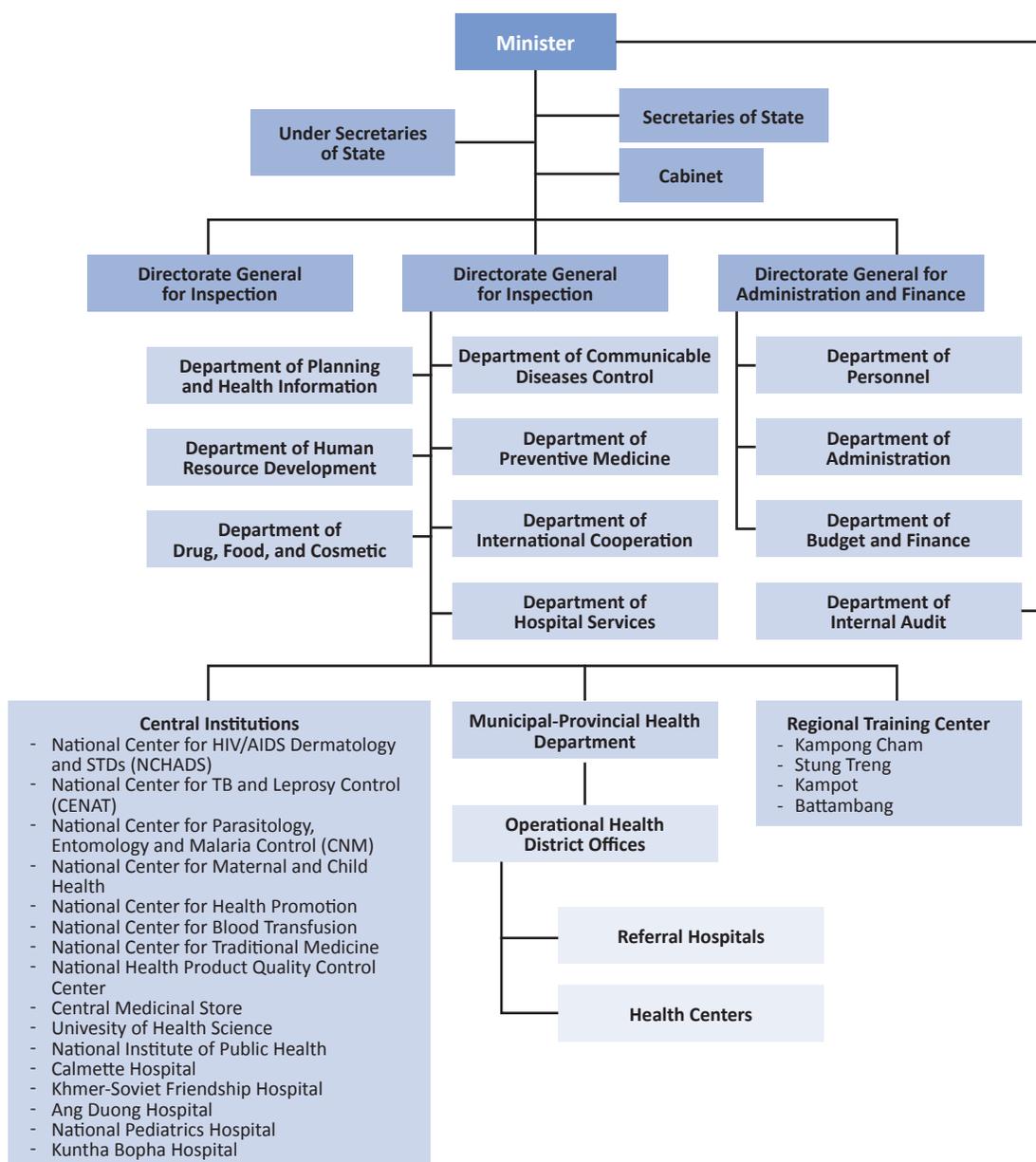
3. Coverage of TB/HIV screening, antiretroviral therapy (ART), and co-trimoxazole preventive therapy (CPT) for relevant patient groups are steadily increasing.
4. Over the decade, surveillance data show a fairly consistent pattern of TB notifications and smear examinations across provinces:
 - Smear-positive (S+) notifications peaked most often in 2005 (in 50% of provinces, peaking between 2005 and 2008; see Figure 3)
 - Total case notifications peaked most often in 2010 (in 50% of provinces, peaking between 2006 and 2011; see Figure 3)
 - Numbers of slides examined have continued to increase to date (i.e. peaking in 2011) in most provinces, although in some lower-burden provinces slide examinations peaked in earlier years, back to 2005 (see Figure 5a).
 - Slide positivity rates generally decreased over 2002 to 2011, across all provinces (Figure 5b).

These data appear to indicate that case detection efforts have continued to improve over the last 10 years, and that the recent fall in smear-positive cases detected may indeed represent a fall in the underlying prevalence of smear-positive TB rather than a general deterioration

in detection. An important caveat though is that there remains a significant gap between case notifications and total disease incidence. In other words, although the programme's smear-positive case-finding is efficient, further improvement is called for. And since smear-negative cases account for 67% of overall adult TB disease prevalence in 2011 but remain relatively under-diagnosed in notifications (see Figure 2), this improvement needs to address particularly the currently smear-negative cases.

In summary, notification patterns are indicative of recent improvements in TB case detection, which may have been most successful for smear-positive TB and TB in young adults. These programme achievements are consistent with the pattern of prevalence decline seen in the 2002 and 2011 surveys.

Figure 6. Structure and organization of health services, including National Center for Tuberculosis and Leprosy Control (CENAT)



Thematic areas of TB control

Theme 1. Programme management, financing and resource mobilization

The donor environment in support of TB control has shifted in Cambodia recently, leading to increased uncertainty about the financial sustainability of the programme. The unsuccessful Round 10 application to the Global Fund estimated a US\$ 100 million financing gap over the next five years. The team confirmed that some donor commitments are shifting or have already shifted. JICA, a long-time supporter of CENAT, is prioritizing maternal and child health and is ending most of its support to TB control. The Department of International Development of the United Kingdom (DFID), a key contributor to overall health systems strengthening, is leaving Cambodia. At the time of the review, an investigation of all Global Fund grants was ongoing, with no official conclusion related to the TB grant. The current grant appeared to be performing well, reflected in its “A1” rating, but ends in March 2014. After years of substantial support from the Global Fund, other donors and technical assistance partners have been directing their attention away from TB, as indicated by the lack of TB funding within the pooled Second Health Sector Support Program (HSSP2) and the absence of TB indicators within the health priorities of the United Nations Development Assistance Framework for Cambodia 2011–2015. A multifaceted approach is required to ensure the financial sustainability of the programme.

The review team was asked to: (a) confirm the estimates of budget needs and the medium-term financing gap; and (b) consider options for improving the financial sustainability of the programme. The review team acknowledges the important proactive stance of CENAT to avoid financing shortfalls for priority activities and recommends a five-point strategy to enhance the financial sustainability of the programme:

1. Increase the Government’s contribution to TB control

Sound vision and health sector-wide strategic planning underpin the success of CENAT. The health sector operates through a Sector-Wide Management (SWiM) plan, with support from pooled national donor resources in the HSSP2. With 20% of health-care financing coming from the Government and 20% coming from donor agencies, the remaining 60% comes from patients themselves through out-of-pocket payments. In addition to formal agreements with health facilities for user fees, the Government has coordinated the introduction of health equity funds (HEFs) to protect the poor by paying their user fees to facilities as reimbursement

for services. Reimbursements are commonly administered through third-party payers who also facilitate the identification and registration of the poor. It is anticipated that 100% population coverage with HEFs will be achieved by 2015. HEFs are of particular interest for TB control since a disproportionate number of TB patients are likely to be found among the poorest populations. HEFs have resulted in significant increases in the utilization of hospital services and maternal care by those poor registered under HEFs. However, TB treatment is already defined by the Government as free to the patient at the point of care, and facilities therefore cannot charge either user fees or benefit from reimbursement under HEFs for the provision of TB services. With 99% of user fees and HEF revenue returning to facilities and their staff, the provision of TB care may represent a lost opportunity for income to health workers, with negative implications for staff motivation for working on TB.

There are other innovations in health financing, such as contracting, vouchers, community-based insurance and others, that have been piloted or are being introduced in Cambodia. During the review mission, it was announced that the Ministry of Health will develop a health financing policy before the end of 2012 that will reflect best practices from the multiple systems and promote a uniform, largely demand-side financing structure. It is a potential avenue to strengthen financial sustainability and motivate all health providers to support TB control, without compromising the quality of the programme or introducing costs for the patients. But it will require determination of the appropriate reimbursement levels and functions to be included in an integrated package, safeguarding key central functions such as drug procurement.

The donor environment in support of TB control has shifted in Cambodia recently, leading to increased uncertainty about the financial sustainability of the programme.

Government commitment to sustaining TB control activities was articulated by all constituencies in the Ministry of Health that were met by the review team, and the translation of this commitment to an increase in government funding should be encouraged, in line with spending levels by other countries in Asia with comparable GDP per capita, and more importantly, to comply with the Global Fund's counterpart funding requirements for lower-middle-income countries. While

currently a low-income country, current trends in GDP growth mean that Cambodia will soon progress to the middle-income category—and the new counterpart financing requirement—perhaps as early as 2016.

An increase in government funding can be accomplished through various means, such as contributions through financial protection programmes such as HEFs, as well as directly through supply-side financing through CENAT. Positive steps in this direction were noted, including the reintroduction of government funding for some anti-TB drugs, specifically for paediatric and second-line drugs. This commitment is commended.

Funding of health worker salaries is an important commitment by the Government, and the small bonus provided to health workers explicitly assigned to TB control is indicative of the Government's recognition that health workers are essential to the programme. However, the current government salary structure remains low. TB-specific staff members are enabled to support a quality programme via an allowance structure that is both complex and seemingly

unreliable as these programmatic activities are largely dependent on donors. Policies regarding civil service salaries go beyond the mandate of CENAT and even the Ministry of Health, but the policies impact the TB programme. Until such time as the overall salary structure is addressed, inefficiencies resulting from the administration of multiple systems of support to programme staff may persist.

Recommendations

1. CENAT should engage actively in the development of:
 - a health financing policy;
 - TB-related indicators for monitoring the performance of health-care provision within the emerging system, the medium-term expenditure framework, and the successor to HSP2; and
 - CENAT also should pilot test the inclusion of TB in a demand-side financing model in selected ODs and hospitals.
2. Cambodia should aim to increase the percentage of public expenditures on TB control that are funded from domestic sources to 20% of the total, in line with the national average.
3. The Ministry of Health (MOH) should reintroduce budget lines for anti-TB drugs to ensure government funding of all anti-TB drugs by the time the Global Drug Facility grant ends in 2016. To access quality-assured and low-cost drugs, the team recommends the continued use of Global Drug Facility, or other similar global agency.

2. Generate solid evidence of the impact of essential activities to appeal to the Global Fund

While the Global Fund is undergoing internal reforms, it is anticipated that the policy of performance-based funding in high TB burden countries will continue³ and will emphasize epidemiological impact over processes, reducing the level of support for activities, such as training,⁴ with an immediate impact that it is difficult to measure. To optimize the potential for future funding, CENAT is encouraged to carefully consider and prepare to respond to emerging policies, Global Fund board and technical review panel (TRP) reports, and other Global Fund documentation. In particular, the review team praised the robust data systems maintained by CENAT, as well as the availability of two sequential prevalence surveys, and noted the potential for further analytical work to document the impact of selected interventions supported by previous Global Fund grants. Coupled with solid budget and costing data that are available through CENAT, cost-effectiveness analyses of many key interventions also appear possible to complete.

Recommendation

CENAT should prepare for future Global Fund funding opportunities by documenting the evidence of impact of TB control efforts to date and determining the value for money of activities or interventions deemed essential by CENAT (e.g. C-DOTS, active case-finding, school-based awareness raising, advocacy and communications).

³ *The Global Fund to Fight AIDS, Tuberculosis and Malaria. Performance based funding at the Global Fund. November 2009.*

⁴ *Congressional Research Service. The Global Fund to Fight AIDS, Tuberculosis, Malaria: Issues for Congress and US Contributions from FY2001 to FY2013. May 15, 2012*

3. Build TB into other funding and implementation platforms, where this is of programmatic benefit

Increased donor (e.g. JICA) and partner (e.g. World Food Programme) attention to maternal and child health may bring opportunities for enhanced focus on the needs of children with TB. A “general principle of integration” for collaboration between MCH and national programmes, including TB, already exists within the Ministry, which may need to be translated into operational strategy for implementation within the new funding environment.

Recommendation

Develop a joint CENAT/MCH strategy and protocol to enhance appropriate detection and management of TB in mothers and children through maternal and paediatric service providers.

4. Identify efficiencies and cost savings

In a resource-constrained environment, it is likely that costs will need to be cut. The review team assessed the budget by different categories, such as by grouping all training costs, in an attempt to identify such cost drivers. The team found, for example:

- a. Training formed 10% of the budget breakdown, and “overheads”, which consisted largely of per diems, 34%. Careful consideration needs to be given to reducing training costs by developing robust on-the-job aids or promoting active mentoring as part of supervisory visits, rather than “off-the-job” training.
- b. Better coordinated supervisory visits appear to offer cost-savings over more specialized supervisory teams.
- c. A community-level screening approach for active case-finding among the general population may prove to be too costly. An approach of targeted screening of vulnerable and high-risk populations may offer cost-efficiency gains.
- d. School-based awareness programmes could be integrated through existing Ministry of Education-led curriculum, removing the need for NTP-directed funding.
- e. Advocacy and communications may be better targeted, based on where people receive information and who needs to receive the messages, thereby reducing the need for repeated advertisements for the general population.

Recommendation

Rather than limiting the geographic coverage or constraining access to services, CENAT is encouraged to rigorously assess any cost drivers in the budget for which alternative lower cost approaches may enable similar or better results. In light of Global Fund policies, CENAT is advised to pay particular attention to its training budget.

5. Seek new partners and/or funding sources

Given the current funding environment, it did not appear likely to the review team that a major new TB-specific source of funding would become available in the near future. However, increased engagement of the HSSP2 in supporting TB control appears possible, if the funding gap can be clearly described. Additionally, there may be opportunities for increased collaboration with new partners, such as CHAI and the World Diabetes Foundation, which could enhance case detection at minimal cost to CENAT.

Theme 2. Laboratory network and introduction of new laboratory tools

Background and achievements since the last review in 2006

Collaboration with key technical partners has enabled the establishment of culture capabilities in three laboratories: CENAT National Reference Laboratory, Battambang Provincial Hospital TB laboratory, and Kampong Cham Provincial Hospital TB laboratory. These laboratories provide acid-fast bacilli (AFB) smear microscopy (fluorescence and bright-field microscopy), solid and liquid media culture, rapid identification methods, molecular testing (Xpert MTB/RIF) and first-line susceptibility testing. CENAT is currently collaborating with the Research Institute of Tuberculosis (RIT), Japan, to validate second-line drug susceptibility testing.

While laboratory performance is improving, too high a proportion of laboratories had “unacceptable” performance in 2011.

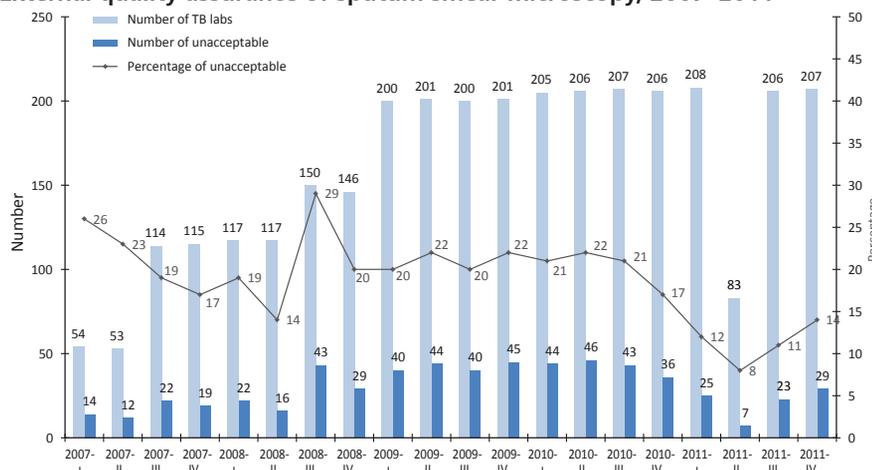
Smear microscopy

The microscopy network is comprised of 214 microscopy centres, or 1 per 65 500 population (an increase of 46 centres since the 2006 JPR). Fluorescence microscopy has expanded to 18 facilities, starting in 2009. External quality assurance (EQA) is performed at the central level and in 16 provincial health departments (PHD), with 39 staff members providing this service. In 2011, 99% of all microscopy centres were enrolled in the EQA programme, with on-site evaluation visits made to 60 facilities. Since the 2006 JPR, all Ziehl-Neelsen staining reagents used within the microscopy network are commercially prepared. Staining reagents used for fluorescence microscopy are prepared by CENAT, quality controlled and distributed to the appropriate facilities.

Challenges

A key observation made during this review is the low frequency of low-positive smear results (denoted as “scanty”) in the AFB smear microscopy registers. While laboratory performance is improving, too high a proportion of laboratories had “unacceptable” performance in 2011

Figure 7. External quality assurance of sputum smear microscopy, 2007–2011



Source: National Center for Tuberculosis and Leprosy Control

(see Figure 7). A significant proportion of the major errors detected by the EQA programme were attributed to high false-negative (HFN) smears, and this could often be attributed to suboptimal quality of smears.

Delays of up to two weeks or more were observed in getting results back from laboratories, when they should be returned within one week.

Chest radiography

Chest radiography is available in all 77 OD referral hospitals in Cambodia. In 46 ODs, training on performing radiography and interpretation of films has been conducted since 2010 (through TB CARE I). As a result, the technical quality of chest X-rays (CXR) has improved, and over-diagnosis of TB has declined.

Challenges

Several teams reported problems with access to chest radiography. Centralization of radiological facilities at referral hospitals raises significant cost barriers for many patients and financial support for transport was not always available. Some facilities were reluctant to do X-ray examinations of child suspects, while others had specific times of the week for TB suspects. While X-ray machines are available widely, several of them are inoperable. Challenges in maintaining adequate supplies of film and reagents were reported by TB CARE I and in the field.

Xpert MTB/RIF

The Xpert MTB/RIF technology was introduced in Cambodia in 2011, and 11 instruments are now used in people living with HIV (PLHIV), multidrug-resistant TB (MDR-TB) suspects and active-case finding. The reported sensitivity of Xpert MTB/RIF for the detection of culture-confirmed TB in Cambodia was lower than previously published reports (40.6%). Further work is under way by US-CDC and TB CARE I/JATA in TB suspects self-presenting to the CENAT outpatient department, and findings are currently being evaluated.

Challenges

The number of specimens submitted for Xpert MTB/RIF testing in several facilities with this technology is low. Guidance for specimen and patient referral was issued in June 2011. However, since then it has not been widely implemented. A maintenance and calibration schedule has not been developed, and currently remote calibration provided by the manufacturer is in pilot phase. Coordination by CENAT is critical for ensuring all equipment introduced by multiple stakeholders remains operable and downtime is avoided. Leaks were reported from sputum collection containers, which are not of optimal quality. A standardized reporting system is not yet in place; positive results are not always communicated to health workers as soon as they are available. Decentralization of the technology should be considered to ensure adequate coverage for high-risk populations.

Culture

In 2011, liquid culture capacity and rapid mycobacterium tuberculosis (MTB) identification methods were established at CENAT and the Battambang Provincial Hospital TB laboratory.

First-line drug susceptibility testing using liquid culture was also validated and implemented at CENAT. An average of 15 specimens is processed per day by CENAT, five specimens by Battambang Provincial Hospital (this is too low for the laboratory to maintain a level of proficiency), and 35 by the Kampong Cham Provincial Hospital laboratory. CENAT and Battambang are scoring high in the College of American Pathology (CAP) proficiency programme. Most specimens submitted are respiratory (sputum). The average MTB positivity rate between March and December 2011 was 31.8%; the non-tuberculosis mycobacteria (NTM) positivity rate was 7.8%. Given the recent increase in clinically diagnosed extrapulmonary TB, expanding services to include culture of extrapulmonary specimens is indicated.

Challenges

Liquid and solid media culture contamination rates exceed the acceptable target ranges of 2%–5% for solid culture and 8%–10% for liquid culture. This could be due to technical procedures, or problems with media and reagents, and may also reflect the quality of specimens collected and submitted. Closer collaboration with in-country partners is required to complement the services offered by CENAT. Paper is used for documentation and reporting of results at CENAT and at the Battambang Provincial Hospital; the average turnaround time for positive results is approximately three weeks.

Recommendations

1. Key technical partners and CENAT should provide training and mentorship in sputum collection, packaging and transport procedures. A specimen rejection policy should be developed to reduce laboratory testing of suboptimal quality specimens.
2. Diagnostic smears and follow-up smears should be separated for the purpose of EQA (as in the 2006 JPR).
3. CENAT should develop procedures for rapid reporting of AFB smear, Xpert MTB/RIF and culture results through the use of cell phones or cell phone text messages. A standardized result form should be developed for Xpert MTB/RIF results.
4. Facilitate and expand access to chest X-rays (CXR):
 - a. MOH should ensure CXR is cost free to the patient, i.e. without charge, at all referral hospitals, and with compensation for patient transport costs.
 - b. NTP should develop a plan with MOH and key stakeholders (TB CARE I, JICA) to expand the EQA programme for CXR to all ODs with radiography services, repair existing chest radiography equipment, install new equipment where required, optimize the utilization of existing capacity, and maintain supplies. Collaborations with private hospitals for chest radiography services should be established.
 - c. NTP should increase the use of chest radiography in populations in which sputum collection is problematic (children, PLHIV). In collaboration with key stakeholders (TB CARE I, JICA, RIT, others), NTP should undertake operational research to provide an evidence-based approach to the broader implementation of chest radiography. Robust multi-symptom screening should be used. An algorithm for performing Xpert MTB/RIF in smear-negative TB suspects with abnormalities observed in chest radiography should be considered.
5. CENAT should work with key stakeholders to develop strategies for decentralization of the Xpert MTB/RIF technology with an emphasis on increasing its utilization.

6. CENAT should invest the required resources into optimizing patient and specimen referral systems. Courier services, community volunteers and collaboration with existing programmes should be explored.
7. CENAT should collaborate with technical partners to develop a budget for annual calibration and general maintenance of all Xpert MTB/RIF machines.
8. The submission of extrapulmonary specimens should be increased for bacteriological confirmation of extrapulmonary TB, particularly in children. CENAT should collaborate with key technical partners to develop the requisite standard operating procedures.
9. CENAT should strengthen linkages with in-country partners to support second-line (SLD) drug susceptibility testing and other services, as needed.
10. CENAT should develop a technical assistance plan for consultants providing training and mentorship to laboratory staff.
11. CENAT should collaborate with key stakeholders on operational research to assess the prevalence of NTM disease in Cambodia.

Theme 3. Treatment, drug procurement and supply management

Achievements

Anti-TB drugs have been obtained through Global Fund resources, and since the last review in 2006, first-line drugs (FLD) for adults and children have been available throughout the country without any stock-outs. However the intended buffer stock could not be maintained because of delays in the disbursement of funds. Potential stock-outs were reported from various health centres (HC), but the problem was overcome by reallocating from those HCs with excess stocks to those facing stock-outs.

The management of anti-TB drugs is well integrated into the general medical supplies of the Ministry of Health, although the entire amount is procured with resources from funding agencies. Global Fund Round 7 support will end in early 2014. A three-year agreement has been reached with the Global Drug Facility (GDF) for the supply of adult FLDs from 2014.

There are sufficient paediatric formulations in the pipeline to cover the needs until Q1 2014. Active case-finding for children with TB had been suspended for two months because of a shortage of drugs.

Second-line drugs (SLD) for MDR-TB patients were made available through the Global Fund Round 7. Negotiations are continuing whereby, when the grant period ends in early 2014, MOH, TB CARE and Médecins Sans Frontières (MSF) will each provide funds for 50 patients, making a total of 150 MDR-TB patient regimens available.

All anti-TB drugs are currently procured through the GDF. Registration of drugs is done by the Department of Drugs and Foods (DDF) in MOH, but anti-TB drugs are not registered. Every time a consignment arrives in the country, a special waiver is obtained without any difficulty, but this may not continue.

Cambodia is one of the first countries in Asia to ban the importation and sale of anti-TB drugs (and antimalarial monotherapies) in the private sector. Cambodia has also banned the sale and use of serological tests for the diagnosis of TB. The JPR team visited 23 private pharmacy stores and found anti-TB drugs on sale in just two of them, but in one GDF drugs were available.

The major challenge is to ensure the constant supply of high-quality drugs (FLD, SLD and paediatric formulations) in the coming years in the light of changing funding sources.

TB medicines are properly kept in a separate temperature-controlled area of the main Central Medical Store (CMS) near the airport, except for SLDs, which are stored at CENAT. This warehouse is not, however, connected to the National Drug Inventory Database (NADID) computer system, making it difficult to determine stock balances and consumption of any particular drug.

Anti-TB drugs are distributed with the other medicines supplied by the CMS directly to operational districts. The CMS has 10 trucks, but only five are in use due of a shortage of drivers and funds for diesel fuel.

A logistics management information system (LMIS) for drug inventories has been developed by Reproductive and Child Health Alliance (RACHA), with support from USAID, but is not fully utilized because the database is situated in the centre of Phnom Penh and the main storage facility for anti-TB drugs, near the airport, is not linked to it.

Challenges

The major challenge is to ensure the constant supply of high-quality drugs (FLD, SLD and paediatric formulations) in the coming years in the light of changing funding sources. Retaining the trained and experienced drug management staff will be the key.

Registration of anti-TB drugs with the DDF is desirable to avoid continually requesting waivers. The enforcement of the ban on the sale of anti-TB drugs will be a challenge in the light of the discovery of anti-TB drugs on sale in private pharmacies, albeit at lower levels than previously reported.

Recommendations

1. MOH should re-introduce its budget lines for anti-TB drugs.
2. MOH should transfer the NADID from the old CMS site in the city to the CMS located on the airport road.
3. NTP and DDF should ensure stricter enforcement of the ban on the sale of anti-TB drugs by increasing the awareness of the ban among the community, health workers and private pharmacists.
4. Anti-TB drugs should be registered with the DDF.

Theme 4. Supervision, monitoring and evaluation (M&E)

Background

The first JPR in 2006 had recommended that CENAT collect outcome data on smear-negative TB. It noted suboptimal supervision (quality and quantity) within CENAT and recommended the decentralization of budget for supervision to the provincial level. It had also noted limited analytical capacity among CENAT staff.

The Global Fund conducted on-site data verifications (OSDV) in 2010 and 2011 in two ODs. These verifications focused on: 1) new smear-positive TB cases detected under DOTS; 2) those successfully treated; 3) the number of TB patients receiving C-DOTS from DOT watchers at village level; and 4) EQA performance of the labs. The 2010 OSDV gave CENAT an A rating, but the 2011 OSDV gave a B2 rating, due to some inconsistencies between patient cards, registers, quarterly reports and the CENAT database, mostly due to archives no longer being available at the local level.

The data recording and flow were found to be generally accurate, complete and timely for patient categories, smear results, treatment outcomes, and patient characteristics, such as age and sex, with minor discrepancies in some ODs.

Registers and data flow

The 2012 JPR assessed data recording and flow based on small-sample, bottom-up data flow verifications (patient card to health centre TB patient book, health centre to OD register, OD register to CENAT central database) in the eight ODs that the field teams visited and through review of CENAT's central database by the M&E sub-team. Although not a systematic data review, the findings are believed to give a fair indication of the strengths and weaknesses throughout the system.

The data recording and flow were found to be generally accurate, complete and timely for patient categories, smear results, treatment outcomes, and patient characteristics, such as age and sex, with minor discrepancies in some ODs.

ODs had their quarterly paper reports readily available for analysis and cross-checking generally back to 2009. Paper reports before 2009 remain available only at CENAT in Phnom Penh. This practice effectively limits the possibility for time-trend analyses anywhere below the central level.

Recommendations

1. Provincial TB supervisor should verify the consistency of OD records and reports before dispatching the quarterly reports to the central level.
2. Conduct a systematic assessment of CENAT's surveillance system, using the WHO's *Stop TB Standards & Benchmarks for Surveillance Systems* tool.
3. Move to electronic TB data management (see next section).

Data reporting and analysis

Staff capacity, and hence the quality of summary reports and analyses, was limited. At the provincial and OD levels, summary tables, written reports and presentations were frequently found to have discrepancies with data in OD quarterly reports and registers, and often misunderstandings in the interpretation. For example, in Kampong Cham, a discrepancy was noted of 60 reported cases in CENAT's 2011 annual report compared to the OD quarterly reports.

In contrast, CENAT had a well-functioning, standardized electronic system capturing OD-level quarterly reports back to 2000, backed up by the corresponding paper OD quarterly reports. The CENAT data management team checks and cleans all new data using standard procedures and sample spot checks, and no obvious data errors were spotted in any year past 2008.

Treatment under C-DOTS is an indicator for the Global Fund Round 7 grant. For reporting to the Global Fund, C-DOTS numbers are collected directly from the 11 sub-recipients of the Round 7 grant, outside of CENAT's routine reporting system that covers all health centres. Generally, HC and OD registers correctly record which patients are being treated under C-DOTS. In Kampong Cham, patient treatment cards were found to include the most complete information on referrals and treatment support broken down by type of provider, as compared with the (corresponding column of the) HC-level TB register or suspect register. Also, monthly C-DOTS Watcher meeting records generally covered larger numbers of community referrals than did the "Sputum Collection and Slide Sending Book".

Recommendations

1. Build M&E capacity at OD and provincial levels with a focus on analysis, interpretation and local use of data to inform, and improve local programme performance. Skills to be addressed include computer-based data entry with quality and consistency checks, MS Excel and analysis.
2. Replace the current paper-based system by electronic data management and build automated checks on calculations and internal consistencies into the data entry software, including some standardized output reports with graphs relevant to local-level programme evaluation. The planned introduction of e-TB manager for MDR-TB could be considered a pilot test for the overall NTP. The key advantages of an electronic system are:
 - Automated, immediate, data quality checking and cleaning.
 - Immediate, real-time availability of data to all levels.
 - Easier analysis, notably of time trends including several past years or of individual patients tested repeatedly over long periods.
 - Facilitation of inclusion of Kantha Bopha data, already reporting through the HMIS, into CENAT's M&E system (see Childhood TB).
 - For TB/HIV, the possibility of cross-checking and triangulation of data with NCHADS, whose electronic HIV data system captures the three UNAIDS/WHO/Universal Access TB/HIV indicators starting in 2009.
 - Improved timeliness of reporting, facilitating for example the reporting of C-DOTS results for Global Fund grants to draw from CENAT's data system, instead of the current double/parallel reporting by sub-recipients.

- CENAT should consider piloting its e-TB manager with priority for TB/HIV, with a view to linking with NCHADS, rather than (or in parallel with) MDR-TB.

Treatment outcome monitoring

Where verified (e.g. in Kampong Cham), the recordings of “cure” as treatment outcome matched the records of the final smear by 100%. However, reviewers were informed that two out of 50 patients followed up in a specific study had died during DOTS treatment, but were recorded as “cured” in the register. Treatment outcome monitoring for smear-negative patients has been adopted since the recommendation of the 2006 JPR.

In general, the recorded cure and completion rates are very high: consistently above 90% through the 2000s at the national level, and above 90% in 66 of 82 ODs in 2011, well above both the international Stop TB target of 85% and the cure rates claimed by neighbouring countries.

Recommendation

Continue internal joint programme reviews covering all provinces and ODs over time, including random patient follow-up interviews, and disseminate findings.

Supervision

If funds are available, supervision takes place during technical meetings between HCs and ODs and during meetings of Provincial Technical Working Groups (including OD TB supervisors, TB and HIV staff, and nongovernmental organization staff, but no HC staff), monthly.

In addition, supervision visits take place monthly at the HC by OD TB staff; and two-monthly for HCs by provincial TB staff. In three ODs, 67% of scheduled supervisions were recorded, but more were reported to have taken place without recording. In Kampong Chhnang, HC workers spend an average of four days per month supervising communities for C-DOTS, which is in line with national C-DOTS guidelines.

Supervision reports are being made of CENAT visits, but not of supervision events at subnational levels.

Recommendations

1. Develop a standard, problem-solving format and checklist for supervision with standardized supervision reports. These should include policy and programmatic updates (e.g. the definition of an MDR suspect) and the availability of a budget for referring smear negative suspects for X-ray at referral hospitals, as well as observations, strengths, weaknesses, specific recommendations and corrective actions to be taken, together with the progress made, to respond to previous recommendations. One field team noted that the “Golden Book”, maintained at health facilities, for recording supervision visits, findings and recommendations is rarely used and not effective.
2. Strengthen supervision with priority for the weakest HCs, e.g. those with more defaulters or uneven record keeping.

Monitoring, evaluation and surveys

Since 2000, CENAT has implemented a broad set of surveys to track key needs and results of TB services, including:

- Disease prevalence surveys in 2002 and 2011, nationwide, and additionally for Phnom Penh in 2004–2005;
- National TB/HIV co-infection surveys in 2003, 2005, 2007 and 2009; and
- National MDR-TB surveys in 2001 and 2006–2007.

The disease prevalence surveys have proven a key piece of evidence demonstrating the reduction in TB burden between 2002 and 2011.

For TB/HIV, routine HIV testing has reached high coverage, so that to repeat HIV surveys in TB patients may not be necessary. In 2011, 84% of TB patients with unknown HIV status, at the start of anti-TB treatment, were referred for HIV testing, of whom 97% were tested at a voluntary counselling and testing (VCT) centre (yielding a 1% HIV co-infection rate among those tested). Conversely, 85% of new adult patients enrolled in pre-ART HIV care were screened for TB in 2011.

Similarly for MDR-TB in 2011, 84% of the notified TB patients defined as being at high risk of MDR-TB were screened for MDR-TB. The MDR-TB suspect and referral register was not comprehensive in the one OD where this issue was reviewed. CENAT and technical advisers are keen to conduct a further MDR-TB survey as soon as new funding allows. With improved routine testing for MDR-TB, this may not be necessary.

Recommendations

1. Explore the possibility to replace TB/HIV surveys with routine screening for HIV.
2. Plan for the next prevalence survey—but not too early—in consultation with WHO tuberculosis monitoring and evaluation (TME) headquarters, considering the cost, expected time before a further prevalence reduction is likely to be detectable and the need for the next five-year cycle of strategic planning.

Theme 5. Childhood TB

Disease burden

Cambodia has a high TB disease burden among children, as suggested by recent national surveillance data. However, despite important progress in diagnosing TB among children, it is likely that many children are being missed, as suggested by:

- High rates of infectious pulmonary TB among adults who are in close contact with vulnerable children. Family sizes in Cambodia remain large (an average 4.7 people per family), and children usually sleep in close proximity to their parents.
- High rates of chronic and complicated TB among older children diagnosed at paediatric referral hospitals, which suggest that more acute cases (especially, in children under 5) do not make it to the referral hospitals and remain undetected.

Access to diagnostic services

Access to diagnostic facilities for children is poor. While CXRs are available at OD referral hospitals, these are rarely used for children, primarily due to lack of training and the uncertainty clinicians in performing and reading CXRs in children. Effectively, diagnostic tools are limited to two tertiary referral hospitals in Siem Reap and four in Phnom Penh. The only cases diagnosed at the HC and OD referral hospital level were “visible cases” among older children, such as TB spine and cervical lymphadenitis.

Assessment of current practice

National figures show an increasing trend of childhood TB cases notified as a proportion of all TB notifications since 2005, rising from 2% in 2005 to 15% in 2011. This rise is almost exclusively due to increased diagnosis of extrapulmonary tuberculosis (EPTB) (see Figure 3), which represents 96% of all childhood TB cases. Approximately 75% of EPTB diagnoses are clinically diagnosed cervical lymphadenitis, with 60% of such notifications coming from only three provinces, reflecting the locally concentrated activities of paediatric active case-finding (ACF) teams. This high proportion of cases diagnosed with EPTB among older children is not expected from the natural history of the disease. Experience in other high-burden countries indicates that children under five years are most frequently affected, with more rapid progression to severe manifestations of disease after exposure and infection. Thus over-diagnosis in some areas, especially of cervical lymphadenitis, co-exists with under-diagnosis in others. The case definition of cervical lymphadenitis is poorly standardized.

The true disease burden in children remains difficult to assess. In general, there is poor awareness of the full spectrum of disease suffered by children with TB. Ongoing child TB training activities are limited, and the national child TB guidelines (CENAT 2008) were found in only a single hospital. Most health-care workers only consider cervical lymphadenitis or TB spine (Pott’s disease) when thinking of TB in children.

Most children are recorded as EPTB without any description of the type of disease identified. There is inconsistency in how intra-thoracic lymph node disease is classified, with most clinicians indicating that they would classify this as EPTB in the absence of visible lung

involvement. Common international practice would be to classify this as smear-negative pulmonary tuberculosis (PTB).

The TB CARE project for childhood TB operates in 17 ODs across eight provinces. Its objective is to strengthen child TB suspect referrals from communities and health centres to OD referral hospitals. It introduced training on paediatric CXR and placement and reading of tuberculin sensitivity test (TST), and has resulted in two- to 11-fold increases in case notifications. However, these are primarily clinically diagnosed EPTB cases, indicating limited uptake of CXR in these project areas.

Building on the strengths of existing programmes

Maternal and child health (MCH) programmes are very strong at the community level. The

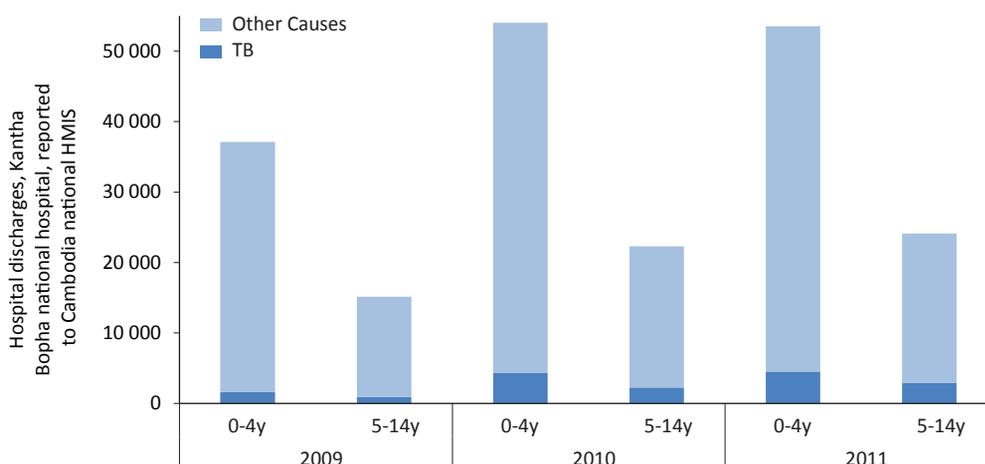
National figures show an increasing trend of childhood TB cases notified as a proportion of all TB notifications since 2005, rising from 2% in 2005 to 15% in 2011.

Road to Health card is an important resource and should provide excellent cues to help clinicians identify child TB suspects. Village health support groups (VHSGs), from which C-DOTS watchers are recruited, regularly assist with routine immunization campaigns and MCH health education campaigns. The existing C-DOTS programme is highly functional, especially in

rural areas, and presents an important resource to assist with pragmatic TB prevention and care strategies.

The four private Kantha Bopha Hospitals report treating and admitting large numbers of children with TB. In 2011, the Kantha Bopha National Hospital in Phnom Penh reported 4532 TB admissions in children 4 years of age and younger, and 2932 TB admissions in children 5–14 years, according to the health management information system (HMIS) (see Figure 8).

Figure 8. Hospital admissions from TB and other causes, in children, as reported by the Kantha Bopha National Hospital in Phnom Penh to the Health Management Information System, as of August 2012



Despite Kantha Bopha's reporting into the HMIS since 2009, collaboration and information sharing between the four Kantha Bopha Hospitals and CENAT remains poor. Active health

system and self-referrals to these hospitals, covering areas in and around Phnom Penh, Siem Reap and Takeo province, together with limited disease descriptions, complicate accurate TB burden assessments. Despite the challenges, better collaboration with Kantha Bopha offers opportunities for improved management of child TB cases, as well as better monitoring and surveillance of this target group.

Recommendations

1. Improve access to accurate diagnosis

- a. Train clinicians at OD and provincial referral hospitals in the full spectrum of TB disease observed in children. Improve the capacity to perform paediatric CXRs and develop local expertise to evaluate them. Potential collaborators include the Angkor Child Hospital, JATA and TB CARE, which have all expressed interest in this activity. Supervision and monitoring should follow any training activity.
- b. Children over 10 years are often able to produce sputum. They should follow adult diagnostic algorithms. Only one smear-positive specimen should be required to diagnose PTB in these children, as opposed to current guidelines requiring two smear-positive out of three specimens.
- c. The case definition for cervical lymphadenitis should be refined⁵ and distributed to all clinicians to improve diagnostic accuracy (especially specificity). Consider fine-needle aspiration biopsy (FNAB) as a simple confirmatory test in children with superficial lymphadenopathy, especially when there are unusual features or a poor response to TB treatment.
- d. To further expand accurate diagnosis of TB in children, consider operational assessments of bacteriologic diagnostics in children, namely sputum induction, gastric aspirates and the “string test” for culture and Xpert MTB/RIF testing.

2. Improve contact tracing and preventive therapy

Consider pilot testing of screening of household contacts, including adults and the elderly, by C-DOTS volunteers with referral of symptomatic contacts for evaluation. Asymptomatic young children (household contacts, under 5 years) should be offered preventive therapy without further work-up (unless they become symptomatic).⁶ This approach is consistent with national guidelines and WHO recommendations for settings with limited access to CXR, TST and culture. If successful, national roll-out should follow. Cambodia would be one of the first countries, together with Ethiopia, to enable the C-DOTS structure to conduct contact screening and provide preventive therapy in children.

3. Better describe EPTB in children in Cambodia

5 Definition of TB lymphadenitis: Painless cervical mass (with or without sinus formation), at least 2x2cm for >2 weeks with no resolution after a course of first-line antibiotics. Management (after at least two weeks): Start TB treatment, but monitor for improvement. If there is no significant improvement, or if there is deterioration, after two months, refer for further evaluation. Note that some enlargement, often accompanied by fluctuation, can temporarily occur in TB lymphadenitis on starting treatment.

6 Evaluation of child contacts should be based on these symptoms: current cough, fever or excessive night sweats, lethargy, or failure to thrive/weight loss. Children WITHOUT ANY of these should be started on preventive therapy regardless of smear status of index, although, in a low-income country priority for contact investigations might sensibly be restricted to index cases who are smear positive or with other high risks for contacts, while children who have at least one symptom should be reassessed within the next one to two weeks to see if symptoms have resolved. If symptoms have not resolved, they should be referred to the HC and OD RH for formal evaluation. This approach would not require TST or routine CXR. CXR will only be performed in children with persistent symptoms (and in these children it would clearly be indicated).

- a. Until 2011, only smear-positive cases were reported by age categories. Since 2012, age breakdowns have also been reported for smear-negative and EPTB cases. Using this information will help to better characterize the child TB disease burden and current service delivery gaps in Cambodia.
 - b. Currently there is no routine documentation of the site of disease for EPTB in the TB register. Any future register revisions should include such a column, and in the meantime, clinicians should record site of disease (e.g. TB meningitis, abdominal TB, cervical lymphadenitis) in the remarks column.
4. Discontinue the use of the retreatment regimens in children (at least in children under 10 years), since TB recurrence is unlikely to be due to relapse, and streptomycin injections are ototoxic (according to WHO 2010 Rapid Advice guidance – recommendation 7).
 5. The Ministry of Health should incorporate specific, formal childhood TB training into integrated management of childhood illnesses (IMCI) training for health-care workers and health education information for VHSGs.
 6. WHO should provide clear guidance on child TB disease classification (e.g. whether intra-thoracic lymph node involvement that is considered EPTB or smear-negative pulmonary TB⁷), encourage countries to include children over 10 years of age in all adult TB activities (e.g. access to smear-based diagnosis, inclusion in prevalence surveys, screening of contacts), and indicate that adult TB formulations are acceptable for children who can swallow tablets and should be used preferentially for children over 10 years of age.

7 This issue was due to be discussed at the Childhood TB Sub-group Meeting in Kuala Lumpur, Malaysia, November, 2012

Theme 6. Active case-finding

Background

Routine national surveillance data and the recent prevalence survey indicate that overall TB prevalence in Cambodia is declining, with most precipitous declines in smear-positive TB. As discussed in the TB epidemiology and programme impact section of this report, it is plausible that the decline in smear-positive TB reflects programme impact, while comparison between survey and surveillance data also shows that the programme likely under-diagnoses smear-negative TB, particularly in the elderly, and both over- and under-diagnoses EPTB. As prevalence declines, the number of suspects that need to be screened to identify each additional case increases, as does the cost and complexity. Active case-finding can serve two aims: 1) to indicate if the routine system may be under-diagnosing cases in a particular area or group; and 2) to prioritize those groups with the highest risk—increasing impact and efficiency.

CENAT prioritized ACF in its first five-year policy in 2001, but activities scaled up only in 2005. In March 2011, a revised ACF policy was drafted by CENAT. The policy reviews different screening and diagnostic modalities and maps high-risk communities. The diagnostic approach chosen uses CXR to screen all contacts and other TB suspects, followed by either smear microscopy or Xpert MTB/RIF. CENAT further identified eight high-risk groups (household contacts, prisoners, elderly, children, diabetics, migrants, those in urban slums and people living with HIV). This section focuses primarily on the first six groups, with particular attention paid to diagnosing and managing childhood TB.

Household contacts

ACF among household and neighbourhood contacts is the longest-running campaign, having started in early 2005. In 2012, ACF was expanded to 15 high-prevalence ODs with the highest poverty rates and most constrained health-care access. VHSg teams invited all household contacts (with and without symptoms) and all neighbourhood contacts (only with symptoms) of all index TB cases of the past two years to the ACF camp sites.

These campaigns have been successful and high yield, with approximately 2.5% of all participants diagnosed with smear-positive TB and an additional 2.5% diagnosed with other forms of TB.⁸ Approximately 43%–46% of participants with abnormal radiographs were diagnosed with TB, while between 16%–22% were bacteriologically confirmed.

As prevalence declines, the number of suspects that need to be screened to identify each additional case increases, as does the cost and complexity.

Of the 33 631 people who participated in ACF campaigns from 2005 to 2010, 885 were diagnosed with smear-positive disease. Thus, 38 people were screened at ACF camp sites for each smear positive case confirmed.

⁸ Eang MT, Satha P, Yadav RP, Morishita F, Nishikiori N, van-Maaren P and Lambregts-van Weezenbeek C. *Early detection of tuberculosis through community-based active case finding in Cambodia*. BMC Public Health 2012;12:469.

However, cost per case diagnosed is rather high at US \$108 per case. Using CXR as a screening tool is relatively expensive and may be difficult to integrate into routine practice. Next iterations of the ACF protocols should consider simple multi-symptom screening to replace CXR screening, which can be more easily incorporated into routine practice.

The elderly

A striking finding from the ACF project in 2005–2010 was the dramatic age distribution shift between routine passive case-finding and active case-finding activities. The proportion of cases over 65 years of age identified through ACF (26%) was double the proportion identified through passive case-finding (13%). The recent prevalence survey indicates there is much undiagnosed TB in the elderly (see Figure 2), and the ACF results certainly support that finding. Prolonged periods of socializing among the elderly may increase exposure, while social marginalization, poverty, long distances to access care and the time-consuming nature of diagnosis may discourage seeking care.

Cross-border migrants

The International Organization for Migration (IOM) project at Poipet has assessed 5000 adult migrants and screened 1800 by CXR, diagnosing 53 patients with TB (3%) in the first two quarters of the project. Unfortunately, children under 15 have been excluded, though they comprise 12% of the returned migrant population through Poipet. ACF in the migrant population is relatively high yield but quite expensive to implement due to screening with CXR. An initial multi-symptom screening may help to reduce cost, and IOM's plans to explore the cost-effectiveness of alternative options will be useful in guiding future efforts.

Prisons

ACF campaigns in prisons documented prevalence rates seven times higher than the general population—around 3000 per 100 000 population. These high rates clearly indicate that routine screening and diagnostic systems are failing to detect cases. ACF in nine prisons in 2011 doubled case notification rates in these prisons, though rates returned to pre-ACF levels shortly after the project concluded. Routine specimen and patient referrals for CXR are uneven given the difficulties in referring prisoners and lack of funding. The routine screening programme is working well in CC1, the main prison in Phnom Penh, thanks to support for specimen transport and referral by MSF. Currently, there is no tracing of referrals once prisoners are discharged to determine continuation of care, and this is a cause for concern for many patients diagnosed and who have started on treatment. There is an opportunity to learn from the routine screening programme in CC1, develop standardized protocols for nationwide use to sustain impact and move away from project-based efforts.

Diabetes and TB

There is currently no ACF or routine case-finding system for TB screening for people with diabetes. Very few patients have been diagnosed with diabetes, and fewer still are receiving treatment. About 1000–2000 patients are receiving treatment from nine clinics at provincial referral hospitals. This presents a high-risk group with a common point-of-entry into the

health-care system where they could receive routine multi-symptom screening, performed by the nurse at the diabetic clinic with provision of on-site sputum collection and smear, as opposed to referral to their HC.

Recommendations

1. ACF should be considered as operational research aimed at determining which diagnostic approaches to operationalize and how to scale them up within routine activities. All ACF approaches should undergo rigorous cost-effectiveness analysis, with careful feasibility assessment and prioritization of initiatives before incorporation in routine activities. In a resource-constrained setting like Cambodia, the proportion of total cases that could be found by an ACF method needs to be considered and assessed against all other routine activities to see if resources are sufficient to prioritize a particular ACF approach. In addition, for any given approach, a clear mechanism is required to enable incorporation into routine activities, e.g. the VHSG and C-DOTS watchers constitute an obvious mechanism for ensuring assessment of household contacts and provision of preventive therapy to vulnerable children.
2. With the aim of incorporating contact screening into routine programme practice, next iterations of the TBREACH projects should employ multi-symptom screening to prioritize suspects for microscopy and CXR, potentially using Xpert MTB/RIF in smear-negative, symptom-positive TB suspects. Performance characteristics and cost can be compared to previously tested approaches. Cough longer than one week and weight loss showed greatest promise in the prevalence survey, although any current symptom should be considered for high-risk groups.
3. Include children under 15 years of age (currently excluded) in all current ACF activities. Children should not be addressed by separate projects. Further, children over 10 years of age can be assessed using the same algorithms as for adults and need not be treated using paediatric formulations, separately.
4. High-risk groups
 - a. *Elderly*: Consider addressing gathering places of the elderly in rural areas for health education, TB suspect screening and active recruitment for ACF activities (e.g. pagodas in high-prevalence areas).
 - b. *Prisoners*: All prisoners should be screened on entry with ongoing access to diagnosis and care. Effective mechanisms should be set up in all prisons to ensure timely referral of TB suspects for investigation by the NTP.
 - c. *Migrants*: On the basis of the current IOM project, consider effective mechanisms for screening all returned migrants—including children—especially those that have been detained, but consider employing a pragmatic initial multi-symptom screening for identifying patients needing further diagnostic workup.
 - d. *Diabetes*: Prioritize operational research to determine the burden of TB in diabetic clinics. Evaluate the feasibility of using a very simple nurse-driven multi-symptom screening at each visit with direct access to sputum collection for identified TB suspects on site at the provincial and district referral hospital. (Note: Persistently symptomatic smear-negative suspects should have access to CXR).

Theme 7. Multidrug-resistant TB

Achievements

The 2006 JPR recognized that the drug-resistance surveillance (DRS) in 2000–2001 showed very low prevalence of multidrug-resistant TB (MDR-TB) and that Cambodia had no capacity to diagnose and treat MDR-TB. This position has changed in the last six years. The follow-up DRS in 2006–2007 showed 1.4% MDR-TB in new cases and 10.5% in retreatment cases. But with overlapping confidence intervals between the two surveys, there is no clear evidence of an increase in drug resistance in the six-year interval. Diagnosis and treatment of MDR-TB began in 2006 through the initiative of the Cambodian Health Committee (CHC) and MSF. In 2011, CENAT started national expansion of the programmatic management of drug-resistant TB (PMDT).

By mid-2012, there were 11 MDR-TB treatment sites spread across the country, each OD had at least two staff members (doctor or nurse) trained in MDR-TB diagnosis and treatment, and guidelines and standard operating procedures (SOP) had been developed. The NTRL is performing culture and FLD DST and 11 Xpert MTB/Rif machines are being used for the rapid diagnosis of TB and rifampicin resistance.

The organizational strength of the MDR-TB activity is demonstrated by the presence of an experienced focal point in the CENAT technical bureau and regularity of MDR-TB technical working group meetings. The programme has treated 252 drug-resistant TB patients since 2006, and 56 of 62 diagnosed patients (90%) were enrolled in MDR-TB treatment in 2011 and the treatment success rates (final treatment outcomes) in 2007, 2008 and 2009 cohorts were an impressive 64%, 70% and 78%, respectively.

Challenges

As recognized elsewhere, one of the main challenges in relation to MDR-TB management is the uncertainty in the funding to purchase SLD from 2014 and beyond. CENAT has negotiated 50 treatments each from the Ministry of Health, TB CARE I and MSF to cover the needs for 2013, but no firm sources are available beyond that.

MDR-TB case-finding among the eligible high-risk groups (as defined by CENAT: non-converters, relapse, failure, return after default and other retreatment cases) has not been as high as expected. This is reflected in the overall suspect examination rate in 2011 of 43% (874/2051). Applying the 2006–2007 DRS prevalence to all retreatment cases in 2011 should have resulted in the diagnosis of 171 MDR-TB patients, but CENAT reported 62 identified cases in all. This JPR identified that the main contributing factors to low case detection are: lack of knowledge by HC staff about who are MDR-TB suspects; misclassification of retreatment patients as new (and hence low testing rates of suspects); potentially poor-quality follow-up (control) slides unable to pick up non-converters and failures; and high culture negative rates (even in smear-positive cases) and contamination rates in the laboratories.

CHC currently follows up most drug-resistant TB patients across the country after discharge using a team based in Phnom Penh. Often this follow-up does not closely involve the OD and

PHD staff, and patients may at times wait long periods of time before their side effects and other medical needs are attended. Although monitoring forms have been introduced for side effects, these are not fully completed.

The programme has treated 252 drug-resistant TB patients since 2006, and 56 of 62 diagnosed patients (90%) were enrolled in MDR-TB treatment in 2011.

Institut Pasteur de Cambodge (IPC) has recently been certified to conduct SLD DST but this is not yet available to patients in the programme. Since the 2006–2007 DRS was conducted barely a year after introducing the six-month rifampicin regimen and as there is no systematic surveillance of drug resistance in retreatment cases, the epidemiology might have progressed and the current drug-resistance prevalence rates are not known.

The JPR also found recently expired ethionamide and ethambutol at Takeo Hospital and elsewhere cycloserine, which was expiring in August 2012, in the store of a treatment provider. The MDR-TB suspect registers at the OD level capture only the patients who submitted sputum samples in that centre, whereas those referred to the provincial or CENAT hospital are not recorded. This practice makes it difficult for the OD supervisor to recognize and act on the low detection rates. An electronic patient management and reporting data system is not yet in place.

Recommendations

1. Improve case detection rates through:
 - a. Integration of drug-resistant TB case-finding and the general principles of drug-resistance management in the national TB guidelines at its next revision.
 - b. Conducting task-based orientation of HC staff on recognition of MDR-TB suspects during supervisory visits.
 - c. Ensuring the staff are aware that the “other” treatment category is among the MDR-TB high-risk groups and hence should be systematically evaluated for it.
 - d. Recording all MDR-TB suspects in the OD TB register.
 - e. Acceleration of sputum transport to the culture laboratory.
 - f. Scale up of Xpert MTB/Rif with preferential positioning in provincial referral hospitals.
 - g. Reduction of contamination rates with technical assistance from the supra-national reference laboratory (SNRL).
2. Improve MDR-TB patient management through:
 - a. Urgently identifying a funding source to ensure sufficient funds for supply of SLDs beyond 2013
 - b. Ensuring CHC and other partners involved in management after discharge are closely supported and supervised by CENAT in the short term.
 - c. Implementing a plan to ensure that the PHD and OD TB supervisors are closely involved in the follow-up of patients and that the PHD supervisors should take over the supervision of this programme in the medium term.
 - d. Publishing and disseminating the MDR-TB management guidelines and related SOPs as soon as possible.
 - e. Improvement of drug management and avoidance of the expiration of drugs through centralized drug management where all three implementers have a combined central SLD stock management.

3. Additionally:
 - a. Update as soon as possible the MDR-TB expansion plan based on the new expected numbers following improved case detection.
 - b. Conduct a DRS in 2013 and introduce routine SLD DST for all MDR-TB patients through collaboration with IPC while waiting for CENAT laboratory to be validated.
 - c. Implement an electronic data recording system (see M&E section).
 - d. Instead of increasing number of isolation rooms, introduce the management of stable MDR-TB patients on an ambulatory basis from the beginning of treatment.
 - e. Integrate MDR-TB into the internal JPR process, which has proven to be very informative.
 - f. Define a list of priority operational research topics taking advantage of the availability of detailed data collected for MDR-TB patients. This could include incidence and prevalence of adverse events in patients on SLDs, cohort analysis of DR-TB patients, impact of specific interventions to improve the quality of sputum collected and data auditing to identify misclassification of patients.

Theme 8. TB/HIV collaborative activities

Background

In Cambodia, HIV prevalence peaked at about 1.7% in the general adult population (15–49 years) in 1998 and had declined to an estimated 0.7% by 2012, equivalent to about 98 000 people living with HIV in 2012.⁹ However, HIV prevalence is considerably higher among female entertainment workers (estimated 4.6% in 2010), men who have sex with men (estimated 2.1% in 2010) and drug users (estimated at 25% in 2007).

The National Centre for HIV/AIDS, Dermatology and STDs (NCHADS) leads Cambodia's HIV response and launched the Comprehensive Continuum of Care (COC) Framework in 2003 to manage opportunistic infections (OI). In 2001, NCHADS introduced antiretroviral therapy (ART) for people living with HIV (PLHIV) with CD4 cell count <200 per cu mm.

Routine HIV screening of TB patients, which has been expanded to cover 82% of TB patients by 2011, confirms the low level of HIV among TB patients.

The number of PLHIV on ART gradually increased to more than 37 000 in 2009. In 2010, the MOH approved an expansion of treatment eligibility to include all PLHIV with CD4 cell count <350 per cu mm, as well as all TB patients infected with HIV, irrespective of CD4 count. This policy change resulted in a significant increase in the adults and children, including TB patients with HIV, receiving ART, which totalled more than 47 000 (>80% of eligible) by June 2012. Impressively, 79% of TB patients found to have HIV infection were receiving ART, despite of the fact that they must attend the OD referral hospitals to access it.

Among TB patients, HIV prevalence peaked in 2003. The fourth national seroprevalence survey showed a significant reduction of HIV prevalence in TB patients to 6.3% in 2009 (see Table 5). Routine HIV screening of TB patients, which has been expanded to cover 82% of TB patients by 2011, confirms the low level of HIV among TB patients: HIV prevalence continued to fall—to 5.1% in 2011 (see Table 6). However, HIV prevalence among TB patients is considerably higher than average (8%–14% in 2009) in Phnom Penh, by the Thai border and along the coast.

Table 5. HIV prevalence among TB patients (TB/HIV seroprevalence surveys, 2003 to 2009)

Region	2003	2005	2007	2009
Cambodia (total)	11.8%	9.9%	7.8%	6.3%
Phnom Penh	34.3%	26.0%	21.7%	14.3%
Thai border provinces	12.8%	15.0%	13.0%	8.1%
Coastal provinces	16.4%	13.6%	14.2%	8.4%

Source: National Center for Tuberculosis and Leprosy Control. National HIV seroprevalence survey amongst TB patients in Cambodia, 2009

Coordination between NCHADS and CENAT resulted in development of TB/HIV guidelines and revision of the TB/HIV implementation framework in 2009. To minimize the mortality and morbidity due to tuberculosis among PLHIV (with the aim of eliminating TB/HIV co-infection

9 NCHADS report on estimation of HIV/AIDS for 2010-2015

by 2020), MOH approved the SOPs for implementing the 3I's Strategy¹⁰ in COC settings in April 2010, and the joint TB and HIV programme statement followed. The National TB/HIV subcommittee, which was set up in 1999, is responsible for joint planning, training and monitoring of TB/HIV collaborative activities in the country. TB/HIV is well integrated within the DOTS services and COC framework at provincial and OD levels. In referral hospitals, TB and HIV staff members meet on a regular basis to exchange information, while in most peripheral health centres, staff work for both programmes. TB and HIV records (HIV uses an electronic system) have been updated to capture information on TB/HIV indicators and clear guidance issued on responsibilities of reporting on different indicators by the two programmes. However, the two programmes report considerably different numbers of patients screened and enrolled in care. Rates of TB screening among PLHIV increased substantially in 2011 (85%) compared to 2009. IPT among new PLHIV has increased steadily after the 3Is implementation and reached more than 1000 new PLHIV initiated on IPT in 2011—that is almost 23% of all new PLHIV registered in the 35 OI/ART centres implementing 3Is (see Table 7).

Table 6. Performance of TB/HIV collaborative activities at national level

Indicators	2009	2010	2011
No. (%) of new adult PLHIV screened for TB (a)	4667/7071 (66%)	3598/5104 (70%)	4757/5596 (85%)
Of (a), no. (%) found having TB (b)	1539 (33%)	1110 (31%)	1187 (22%)
Of (b), no. started on anti-TB treatment*	NA	NA	NA
Of (a), no. started on IPT	43	188	1,043
No. (%) of TB patients tested for HIV (c)	28 246/40,199 (70%)	32 236/41,628 (77%)	32 544/39 670 (82%)
Of (c), no. (%) found HIV positive (d)	3597 (13%)	2112 (6.6%)	1650 (5.1%)
Of (d), no. (%) started/continued on CPT	1081 (30%)	1383 (65%)	1456 (88%)
Of (d), no. (%) started/continued on ART	526 (14%)	944 (45%)	1306 (79%)

Source: National Center for Tuberculosis and Leprosy Control

* The current NCHADS data system does not capture this information, but we were assured that all diagnosed TB among PLHIV is under TB treatment.

Table 7. TB and HIV services in Cambodia (by June 2012)

TB services	HIV services
<ul style="list-style-type: none"> • TB microscopy centres: 210 • TB culture laboratories: 3 (including 1 doing DST of first-line drugs) • TB treatment available from 1071 health facilities 	<ul style="list-style-type: none"> • No. of VCCT: 255 • CD4 laboratories: 7 regional labs + Institut Pasteur de Cambodge • No. of OI/ ART centres: 60 in 46 ODs and 21 provinces • No. of OI/ART centres implementing 3Is (mainly IPT): 35 • No. of OI/ART centres using TST for IPT: 3

Challenges

1. Less than 60% OI/ART sites (35 out of 60) are implementing IPT, and currently less than one quarter of the screened PLHIV receive IPT.
2. There is a sizeable discrepancy in data collected by TB and HIV programmes for various indicators, even though the responsibility of reporting on various indicators is clearly defined.

¹⁰ The 3 I's are Infection Control, Isoniazid Preventive Therapy and Intensive Case-Finding

3. Consistent with existing national policy, NCHADS reports on TB screening among new PLHIV only, but the global United National General Assembly Special Session on HIV/AIDS (UNGASS) indicator requires screening and reporting on all PLHIV (new and old) visiting HIV care during a reporting period.
4. Operational challenges of administration of tuberculin skin testing (TST), mainly loss of patients after TST administration, found in OI/ART sites (currently three sites) using TST for initiating IPT.
5. Delay in getting data from TB patients referred for HIV testing, such as the HIV test result, and subsequent possible delays in start of ART.
6. Culture and Xpert MTB/RIF are not widely used for diagnosing TB in PLHIV.

Recommendations

1. Expand implementation of 3Is (mainly IPT) in all OI/ART sites:
2. HIV programme should train staff in new OI/ART sites on 3Is
3. TB programme should provide isoniazid INH to new OI/ART sites.
4. CENAT and NCHADS should ensure that staff of both programmes in each OD strengthen feedback mechanism and meet at least once in a month to exchange data and improve reporting by defining the responsibilities of reporting on different indicators.
5. NCHADS should consider changing the indicator and increase the activity to report all (new and old) PLHIV screened for TB in any reporting period.
6. Since, according to WHO recommendations,¹¹ TST is not a requirement for initiating IPT, the programmes should consider giving IPT to all PLHIV with no symptoms suggestive of TB, including those who are on ART.
7. Strengthen referral and feedback mechanisms between both programmes:
 - a. At referral hospital level, TB and HIV programme staff should meet more frequently, preferably weekly, to exchange data on referral.
 - b. At OD level, TB and HIV staff should discuss referrals and feedback at least on a monthly basis. A case-management approach might be considered to strengthen efficiency. Quarterly review meetings should also be utilized to strengthen this mechanism.
 - c. Health centre staff should communicate regularly with OI/ART staff for feedback on referrals, especially on TB treatment initiation.
8. See section the on Supervision, Monitoring and Evaluation for recommendation on electronic TB data management, which would likely be especially advantageous in TB/HIV.

11 Guidelines for TB ICF and IPT in resource constrained settings, WHO, 2011

Theme 9. Infection control (IC)

Achievements

In 2011, with assistance from TB CARE I, CENAT conducted a workshop on tuberculosis infection control (TB-IC), which was followed by the development of National TB-IC SOPs

TB-IC measures are not adequately and systematically implemented, and there is evidence of mixing up of TB patients with other emergency patients in referral hospitals.

aimed at health-care settings, as well as congregate settings such as prisons and factories. The TB-IC chapter in the MDR-TB guidelines was updated. Cambodia has integrated airborne IC into its national IC policy and technical guidelines and also

into the TB-IC SOPs for OI/ART centres. Staff members have general awareness of TB-IC. Most hospitals have good ventilation and separate patients with infectious disease from others. CENAT has renovated isolation rooms in treatment sites for drug-resistant TB, and respirators are usually available to staff in MDR-TB wards and culture laboratories.

Challenges

Delayed TB diagnosis and limitations in MDR-TB case detection have been detailed in other chapters. The TB-IC SOPs are not published and disseminated, and hence health facilities have not developed their specific IC SOPs. Most staff members have not been trained in TB-IC. Cough triage in OPDs and hospitals is not implemented, and there are very limited IEC materials on TB-IC displayed in health facilities. Some facilities have not introduced the separation of confirmed or suspected infectious TB patients from other general patients before they were put in treatment. CENAT national laboratory has noted biosafety risks linked to leakage of Xpert MTB/RIF cartridges during the mixing phase. TB-IC measures are not adequately and systematically implemented, and there is evidence of mixing up of TB patients with other emergency patients in referral hospitals, exposure of at-risk patients during induction of sputum and no separation of infectious patients in OI/ART sites.

Recommendations

1. Finalize the TB IC SOPs and disseminate it using support from TB CARE I as soon as possible.
2. Include specific TB-IC in integrated TB supervisory checklists.
3. Encourage implementation of facility-specific TB-IC SOPs, especially in hospitals, and include them in the general IC plan as soon as the National TB-IC SOPs have been disseminated.
4. Conduct a survey to estimate the occurrence of TB disease among health workers and consider the introduction of a routine data collection and monitoring system of health workers with notified TB to be able to provide data for the annual WHO global report.
5. Conduct cough-triage in OPD and medical wards.
6. Plan a rapid infection-risk assessment of referral hospitals and other big hospitals and urgently implement appropriate TB-IC measures, e.g. separating coughing patients in OPDs and medical wards from non-coughing patients, at least, until the diagnosis is confirmed, stopping sputum induction that exposes other patients, isolating TB patients from other emergency patients, etc. TB infection control should be included in all TB- and HIV-related training.

Theme 10. Community DOTS and the engagement of civil society organizations

Achievements

Community DOTS (C-DOTS) began in 2002 and is currently being implemented in 857 out of 960 HCs in 68 ODs in the country. Thirteen nongovernmental organizations are supporting its implementation. The number of HCs that each of them support ranges from 5 to 193 HCs.¹² The majority of activities are being implemented through government-supported community-based structures, and the role of the nongovernmental organizations includes provision of funds and ongoing capacity-building and supervision.

Community-based TB activities are often integrated with other health interventions supported by different technical and financial partners, such as maternal and child health programmes and malaria programmes. These are conducted in line with the draft Community Participation Policy for Health,¹³ through the Village Health Support Groups (VHSG) and Health Centre Management Committees (HCMC). For TB, two VHSG members per village were trained to refer suspects, collect and transport sputa, conduct community sensitization, support patients on treatment, and collect drugs from HCs. Transport cost for collection of drugs from HCs for their patients is financially supported with US\$ 1 per trip.

The most recent assessment from 2010 reports an increase in the proportion of notified TB patients referred by community volunteers from 5% to 32% in the preceding five years.

The effectiveness of C-DOTS has been demonstrated and is well documented. The most recent assessment from 2010 reports an increase in the proportion of notified TB patients referred by community volunteers from 5% to 32% in the preceding five years, and an increase in treatment success from 87% to 93% before and after the C-DOTS implementation (p value <0.001).¹⁴

Key observations

- The quality of implementation of C-DOTS varies.
- Enhancing early case-finding is a priority in Cambodia. Active case-finding activities are effective, but may be costly and unsustainable unless included in routine programme activities.
- Unexploited opportunities for joint programming exist between MOH and donor priority health programmes such as MNCH and NCDs.¹⁵
- Cost-effectiveness of C-DOTS is a cause of concern for stakeholders.
- HC staff motivation and capacity is insufficient to ensure quality support to C-DOTS; nongovernmental organizations should therefore continue providing capacity-building and joint supervision.
- During interviews, pharmacists were consistently reported as the first contact for health-care seeking. This calls for harmonization of C-DOTS activities and Public–Private Mix approaches aimed at engaging all care providers, including pharmacists at the grassroots level to ensure early referral of people with suspected TB. Thus, the non-qualified drug sellers in more remote areas should also be included.

12 Tuberculosis Report 2011, Kingdom of Cambodia Ministry of Health, 2012.

13 Community Participation Policy for Health, Kingdom of Cambodia Ministry of Health, 2008.

14 Community DOTS Programme Evaluation in Cambodia, 2010, FHI Cambodia and CENAT, 2010.

15 Ibid.

- Home-based care and family-based DOTS seem to be working well in the visited areas.
- The urban community model is not performing as well as the country-wide C-DOTS model. In Phnom Penh, only five out of 70 nongovernmental organizations working in health are involved in TB.
- Some cost-related concerns stem from the recent analysis of financial vulnerability of TB control in Cambodia. The analysis shows that the cost of C-DOTS as a percentage of overall cost per patient is much higher than in other countries. However, the C-DOTS budget submitted by Cambodia to WHO—and used in the analysis—includes other costs such as TB/HIV activities, transport for referral of smear-negative suspects to an X-ray facility, and some ACSM activities. In fact, the review team found that the cost of activities in C-DOTS does not seem excessive.
- The overheads of nongovernmental organizations represent 25% of the total budget of TB control in Cambodia for 2012 (see section on health systems and financing).

Recommendations

1. To standardize and improve the quality of implementation of C-DOTS:
 - a. Strengthen supervision of C-DOTS at the HC and community level.
 - b. Develop and introduce the use of simple checklists for strengthening problem-solving during supervisory visits. Partners currently involved in capacity- building for C-DOTS should collaborate to do this.
 - c. Ensure that M&E for C-DOTS is an integrated part of the CENAT M&E system (see the Supervision, monitoring and evaluation section).
 - d. Consider formalizing family engagement in the next update of the C-DOTS guidelines.
2. To enhance early case-finding
 - a. Make contact-tracing by community volunteers routine, as already recommended by the 2006 JPR.
 - b. Community volunteers should sensitize pharmacists and other informal providers on the importance of suspect referral, which currently constitutes a missed opportunity.
 - c. As a priority, CENAT should map nongovernmental organizations working on themes related to TB in high-risk TB areas and groups (e.g. slums and other areas struck by poverty, especially around Phnom Penh) and engage them in referral of TB suspects and care provision.
3. To exploit synergies between TB control and priority health programmes such as MNCH and NCDs
 - a. Develop strategies and protocols for TB and MNCH linkage. Scale up TB screening and suspect referral at MNCH programmes at both facility and community levels in collaboration with, and reporting to, the national programmes, with WHO as a catalyst,¹⁶ e.g. Operation ASHA can share lessons learnt from their vast TB and MNCH integration experience in India.
4. To address concerns about the cost effectiveness of C-DOTS
 - a. For the next application to the Global Fund, nongovernmental organization overheads must be brought down. Otherwise, the country may run the risk of having the proposal rejected.

¹⁶ The WHO catalyst role derives from its relatively easy access to other United Nation agencies closely involved in MCH (e.g. UNICEF and others), advocacy with in-country MCH partners to raise TB visibility and trigger their interest and engagement, and capacity to source technical assistance experienced in TB-MCH integration from beyond Cambodia.

Theme 11. Advocacy, communications and social mobilization (ACSM)

ACSM activities have been ongoing in Cambodia for many years, focused on communication activities targeted at the general population through radio and TV spots, billboards, and IEC materials available at health centres and communities. The availability of IEC materials and the level of implementation of other community activities, such as patient groups and large community education events, vary throughout the country. In areas with a large nongovernmental organization presence, reviewers found more materials and activities available.

CENAT developed draft action plan on ACSM following the 2006 JPR. However, none of the documents were finalized. The NTP worked recently with the Stop TB Partnership's subgroup on ACSM at the country level to integrate ACSM activities into all Stop TB strategy components instead of developing a stand-alone ACSM guide.

The team visits and prior reports show that knowledge of TB and TB symptoms in the community remains very low.

The funds for ACSM have been very limited in recent years, and thus only a small number of activities could be implemented. The team visits and prior reports show that knowledge of TB and TB symptoms in the community remains very low.¹⁷ Team interviews of patients and their families revealed that very few had heard of TB or knew of symptoms prior to diagnosis. Once diagnosed, most patients were able to explain transmission through coughing and understood coughing as a symptom, although they did not often identify other symptoms.

In Global Fund Round 7 Phase 2 renewals, the budget for ACSM activities, specifically radio and TV spots, was drastically reduced. The reason for this was that the available measures could not be shown to have had impact. Except for a 2005 knowledge, attitudes and practices (KAP) survey, the country still has not shown clear impact or effectiveness of the ACSM activities implemented. As mentioned above, TB awareness in the community remains low. It is unclear if demographic and health surveys (DHS) data (Cambodia DHS 2010) showing where and how people seek information, or other similar studies, are being used to effectively reach target populations when ACSM activities are planned. Given the current donor climate and funding situation in the country, CENAT will have to show clear impact and cost-effectiveness in order to justify continuation of large-scale ACSM activities.

Recommendations

1. Mobilize more resources for ACSM, but ACSM should be integrated into applications for different components of TB control, and not as a stand-alone activity.
2. Use ACSM more strategically to support specific programmatic objectives, including:
 - a. Joint programming with MNCH, which will need regular advocacy at central and other levels. TB information will need materials targeting MNCH nongovernmental organizations and clinics.
 - b. Engage former patients to provide important information to families affected by TB to maximize appropriate, supportive responses and minimize stigma and misconceptions.
3. Develop an evidence base for each planned activity (DHS information, KAP studies, etc.) and plan for impact measurement alongside activities.

¹⁷ Evaluation of C-DOTS by FHI-360, USAID and partners, 2010.

Theme 12. Health system strengthening: Public–Private Mix for TB care

Achievements

The private sector in total contributed to the detection of 6% of all TB cases detected in ODs where PPM is being implemented.

The national prevalence survey in 2002 first put a spotlight on the potential of private sector engagement in Cambodia when it revealed that around 67% of TB suspects and patients first visited the private sector for care, and only 3% directly went to government health centres and hospitals. The remaining 30% of TB suspects and patients took no action. Following up on these findings, CENAT in collaboration with key partners undertook a comprehensive assessment of the private sector and launched a Public–Private Mix (PPM) strategy in 2005 as a key approach to improve access to TB services by engaging various types of private health-care providers. The PPM strategy is comprised of two phases. The first phase, which already has been launched across the country, consists of establishing referral mechanisms for private providers to refer TB suspects to the public sector for diagnosis and treatment. The second phase, which is yet to be launched, would involve the engagement of private health-care providers in comprehensive TB case management, including diagnosis and treatment.

As a first step, PPM pilot projects were initiated by CENAT in two ODs in Phnom Penh and Battambang. Through a strong network of partners, CENAT has since scaled up PPM across the country to cover 37 ODs in 2011, from just three in 2005. The private providers engaged include private pharmacies, private hospitals and clinics. Private pharmacies have been most active in referral of TB suspects in the country with support from the Pharmacy Association of Cambodia (PAC). In 2011, private providers referred 5024 TB suspects to the public sector for diagnosis and treatment. The private sector in total contributed to the detection of 6% of all TB cases detected in ODs where PPM is being implemented.

The recent ban by the Government on the sale of anti-TB drugs appears to be succeeding. Whereas a 2004 study showed that TB drugs were available without a prescription in 66 out of 66 private pharmacies,¹⁸ the review team found only two out of 23 pharmacies stocking anti-TB drugs. A study conducted in early 2012 found three out of 18 private pharmacies still stocking anti-TB drugs. Efforts will need to continue before victory can be claimed.

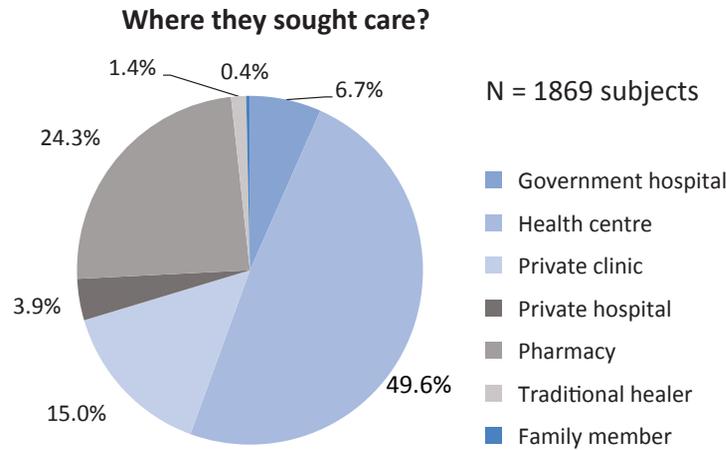
Challenges

The second national prevalence survey in 2011 revealed that 45% of TB suspects and a similar proportion of TB patients still approach the private sector for TB services (see Figure 9).

While excellent progress has been made in engaging the private sector, gaps still remain in strengthening the involvement of certain providers.

¹⁸ Uchiyama, Y., et al., An assessment survey of anti-tuberculosis drug management in Cambodia. *International Journal of Tuberculosis and Lung Diseases*, 2006. 10(2): p. 153–159.

Figure 9. Health-seeking behaviour of known TB patients in the prevalence survey (2011)

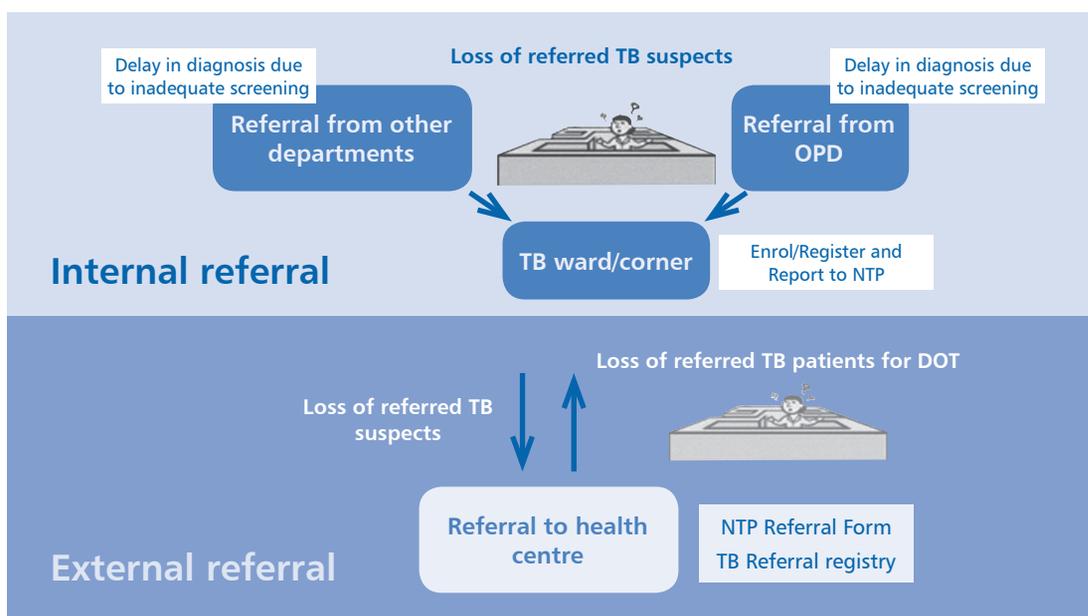


Source: National Center for Tuberculosis and Leprosy Control. Second National Tuberculosis Prevalence Survey Cambodia, 2011.

Hospitals

The review team was informed that a large number of TB suspects and patients who visit both public and private hospitals are often not screened for TB at the OPD level. Also, those who are diagnosed with TB and referred to the TB ward are often lost from the system in the internal referral processes. Further, TB suspects referred from a health centre to a hospital for diagnosis or who are referred from a hospital to a health centre for treatment are often lost in the process. Addressing these gaps will increase case detection and treatment. The Kantha Bopha Hospitals, which claim to diagnose a huge number of TB cases in children, still remain unengaged.

Figure 10. Schematic illustrating the need to ensure TB suspects in hospitals are properly referred



Pharmacies

The Pharmacy Association of Cambodia (PAC) was a key catalyst in promoting the engagement of pharmacies in the referral of TB suspects, but its capacity may now be diminished with the loss of its earlier leadership. The pharmacy involvement initiative has also transitioned from one nongovernmental organization to another two nongovernmental organizations over the past year. Both these factors could have impact in sustaining the initial momentum of pharmacy engagement.

Clinics ('Cabinets')

The volume of referrals from clinics is low and some clinics and private practitioners often diagnose and manage TB cases without following NTP guidelines. These clinics and private practitioners need to be suitably incentivized to engage with the public sector. In many settings, social franchising mechanisms with branding serve as a useful non-financial incentive to engage the private sector, but they are time consuming and complex to set up.

Private laboratories

The review identified that many private labs, such as IPC, were diagnosing TB cases for private providers but not reporting them to CENAT. The engagement of these laboratories is crucial to record and report the TB cases diagnosed in these labs, as well as to support the thinly stretched resources of CENAT and the health system in diagnosing TB cases.

Others

Although TB care has been made available in the workplace in a number of factories, the potential of providers such as the corporate sector and business associations still remains largely untapped.¹⁹ In rural areas, *pet phums*, traditional healers and local drug sellers still require further sensitization and the current level of engagement could be further scaled up in getting them to refer TB suspects who approach them.

Medical education

The current medical training curriculum in Cambodia in the pre-service phase only covers TB epidemiology. Management of TB is only covered under in-service training for public sector physicians. Private sector doctors thus do not have any training in TB care. The Medical Council of Cambodia in an effort to strengthen the capacity of doctors in the public and private sectors is in the process of introducing a series of training sessions, with credits, that all practitioners will have to undertake to renew their medical license every three years. The council is willing to include obligatory credits on TB management to ensure that all doctors are trained in TB care and control. There is need for collaboration by CENAT with the medical council to provide technical input on the course content and to ensure that the credits are introduced.

19 FHI-360, CENAT, CATA, USAID. Cambodia Anti-TB Association (CATA) response to tuberculosis in the workplace: a qualitative assessment among 17 Cambodian factories. 2012.

Recommendations

1. Ministry of Health, CENAT and WHO should work together to develop a stronger communications and sensitization plan to spread information on the anti-TB drug ban and serological test ban and work with the Department of Drugs and Food to enforce it.
2. CENAT should provide technical input to the medical council to include TB management as an obligatory credit within the continuing medical education required for medical licenses.
3. To attract the engagement of private providers (especially, clinics/cabinets) and build demand for quality TB care, CENAT should consider introducing social franchising mechanisms with branding. This could best be initiated by inviting a consultant with experience in this field to evaluate the possibilities and recommend a suitable approach.
4. CENAT should link with business associations to educate workers on TB and integrate TB into workplace and occupational safety and health programmes.
5. CENAT should engage with private laboratories, such as the IPC, to notify the TB cases they diagnose and support the diagnostic load in country, e.g. by drug-susceptibility testing.
6. CENAT should link with relevant departments in the MOH, as well as key partners working on hospital engagement such as the University Research Corporation (URC), to strengthen internal and external TB referral linkages within hospitals to facilitate early detection of TB cases.

Annex

Annex 1: Review team members

Teams	Operational districts visited	International participants		National participants	
		Names	Agencies	Names	Agencies
Team I Diagnostic services	Kampong Thom OD (Kampong Thom)	Kimberly McCarthy	US-CDC	Sokheng Pheng	CENAT
		Max Meis	KNCV	Sambo Boy	WHO/CENAT
				Chey Mony	JATA/TBCARE
Team II Drug Supply and Treatment	Kampong Chhnang OD (Kampong Chhnang)	Thomas Chiang	USAID	Chay Sokun	CENAT
		Aung Kya Jai Maug	Damien Foundation	Long Ngeth	CENAT
Team III Monitoring and Evaluation	Krivong OD (Takeo)	Paul Nunn	Consultant	In Sokhanya	CENAT
		Eline Korenromp	Global Fund	Ly Sothin	CENAT
		Soleil Labelle	WHO/HQ	Ken Veasna	RHAC
		Katherine Chong	WHO/Intern		
Team IV Economic Analysis	Kien Svay OD (Kandal)	Christy Hanson	Macalester College	Tek Sophoeun	CENAT
		Janet Phillips	USAID	Tan Kun Dara	CENAT
		Hannah Monica Dias	WHO/HQ	Ny Keophara	CENAT
				Vanthy Ly	US-CDC
Team V TB/HIV	Sampov Meas OD (Pursat)	Laurent Ferradini	FHI 360	Khun Kim Eam	CENAT
		Perry Killam	US-CDC	Nou Sovann	RACHA
		Kalpesh Rahevar	Consultant	Ung Prahors	CHC
Team VI DR-TB, infection control, hospital care	North OD (Phnom Penh)	Tauhid Islam	WHO/ WPRO	Keo Sokonth	CENAT
		Bern Nyang'wa	MSF-UK	Narith Ratha	CENAT
				Sam Sophan	CHC
				Cheang Chandarith	URC
				Khann Sokhan	WHO/CENAT
				Thai Sopheak	SHCH
Team VII Community DOTS, PPM DOTS and Civil Society Organizations	Chamcar Leu OD (Kampong Cham)	Lana Tomaskovic	WHO/HQ	Team Bak Khim	CENAT
				Thor Chanthé	CHC
				Mena Ly	FHI 360
				Song Ngak	FHI 360
				Chak Chantha	USAID
				Peng Veasna	CENAT
Team VIII High-risk groups and situations	Angkor Chum OD (Siem Reap)	Ben Marais	University of Sydney	Peou Satha	CENAT
		Akira Shimouchi	RIT/JATA	Sayoeun	CENAT
		Brittany Moore	US-CDC	Kunrath Seak	JATA
				Kheng Chheng	URC

Other international participants					
Anne Zeindl Cronin	GDF				
Anthony Bondurant	FHI 360				
Jaap F Broekmans	Global Fund (TERG)				
Daniel Low-Beer	Global Fund				
Kosuke Okada	JICA				
Xuanhao Chan	Clinton Health Access Initiative				

Overall coordination					
Paul Nunn	Consultant				
Kalpesh Rahevar	Consultant				
Mao Tan Eang	CENAT				
Tieng Sivanna	CENAT				
Khloeung Phally	CENAT				
Rajendra Yadav	WHO/Cambodia				
Jamie Tonsing	FHI 360 / TB CARE				