# Global Fund 5-Year Evaluation

# Cambodia
# Health Impact Evaluation
# 2008

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Phnom Penh, Cambodia

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National Malaria Center (CNM)
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Geneva, Switzerland

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**Five-Year Evaluation of the Global Fund—Study Area 3: Health Impact**
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This report presents the findings of the 2008 Cambodian Health Impact Evaluation carried out by multiple national partners including the National Center for HIV/AIDS Dermatology and STD (NCHADS), the National TB Program (NTP), the National Malaria Center (CNM), and the Psychosocial Organization (PSO). The Cambodian Impact Evaluation Task Force developed and guided the overall workplan, and a National Coordinator oversaw the implementation of the major evaluation activities. Members of the Health Impact Evaluation Consortium, namely Macro International and the World Health Organization, provided financial and technical assistance for the Evaluation through the Global Fund Five-Year Evaluation project.[1] The Five-Year Evaluation was conceived in November 2006 by the Global Fund to Fight AIDS, Tuberculosis and Malaria, with the objective to evaluate the impact of collective investments on the reduction of burden of the three diseases (Study Area 3). Global guidance and oversight of the Evaluation in 18 countries was provided by the Global Fund's Technical Evaluation Reference Group (TERG). The opinions expressed in this report are those of national partners in Cambodia.

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[1] The five members of the Health Impact Evaluation Consorium include Macro International, Harvard University, the African Population and Health Research Center, John Hopkins University, and the World Health Organization. The Consortium is under contract with the Global Fund to Fight AIDS, Tuberculosis and Malaria to conduct the Five-Year Evaluation in 18 countries.

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# Secondary Analysis of Disease Trends:

# HIV/AIDS

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# 1.0 DATA SOURCES AND DATA QUALITY

The usefulness of the information generated in this evaluation is dependent on the quality of the original, underlying data. The main type of secondary data used in this trend analysis is routine HIV/AIDS information that is collected from health service delivery points and reported to the national level via the health information system (HIS). For this evaluation the quality of HIS information was checked by assessing elements of internal quality, including completeness, timeliness, comprehensiveness, and accuracy.

- Completeness and timeliness were assessed by reviewing the availability of regular reports submitted by delivery points
- Comprehensiveness was assessed by reviewing the content of the regular reports, if accessible
- Accuracy was checked by verifying internal consistency by comparing with other studies and data sources, if available.

Based on the information about the quality of the information in the national and district record reviews for HIV/AIDS, recommendations for improving the quality of the reporting system are formulated.

## DESCRIPTION OF HIV/AIDS REPORTING SYSTEMS

Prior to 2005, the health information system department of the Ministry of Health was responsible for collecting most health related information. The National Center for HIV/AIDS Dermatology and STD (NCHADS), on the other hand, was responsible for collecting information related uniquely to HIV/AIDS & VCCT, mainly through maintaining active surveillance systems.

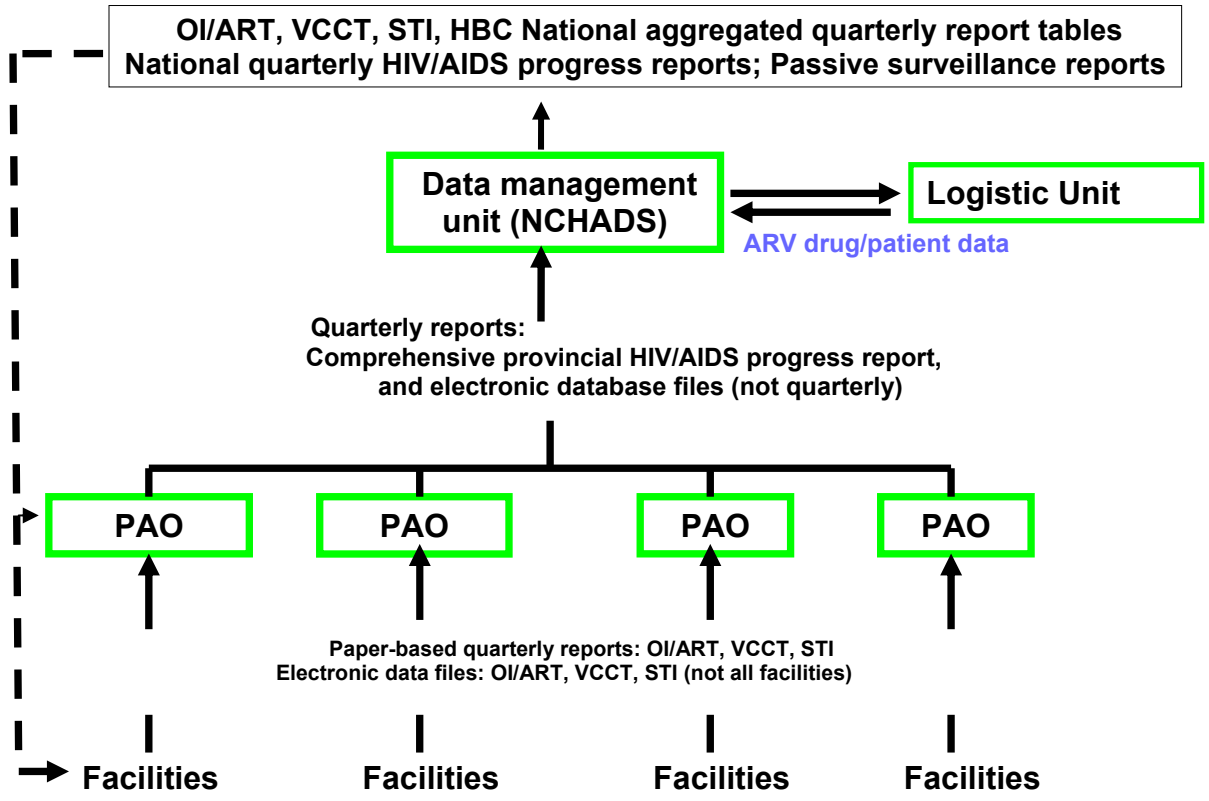
At the end of 2005, the NCHADS data management unit was established and the data collection mandate was expanded to manage patient data from STI, VCCT, OI/ART and Home Based Care (HBC). To perform this role, data management teams were recruited to work in provincial AIDS office (PAO) in 11 provinces out of the total 24 provinces/provincial cities. NCHADS is further scheduled to set up data management teams in another 9 provinces by 2009. For the remaining provinces without a data management team, the facility data is to be sent directly to NCHADS. In this report, the description focuses mainly on the flow of the data collected through NCHADS data reporting system. Note that, information related to PMTCT is not collected through NCHADS reporting systems.

There are two ways of collecting data at the facility level – paper-based and computer-based. To date, there are databases for data from VCCT, STI clinics, and OI/ART sites. The data are sent to the Provincial AIDS office by the staff working in these facilities as well as from HBC teams. The data management team in each province analyzes the data and compiles quarterly and annually reports for their provinces.

Comprehensive provincial HIV/AIDS progress reports and electronic data files are sent to Data Management Unit at NCHADS on a quarterly basis (Figure 1.1). At the central level, Data management staff routinely compiles national comprehensive HIV/AIDS reports from the quarterly provincial reports on OI/ART, VCCT, STI and HBC. This National report is printed and

distributed to all units at NCHADS, the Provincial AIDS offices, and to the public through the NCHADS internet site (http://www.nchads.org).

**Figure 1.1: Schematic of NCHADS HIV/AIDS reporting system**




## QUALITY OF HIV/AIDS DATA FROM THE NCHADS HMIS SYSTEM

There are 3 sources from which data are reported through HIV information system: VCCT, STD clinic and OI/ART clinics. The level of reporting completeness of these 3 sources may vary by source and also from province to province.

NCHADS has found that the completeness of reporting on HIV counseling and testing, measured by using the percentage of the number of expected quarterly reports received by quarter, was over 90% in 2006 and 2007 (Table 1.1).

**Table 1.1: Completeness of HIV counseling and testing reporting over time**

**Percentage of expected quarterly reports received by quarter, 2006 and 2007**

| Year | Quarter | Expected report (N) | Received report (N) | % reporting completeness |
|---|---|---|---|---|
| 2007 | Q4 | 197 | 192 | 97% |
| | Q3 | 190 | 184 | 97% |
| | Q2 | 176 | 161 | 91% |
| | Q1 | 156 | 150 | 96% |
| 2006 | Q4 | 140 | 140 | 100% |
| | Q3 | 129 | 128 | 99% |
| | Q2 | 122 | 117 | 96% |
| | Q1 | 103 | 103 | 100% |

Source: VCCT Record Review, Global Fund Health Impact Evaluation 2008

The completeness of VCCT reporting was high in all provinces (Table 1.2). The percentage of quarterly reports received in Phnom Penh and Siem Reap was lowest, less than 95%. In Phnom Penh this may be due to the fact there are relatively more VCCT sites compared to other places, but this would not be the case for Siem Reap where reporting completeness is the lowest in 2007.

**Table 1.2: Completeness of HIV counseling and testing reporting across provinces**

**Percentage of expected quarterly reports received, by province 2006 and 2007**

| | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|
| Province | Expected report | Received report % | | Expected report | Received report % | |
| Bantey Mean Chey | 8 | 8 | 100% | 16 | 16 | 100% |
| Batambang | 8 | 7 | 88% | 15 | 15 | 100% |
| Kampong Cham | 13 | 13 | 100% | 17 | 17 | 100% |
| Kampong Chhang | 3 | 3 | 100% | 4 | 4 | 100% |
| Kandal | 9 | 9 | 100% | 14 | 14 | 100% |
| Kep | 1 | 1 | 100% | 1 | 1 | 100% |
| Koh Kong | 2 | 2 | 100% | 2 | 2 | 100% |
| Kampot | 4 | 4 | 100% | 6 | 6 | 100% |
| Kratie | 3 | 3 | 100% | 4 | 4 | 100% |
| Kampong Speu | 2 | 2 | 100% | 4 | 4 | 100% |
| Kampong Thom | 5 | 5 | 100% | 6 | 6 | 100% |
| Modulekiri | 1 | 1 | 100% | 1 | 1 | 100% |
| Odormeanchey | 2 | 2 | 100% | 2 | 2 | 100% |
| Pailin | 1 | 1 | 100% | 3 | 3 | 100% |
| Phnom Penh | 22 | 21 | 95% | 29 | 27 | 93% |
| Pursat | 6 | 6 | 100% | 9 | 9 | 100% |
| Preyveng | 7 | 7 | 100% | 8 | 8 | 100% |
| Preah vihea | 1 | 1 | 100% | 1 | 1 | 100% |
| Ratannak kiri | 1 | 1 | 100% | 1 | 1 | 100% |
| Siem Reap | 7 | 7 | 100% | 10 | 9 | 90% |
| Sihanouk Ville | 2 | 2 | 100% | 3 | 3 | 100% |
| Stung Treng | 1 | 1 | 100% | 2 | 2 | 100% |
| Svay Rieng | 3 | 3 | 100% | 6 | 6 | 100% |
| Takeo | 6 | 6 | 100% | 10 | 10 | 100% |

Source: VCCT Record Review, Global Fund Health Impact Evaluation 2008

In 2007 the timeliness of reporting was also good in all provinces. In the third quarter 2007, seven provinces sent their report late although the delay was within one week of the reporting deadline. Table 1.3 shows the number of HIV counseling and testing facilities reporting in each province, and the timeliness of reporting (on-time or within a week of the deadline): It is not known from the information available below whether delays are due to delays at the provincial level, or else due to delays because of facilities within the province are reporting late.

**Table 1.3: Timeliness of HIV counseling and testing reporting across provinces**

**Percentage of provinces (and facilities within provinces) reporting on-time, quarters in 2007**

| | Q1- 2007 | | | Q2- 2007 | | | Q3- 2007 | | | Q4- 2007 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 week | | | 1 week | | | 1 week | | | 1 week | |
| Province | On time | late | % on time | On time | late | % on time | On time | late | % on time | On time | late % | on time |
| Bantey Meanchey | 16 | | 100.00% | 16 | | 100.00% | 16 | | 100.00% | 16 | | 100.00% |
| Battambang | 15 | | 100.00% | 15 | | 100.00% | 15 | | 100.00% | 15 | | 100.00% |
| Kampong Cham | 17 | | 100.00% | 17 | | 100.00% | 17 | | 100.00% | 17 | | 100.00% |
| Kampong Chhang | 4 | | 100.00% | 4 | | 100.00% | | 4 | 0.00% | 4 | | 100.00% |
| Kandal | 14 | | 100.00% | 14 | | 100.00% | 14 | | 100.00% | 14 | | 100.00% |
| Kep | 1 | | 100.00% | 1 | | 100.00% | | 1 | 0.00% | 1 | | 100.00% |
| Koh Kong | 2 | | 100.00% | 2 | | 100.00% | 2 | | 100.00% | 2 | | 100.00% |
| Kampot | 6 | | 100.00% | | 6 | 0.00% | | 6 | 0.00% | 6 | | 100.00% |
| Kratie | 4 | | 100.00% | 4 | | 100.00% | | 4 | 0.00% | 4 | | 100.00% |
| Kampong Speu | 4 | | 100.00% | 4 | | 100.00% | 4 | | 100.00% | 4 | | 100.00% |
| Kampong Thom | 6 | | 100.00% | 6 | | 100.00% | 6 | | 100.00% | 6 | | 100.00% |
| Mondul Kiri | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% |
| Odormeanchey | | 2 | 0.00% | 2 | | 100.00% | 2 | | 100.00% | | 2 | 0.00% |
| Pailin | | 3 | 0.00% | 3 | | 100.00% | 3 | | 100.00% | 3 | | 100.00% |
| Phnom Penh | | 29 | 0.00% | 29 | | 100.00% | 29 | | 100.00% | 29 | | 100.00% |
| Pursat | 9 | | 100.00% | 9 | | 100.00% | 9 | | 100.00% | 9 | | 100.00% |
| Preyveng | 8 | | 100.00% | 8 | | 100.00% | | 8 | 0.00% | 8 | | 100.00% |
| Preah Vihea | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% |
| Rattanak Kiri | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% | 1 | | 100.00% |
| Sihanouk Ville | 3 | | 100.00% | 3 | | 100.00% | 3 | | 100.00% | 3 | | 100.00% |
| Siem Reap | 10 | | 100.00% | 10 | | 100.00% | 10 | | 100.00% | 10 | | 100.00% |
| Stung Treng | 2 | | 100.00% | 2 | | 100.00% | | 1 | 0.00% | 2 | | 100.00% |
| Svay Rieng | 6 | | 100.00% | 6 | | 100.00% | | 6 | 0.00% | 6 | | 100.00% |
| Takeo | 10 | | 100.00% | 10 | | 100.00% | 10 | | 100.00% | 10 | | 100.00% |

Source: VCCT Record Review, Global Fund Health Impact Evaluation 2008

On the other hand, PMTCT services, which are overseen by the National Maternal and Child Health (NMCHC), have a separate reporting system from the NCHADS reporting system. The completeness and timeliness of PMTCT information system was therefore not evaluated. Some information related to PMTCT, however, is regularly obtained by NCHADS to compile and publish in NCHADS quarterly and annually reports.

ART reports are collected from all OI/ART sites in Cambodia. Information collected at delivery sites is sent to NCHADS through the Provincial AIDS office where annual and quarterly reports are produced for each province. Then, annually and quarterly reports from each provinces are sent to the data management unit at NCHADS for compiling and producing national reports.

There were a total of 39 to 49 OI/ART sites in first quarter 2006 and fourth quarter 2007, respectively. The completeness of the quarterly reports submitted by these sites is perfect (100%) for every quarter from 2006 to 2007 (Table 1.4), and for every province (Table 1.5).

**Table 1.4: Completeness of ART reporting over time**

**Percentage of expected quarterly report received from all sites, 2006-2007**

| Reporting period | % site reporting per quarter | # site expected to report |
|---|---|---|
| Q4 2007 | 100 | 49 |
| Q3 2007 | 100 | 48 |
| Q2 2007 | 100 | 46 |
| Q1 2007 | 100 | 47 |
| Q4 2006 | 100 | 41 |
| Q3 2006 | 100 | 40 |
| Q2 2006 | 100 | 40 |
| Q1 2006 | 100 | 39 |

Source: OI/ART Record Review, Global Fund Health Impact Evaluation 2008

**Table 1.5: Completeness of ART reporting across provinces**

**Percentage of expected quarterly reports received by provinces, 2006-2007**

| | 2006 | | 2007 | |
|---|---|---|---|---|
| Province | % of expected report | # of expected quarterly report | % of expected report | # of expected quarterly report |
| Banteay Meanchey | 100 | 12 | 100 | 12 |
| Battambang | 100 | 15 | 100 | 18 |
| Kampong Cham | 100 | 16 | 100 | 16 |
| Kampong Chhang | 100 | 4 | 100 | 4 |
| Kampong Speu | 100 | 4 | 100 | 4 |
| Kampong Thom | 100 | 4 | 100 | 4 |
| Kampot | 100 | 8 | 100 | 8 |
| Kandal | 100 | 8 | 100 | 8 |
| Koh Kong | 100 | 4 | 100 | 7 |
| Kratie | | | 100 | 4 |
| Odor Meanchey | | | 100 | 4 |
| Pailin | 100 | 4 | 100 | 4 |
| Phnom Penh | 100 | 37 | 100 | 40 |
| Prey Veng | 100 | 8 | 100 | 9 |
| Pursat | 100 | 4 | 100 | 4 |
| Siem Reap | 100 | 12 | 100 | 16 |
| Sihanouk Ville | 100 | 4 | 100 | 4 |
| Stung Treng | 100 | | 100 | 4 |
| Svay Rieng | 100 | 4 | 100 | 8 |
| Takeo | 100 | 12 | 100 | 12 |
| Grand total | | 160 | | 190 |

Source: OI/ART Record Review, Global Fund Health Impact Evaluation 2008

The percentage of OI/ART sites reporting on time in the first and the last reporting period in 2007 was lowest in Phnom Penh, where 10 OI/ART are functioning, with 80% and 70% of sites submitting timely reports in the first and the last quarter of 2007, respectively (Table 1.6).

**Table 1.6: Timeliness of ART reporting across provinces**

**Percentage of OI/ART sites reporting on time in the first and last reporting periods of 2007, by province**

| | 2007 | | | |
|---|---|---|---|---|
| **Province** | **% site reported_Q1** | **# site to report** | **% site reported_Q4** | **# site to report** |
| Banteay Meanchey | 100 | 3 | 100 | 3 |
| Battambang | 100 | 4 | 100 | 5 |
| Kampong Cham | 100 | 4 | 100 | 4 |
| Kampong Chhang | 100 | 1 | 100 | 1 |
| Kampong Speu | 100 | 1 | 100 | 1 |
| Kampong Thom | 100 | 1 | 100 | 1 |
| Kampot | 100 | 2 | 100 | 2 |
| Kandal | 100 | 2 | 100 | 2 |
| Koh Kong | 100 | 2 | 100 | 2 |
| Kratie | 100 | 1 | 100 | 1 |
| Odor Meanchey | 0 | 1 | 100 | 1 |
| Pailin | 0 | 1 | 100 | 1 |
| Phnom Penh | 80 | 10 | 70 | 10 |
| Prey Veng | 100 | 2 | 100 | 3 |
| Pursat | 100 | 1 | 100 | 1 |
| Siem Reap | 100 | 4 | 100 | 4 |
| Sihanouk Ville | 100 | 1 | 100 | 1 |
| Stung Treng | 100 | 1 | 100 | 1 |
| Svay Rieng | 100 | 2 | 100 | 2 |
| Takeo | 100 | 3 | 100 | 3 |

Source: OI/ART Record Review, Global Fund Health Impact Evaluation 2008

## RECOMMENDATIONS FOR IMPROVING HIV/AIDS REPORTING SYSTEMS

After 3 years of implementing the routine data collection system, a few recommendations are voiced in order to improve the HIV/AIDS reporting system. First, the data reporting tools should be standardized across all health facilities, including those supported by both government and non governmental organizations.

Second, the completeness, timeliness and the quality of the data should be maintained and improved despite the fact that completeness and timeliness of information collected from VCCT and OI/ART sites are already good. Third, it is strongly suggested that staff motivation is maintained for ensuring the completeness and quality of data, and, in order to avoid any loss of data, paper based data collection tools should be used in parallel with electronic reporting.

Finally, the implementation of continuous quality assurance strategies at all sites are crucial to guarantee that information derived from those sites can be used with minimal margin of errors.

## 1.1 HIV/AIDS: BACKGROUND

### HISTORICAL PERSPECTIVE

#### HISTORY OF THE EPIDEMIC

The history of the HIV/AIDS epidemic has been relatively well documented since the detection of the first HIV infected blood donor in 1991 and the first detected AIDS case in 1993. With the estimated prevalence of HIV among the general adult population 15-49 years old at 0.9% in 2006, Cambodia stands as the most affected country in South East Asia, despite the fact that HIV prevention programs in Cambodia are currently showing very promising results on taming the wild epidemic.

#### CHARACTERISTIC OF THE EPIDEMIC

At the early stage of epidemic, female sex workers and other sexually active groups such as military, police, and moto-taxi drivers were hard hit. Since then the declining trends of HIV prevalence have been directly seen not only in the female sex worker group, but also in all other high risk groups. In addition, the prevalence of HIV among women seeking prenatal services also has gradually declined (2.1% in 2000 vs 1.1% in 2006).

Heterosexual activity is the main mode of HIV transmission in Cambodia. There is not enough evidence to presume that injecting drug use and homosexuality have been attributed to the spread of the epidemic in Cambodia, although these routes of transmission are predominant in the neighboring countries of Vietnam and Thailand. However, a study conducted among MSM in 2005 revealed that the HIV prevalence for this population was about 5%, which is substantially higher than the general population, and about 7% among MSM in Phnom Penh. HIV prevalence among drug users has recently been conducted and the results will be available in late 2008.

Regarding vertical transmission, thus far there have been no empirical studies done to accurately document the magnitude of transmission from mother to child in Cambodia; however, it is widely perceived that the demand for ART treatment for children is rising. NCHADS estimates that approximately 3900 children age 0-14 years were living with HIV in 2006 (HIV consensus report 2006).

#### a. Preventive Strategies

The Royal government of Cambodia, with financial and technical support from international communities, initiated the response against HIV transmission soon after the first HIV case in the country was identified. It has been observed that in the early stage of the epidemic, the government strategies were to target HIV prevention solely among high risk groups, while later, the focus has been redirected to the provision of care to AIDS patients and to the expansion of HIV prevention efforts among low risk groups ie, the general population. In brief, the main strategies being implemented in Cambodia include comprehensive surveillance systems, voluntary counseling and testing (VCT), and AIDS care.

### i. Surveillance systems

The first response to the HIV epidemic was the establishment of surveillance systems which are generally believed to provide reliable documentation of the magnitude and trends of the epidemic. The surveillance systems in Cambodia are composed of 2 vital components: monitoring and control.

The monitoring component consists of HIV Sentinel Surveillance (HSS), Behavioral Sentinel Surveillance (BSS), Sexually Transmitted Disease Sentinel Surveillance (SSS), and HIV and STD passive surveillance. HSS and BSS have been annually conducted since 1997 (except there was no BSS in 2000 & 2002), while SSS have been conducted every 5 years. Female sex workers, police/military, moto taxi drivers, and pregnant women attending antenatal clinics have been consistently included in both HSS and BSS in order to monitor the trend of the HIV prevalence as well as potential risk behaviors. Thus far, there have been 9 rounds of HSS, 7 rounds of BSS and 3 rounds of SSS.

Passive surveillance, on the other hand, is not systematic and hence data quality, completeness, and the extent of coverage are very limited. However, this system has been expanded and improved significantly since 2004, especially for VCCT, ART/OI and STD information.

### ii. 100% condom use programs and others health education programs

In addition to these surveillance systems, there are an epidemic control programs such as 100% condom use, free sexually transmitted infections (STIs) treatment, and peer and outreach education. 100% condom use program, which was designed to increase the prevalence of condom use among brothel-based female sex workers (direct female sex workers) to 100%, was first implemented in 1998 and due to its considerable success has been quickly scaled up to cover 22 of 24 provinces/cities. To make the 100% condom use program complete, NCHADS offers diagnosis and treatment of all STIs in communities free of charge, especially to female commercial sex workers and their male clients. In addition, HIV/AIDS education programs have been consistently implemented countrywide. In order to ensure the acceptability of these programs and optimize their positive effects, educational materials have been designed in various models and delivered in different forms of media ranging from small group discussions to drama on radio or TV.

### iii. Voluntary counseling and testing services

VCCT was first made available in Cambodia in 1995. Up until 2007, 197 VCCT have been operating in 24 provinces/cities. Among all VCCT, 170 sites are under the management of NCHADS. By 2007, there were approximately 259,883 people who had their blood tested for HIV, among which 56.5% were female. It has been observed that the prevalence of HIV among male and female visiting VCCT centers is 6% and 5%, respectively.

### iv. AIDS care

Continuum of Care (CoC) framework was designed to respond to the increase in the number of people living with HIV/AIDS (PLHA). Components of CoC include: Opportunistic Infections (OI), Anti-retroviral (ARV) treatment, Home based care (HBC), and VCCT. Up until 2006, 65000 adults aged between 15-49 years old were estimated to live with HIV/AIDS and approximately 3900 children were infected. In an attempt to provide appropriate care to AIDS patients, Cambodia has scaled up health facilities in the last 4 years so that OI & ARV treatment are more widely available.

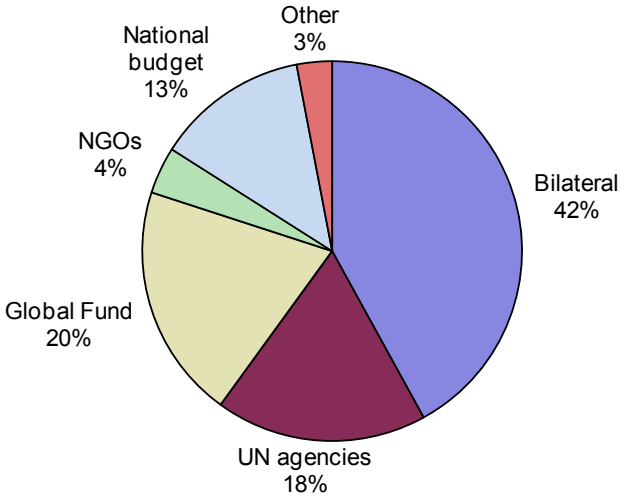
To date, 49 health facilities in 20 provinces offer OI and ARV services, including 2 facilities that provide only OI care and 22 sites that provide HIV pediatric care. In addition, home based care has

been expanded from 51 teams in 2001 to 253 teams in 2007. The number of home based care teams in 2007 is decreasing since some non-governmental organizations have stopped their activity due to the lack of funding.

## 1.2 FINANCING FOR HIV PREVENTION AND TREATMENT PROGRAMS

According to the 2006 NASA, it is estimated that in 2006, US$ 46.3 million was spent on activities related to HIV/AIDS in Cambodia. There are three significant sources of funding used in the combat against the HIV/AIDS epidemic: donor agencies, NGOs and private agents, and the government. The National Budget contributed just 13% to the total budget (Figure 1.2).

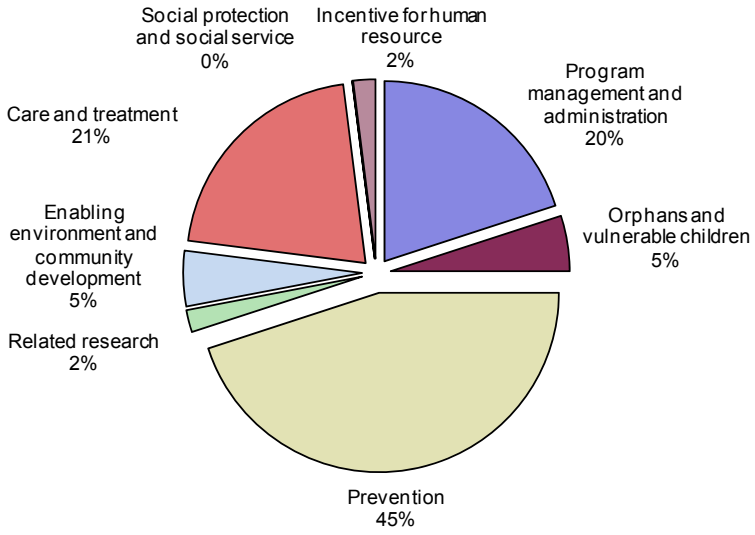
**Figure 1.2: Source of HIV/AIDS funds in Cambodia, 2006**




Source: NASA report 2006

By breaking down the expenditure on HIV/AIDS into discrete categories, it has been found that prevention activities consumed 45% of the total budget while a very small proportion of the budget was allocated to providing social protection and social services in the area of HIV/AIDS (Figure 1.3). Social protection and social services include activities such as the provision of medical pensions, early retirement, food security, funeral expenses, day care services, transportation, etc. to HIV/AIDS patients.

**Figure 1.3: HIV/AIDS expenditure by categories**



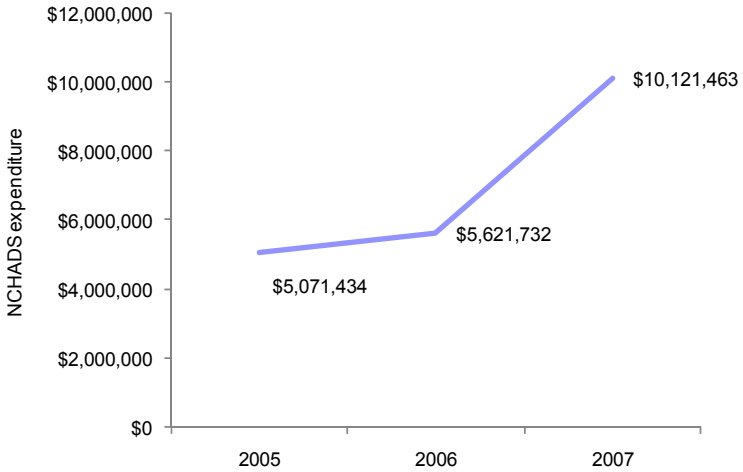

Source: NASA report 2006

Although the NASA report provides crucial information related to funding on HIV/AIDS activities in Cambodia in 2006, it is not possible to produce a trend of HIV/AIDS expenditures over time.

Some financial trend information at NCHADS shows that the budget planned and spent on HIV/AIDS has increased substantially since 2005. Note that this budget is lower than the actual figures since NCHADS does not have information related to the budget amount allocated for HIV/AIDS drug supplies.

The substantial increase in expenditures from 2006 to 2007 may reflect the fact that more VCCT sites and OI/ART sites were opened to public in this period (Figure 1.4). In addition, although the number of ART sites remains the same or has just slightly increased, more functions such as AIDS case management for children have been added to the existing ART sites.

**Figure 1.4: HIV/AIDS expenditure at NCHADS***




*Expenditures in 2005 and 2006 is lower than actual expenditures due to unreported expenses for ART drug purchases from Global Fund principal recipient

Source: NCHADS annual reports (paper based), Global Fund Health Impact Evaluation 2008

## 1.3 HIV COUNSELING AND TESTING SERVICES

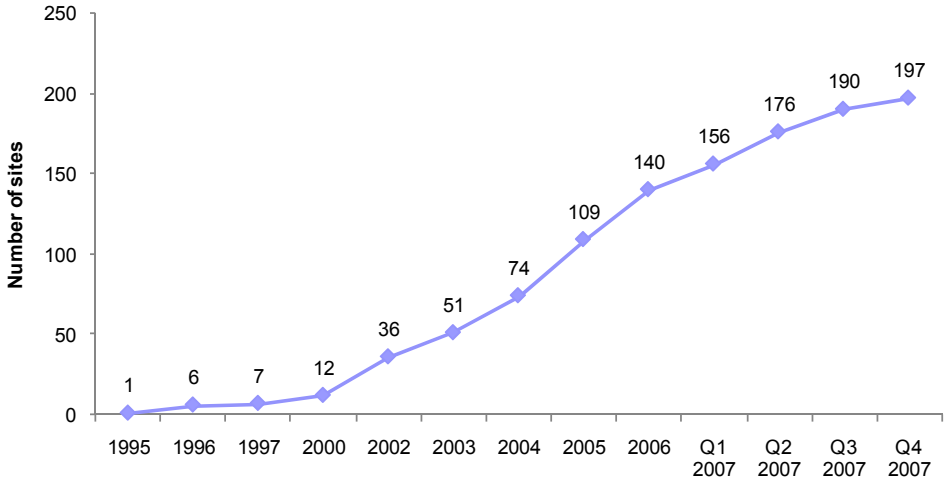
### FINANCING FOR HIV COUNSELING AND TESTING SERVICES

Although specific financial data for HIV counseling and testing is not available, there appears to be a strong association between an increase of funding and an increase in counseling and testing services.

### AVAILABILITY OF HIV COUNSELING AND TESTING SERVICES

Based on NCHADS reporting, in quarter 4 of 2007, 7 new VCCT sites were opened, in addition to the 190 existing sites. The increasing trend in the number of sites is evidence that funding availability is one of the vital parts in the expansion of number of VCCT sites (Figure 1.5).

**Figure 1.5: National trends in the number of sites offering HIV counselling and testing**



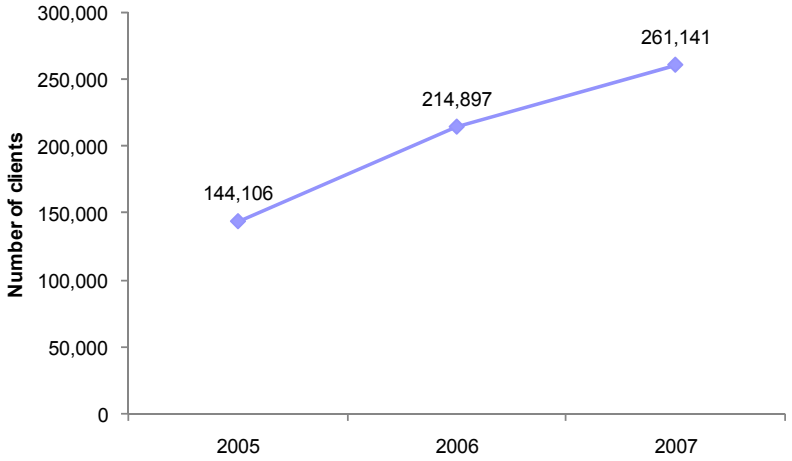

Source: VCCT Record Review, Global Fund Health Impact Evaluation 2008

### QUANTITY AND DISTRIBUTION OF HIV COUNSELING AND TESTING SERVICES

There are clear and comprehensive guidelines developed for assessing the feasibility of the expansion of VCCT sites in any city/province. Several criteria have to be fulfilled, such as having a sufficient number of potential clients, a sufficiently extensive coverage areas, qualified staff, etc. before a decision can be made on establishing a new VCCT site. It is therefore believed that sites are equitably distributed across the density of the population and geographical areas.

Due to the expansion of VCCT sites, the number of people accessing this service has increased substantially from 2005 to 2007 (Figure 1.6). The increase has been in all cities/provinces suggesting there is a good coverage of the population. For instance, at national level about 2% of population age 15- 49 years had test at VCCT in 2005, and this percentage increased to 3.5% in 2007 (Table 1.7).

**Figure 1.6: National trends in total number of people accessing pre-test HIV counseling, 2005-2007**




Source: VCCT Record Review, Global Fund Health Impact Evaluation 2008

**Table 1.7: Background characteristics of clients accessing HIV counselling and testing services, 2005 – 2007**

**Number of clients who accessed HIV pre-test counselling and % of adults 15-49 who accessed pre-test counselling, by province, 2005-2007**

| | 2005 | | 2006 | | 2007 | |
|---|---|---|---|---|---|---|
| Province | # who received pre-test counseling | % pre-tested | # pre-tested | % | pre-tested | % |
| Bantey Meanchey | 8,290 | 2.10% | 10,639 | 2.60% | 13,770 | 3.25% |
| Battambang | 12,014 | 2.39% | 16,566 | 3.19% | 20,373 | 3.82% |
| Kampong Cham | 9,669 | 1.02% | 19,836 | 2.05% | 23,637 | 2.38% |
| Kampong Chhang | 2,360 | 0.97% | 4,043 | 1.60% | 4,368 | 1.67% |
| Kampong Speu | 2,066 | 0.58% | 2,845 | 0.77% | 5,017 | 1.31% |
| Kampot | 3,626 | 1.19% | 4,753 | 1.52% | 5,418 | 1.68% |
| Kandal | 4,953 | 0.78% | 8,990 | 1.38% | 13,618 | 2.02% |
| Kep | 442 | 2.33% | 534 | 2.68% | 584 | 2.79% |
| Kampong Thom | 3,640 | 1.08% | 5,994 | 1.72% | 7,785 | 2.16% |
| Koh Kong | 1,339 | 1.36% | 1,736 | 1.69% | 1,999 | 1.86% |
| Kratie | 1,049 | 0.64% | 3,301 | 1.95% | 4,162 | 2.38% |
| Modulkiri | 110 | 0.57% | 222 | 1.11% | 351 | 1.71% |
| Odor Meanchey | 807 | 1.65% | 2,297 | 4.51% | 2,630 | 4.96% |
| Pailin | 1,096 | 6.42% | 1,410 | 7.93% | 1,949 | 10.53% |
| Phnom Penh | 51,375 | 6.71% | 64,839 | 8.21% | 73,587 | 9.05% |
| Preah Vihea | 370 | 0.51% | 869 | 1.15% | 684 | 0.87% |
| Prey Veng | 7,092 | 1.29% | 16,458 | 2.92% | 23,212 | 4.02% |
| Pursat | 2,873 | 1.35% | 4,176 | 1.89% | 7,832 | 3.44% |
| Ratanak Kiri | 432 | 0.79% | 685 | 1.21% | 739 | 1.26% |
| Siem Reap | 11,368 | 2.66% | 16,461 | 3.72% | 18,420 | 4.03% |
| Sihanouk Villes | 5,182 | 4.78% | 6,887 | 6.09% | 7,121 | 6.05% |
| Stung Treng | 590 | 1.18% | 883 | 1.70% | 1,093 | 2.03% |
| Svay Rieng | 6,289 | 2.22% | 9,565 | 3.27% | 9,163 | 3.04% |
| Takeo | 7,074 | 1.58% | 10,908 | 2.37% | 13,629 | 2.88% |
| Total | 144,106 | 2.04% | 214,897 | 2.95% | 261,141 | 3.48% |

Source: VCCT record review, Global Fund Health Impact Evaluation 2008

## QUALITY OF HIV COUNSELING AND TESTING SERVICES

### INDETERMINATE HIV TEST RESULTS

The percentage of unknown or indeterminate HIV test results was calculated by using annual total number of indeterminate test results divided by the total number of HIV tests, times 100. It has been found that on average, the percentage of unknown or indeterminate HIV decreased from 0.6% in 2006 to 0.3% in 2007 suggesting a slight improvement of quality of testing performed at VCCT sites (Table 1.8).

**Table 1.8: National trends in the percentage of indeterminate HIV test results from HIV counselling and testing sites, 2005-2007**

| Province 2005 | | 2006 | 2007 |
|---|---|---|---|
| Bantey Meanchey | 0.00% | 0.60% | 0.34% |
| Battambang | 0.00% | 0.75% | 0.34% |
| Kampong Cham | 0.00% | 0.96% | 0.47% |
| Kampong Chhang | 0.00% | 0.10% | 0.12% |
| Kampong Speu | 0.00% | 0.48% | 0.22% |
| Kampot | 0.00% | 0.37% | 0.37% |
| Kandal | 0.00% | 0.62% | 0.19% |
| Kep | 0.00% | 0.00% | 0.00% |
| Khampong Thom | 0.00% | 0.56% | 0.22% |
| Koh Kong | 0.00% | 0.16% | 0.05% |
| Kratie | 0.00% | 0.85% | 0.31% |
| Mondulkiri | 0.00% | 0.00% | 0.00% |
| Oddor Meanchey | 0.00% | 0.96% | 0.84% |
| Pailin | 0.00% | 1.70% | 1.08% |
| Phnom Penh | 0.00% | 0.51% | 0.33% |
| Preah Vihear | 0.00% | 2.35% | 0.58% |
| Prey Veng | 0.00% | 0.10% | 0.03% |
| Pursat | 0.00% | 0.62% | 0.24% |
| Ratanakiri | 0.00% | 1.12% | 0.14% |
| Siem Reap | 0.00% | 0.34% | 0.16% |
| Sihanouk Ville | 0.00% | 0.93% | 0.59% |
| Stung Treng | 0.00% | 0.00% | 0.18% |
| Svay Rieng | 0.00% | 0.28% | 0.08% |
| Takeo | 0.00% | 0.58% | 0.41% |
| Total | 0.00% | 0.62% | 0.30% |

Source: VCCT record review, Global Fund Health Impact Evaluation 2008

## ADHERENCE TO HTC TREATMENT GUIDELINES

The percentage of referrals from VCCT to other services has been increased from approximately 30% in 2005 to about 100% in 2007 (Table 1.9). The huge increase may be due to the introduction of the continuum of care services which were first implemented in 2003 and scaled up every year since then.

**Table 1.9: National trends in the percentages of HIV positive counselling and testing clients who were referred for other services, 2005-2007***

| | 2005 | | | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| Province | Total positive | Number referred | % | Total positive | Number referred | % | Total positive | Number referred | % |
| Bantey Meanchey | 1,189 | 1,065 | 89.6% | 1,032 | 1,125 | 109.0% | 903 | 902 | 99.9% |
| Battambang | 1,602 | 621 | 38.8% | 1,431 | 1,459 | 102.0% | 1,262 | 1,271 | 100.7% |
| Kampong Cham | 1,144 | | | 1,515 | 1,434 | 94.7% | 1,221 | 1,212 | 99.3% |
| Kampong Chhang | 255 | 13 | 5.1% | 296 | 288 | 97.3% | 224 | 225 | 100.5% |
| Kampong Speu | 295 | | | 274 | 235 | 85.8% | 325 | 336 | 103.4% |
| Kampot | 622 | 136 | 21.9% | 549 | 541 | 98.5% | 431 | 431 | 100.0% |
| Kandal | 1,188 | 232 | 19.5% | 1,252 | 1,233 | 98.5% | 1,047 | 1,037 | 99.0% |
| Kep | 15 | 1 | 6.7% | 23 | 23 | 100.0% | 7 | 20 | 285.7% |
| Khampong Thom | 325 | | | 327 | 308 | 94.2% | 317 | 321 | 101.3% |
| Koh Kong | 298 | 287 | 96.3% | 307 | 307 | 100.0% | 332 | 282 | 84.9% |
| Kratie | 96 | 46 | 47.9% | 172 | 172 | 100.0% | 186 | 186 | 100.0% |
| Mondulkiri | | | | 7 | 3 | 42.9% | 4 | 4 | 100.0% |
| Oddor Meanchey | 58 | 3 | 5.2% | 128 | 120 | 93.8% | 136 | 160 | 117.7% |
| Pailin | 147 | 66 | 44.9% | 143 | 143 | 100.0% | 126 | 106 | 84.1% |
| Phnom Penh | 5,754 | 1,611 | 28.0% | 5,074 | 5,073 | 100.0% | 4,471 | 4,494 | 100.5% |
| Preah Vihear | 16 | 2 | 12.5% | 29 | 29 | 100.0% | 33 | 33 | 100.0% |
| Prey Veng | 825 | 164 | 19.9% | 925 | 921 | 99.6% | 645 | 643 | 99.7% |
| Pursat | 376 | 179 | 47.6% | 341 | 341 | 100.0% | 328 | 248 | 75.6% |
| Ratanakiri | 19 | | | 26 | 26 | 100.0% | 44 | 42 | 95.5% |
| Siem Reap | 1,079 | 373 | 34.6% | 1,092 | 1,086 | 99.5% | 938 | 910 | 97.0% |
| Sihanouk Ville | 741 | 153 | 20.7% | 604 | 582 | 96.4% | 448 | 413 | 92.2% |
| Stung Treng | 55 | | | 65 | 65 | 100.0% | 50 | 49 | 98.0% |
| Svay Rieng | 478 | 146 | 30.5% | 432 | 432 | 100.0% | 358 | 358 | 100.0% |
| Takeo | 1,074 | 79 | 7.4% | 924 | 946 | 102.4% | 742 | 757 | 102.0% |
| Grand total | 17,651 | 5,177 | 29.3% | 16,968 | 16,892 | 99.6% | 14,578 | 14,440 | 99.1% |

* Note that the percentage of HIV-positive persons referred from counseling and testing services is greater than 100% in some provinces. This percentage may be due to the fact that some HIV clients may carry over from the previous year. For example, in Battambang province in 2005, only 38.6% of HIV + clients were referred by VCCT for other services. This percentage jumped to 101% and 100.7% in 2006 and 2007, respectively. However, in the current report format there is no means to differentiate those whose HIV test result turned positive and were referred for other services in the same time period in a given year.

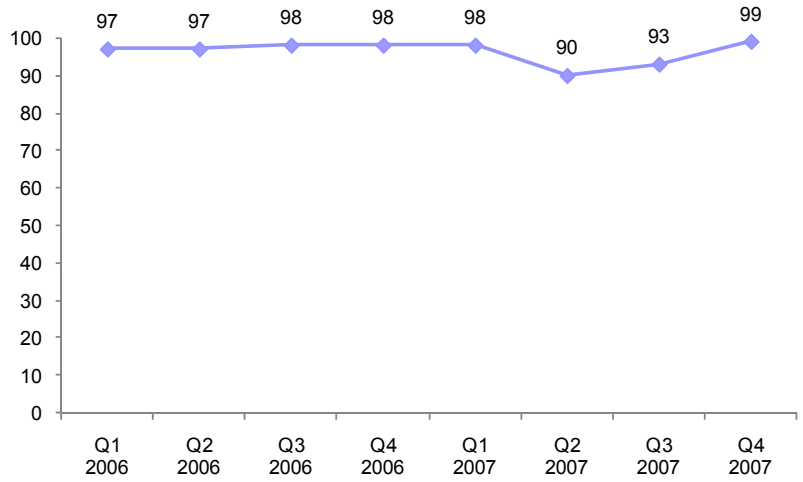
Source: VCCT record review, Global Fund Health Impact Evaluation 2008

## ADHERENCE TO HTC SERVICES

To measure adherence to services provided, the percentage of HIV counselling and testing clients that complete the testing and counselling process was calculated. This should be equal to the ratio of the annual number of clients who receive post-test counselling over the annual number of clients provided with HIV pre-test counselling. However, we cannot estimate the percentage directly from the HIV reporting system at NCHADS since the aggregate reporting does not permit linking individual cases that attended both the post test counselling and that received HIV results. Thus, it is assumed that those who received post test counselling also received the HIV result, and the proportion of those who received post test counselling over those who received pre test counselling was used to calculate the indicator.

The percentages bounced around 98% in 2006 and reached 99% in quarter 4, 2007 (Figure 1.7 and Table 1.10). In 2007, it was recorded that 98.9% of clients tested for HIV received their results through post-test counselling.

**Figure 1.7: National trends in the proportion of HIV counselling and testing clients that completed the post-test counselling process, 2006–2007**




Source: VCCT record review, Global Fund Health Impact Evaluation 2008

**Table 1.10: Number and percentage of VCCT clients that complete the pre-test, HIV testing, and post-test counselling**

| | 2006 | | | | 2007 | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | |
| Pretest | 50,298 | 47,774 | 55,723 | 59,801 | 61,593 | 61,860 | 74,733 | 69,745 |
| Tested | 50,137 | 47,610 | 55,586 | 59,477 | 61,236 | 58,295 | 70,870 | 69,516 |
| Post-test | 48,966 | 46,476 | 54,820 | 58,596 | 60,284 | 55,720 | 69,786 | 68,784 |
| % completed the test | 97.7% | 97.6% | 98.6% | 98.5% | 98.4% | 95.6% | 98.5% | 98.9% |
| % tested and received test result | 97.4% | 97.3% | 98.4% | 98.0% | 97.9% | 90.1% | 93.4% | 98.6% |

Source: VCCT record review, Global Fund Health Impact Evaluation 2008

## COVERAGE OF HIV COUNSELING AND TESTING SERVICES

The estimation of the density of VCCT centers was calculated among the general population age 15 to 49 years. In general, there is no decline in number of VCCT centers per 100,000 adult population in any cities/province (Table 1.11). This reflects that the number of VCCT center in each province increased at least as rapidly as the population grew, in all provinces from 2005 to 2007.

**Table 1.11: Density of HIV counselling and testing service delivery points, 2005 – 2007**

**Number of service delivery points per 100,000 populations aged between 15-49 years old, by province**

| | 2005 | | | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| Province | Pop 15-49 | Number of sites | Sites per 100,000 | Pop 15-49 | Number of sites | Sites per 100,000 | Pop 15-49 | Number of sites | Sites per 100,000 |
| Banteay Mean Chey | 394,122 | 5 | 1 | 408,832 | 10 | 2 | 423,547 | 17 | 4 |
| Bat Dambang | 503,616 | 8 | 2 | 518,853 | 9 | 2 | 533,938 | 15 | 3 |
| Kampong Cham | 943,829 | 13 | 1 | 969,391 | 16 | 2 | 994,927 | 20 | 2 |
| Kampong | 244,141 | 2 | 1 | 252,836 | 3 | 1 | 261,670 | 4 | 2 |
| Kampong Spueu | 356,314 | 2 | 1 | 369,312 | 2 | 1 | 382,397 | 5 | 1 |
| Kampong Thum | 337,239 | 4 | 1 | 348,505 | 5 | 1 | 359,890 | 6 | 2 |
| Kampot | 304,167 | 4 | 1 | 312,867 | 4 | 1 | 321,596 | 6 | 2 |
| Kandal | 634,804 | 4 | 1 | 653,779 | 10 | 2 | 672,668 | 15 | 2 |
| Kaoh Kong | 98,411 | 1 | 1 | 102,853 | 2 | 2 | 107,415 | 3 | 3 |
| Kracheh | 163,807 | 1 | 1 | 169,163 | 3 | 2 | 174,712 | 4 | 2 |
| Mondol Kiri | 19,384 | 1 | 5 | 19,948 | 1 | 5 | 20,582 | 1 | 5 |
| Phnom Penh | 765,597 | 21 | 3 | 789,411 | 32 | 4 | 812,890 | 40 | 5 |
| Preah Vihear | 73,092 | 1 | 1 | 75,865 | 1 | 1 | 78,816 | 1 | 1 |
| Pray Veaeng | 550,976 | 5 | 1 | 564,412 | 7 | 1 | 577,524 | 8 | 1 |
| Pousat | 213,583 | 4 | 2 | 220,722 | 6 | 3 | 227,703 | 8 | 4 |
| Rotanakiri | 54,953 | 1 | 2 | 56,796 | 1 | 2 | 58,739 | 1 | 2 |
| Siem Reab | 427,689 | 7 | 2 | 442,196 | 9 | 2 | 456,843 | 11 | 2 |
| Sihanouk Ville | 108,454 | 3 | 3 | 113,097 | 3 | 3 | 117,773 | 4 | 3 |
| Stueng Traeng | 50,091 | 1 | 2 | 51,926 | 1 | 2 | 53,859 | 2 | 4 |
| Svay Rieng | 283,630 | 3 | 1 | 292,525 | 3 | 1 | 301,211 | 6 | 2 |
| Takaev | 446,329 | 6 | 1 | 459,638 | 7 | 2 | 473,108 | 11 | 2 |
| Otdar Meanchey | 48,865 | 1 | 2 | 50,922 | 2 | 4 | 53,043 | 2 | 4 |
| Krong Kaeb | 18,982 | 1 | 5 | 19,954 | 1 | 5 | 20,936 | 1 | 5 |
| Pailin | 17,065 | 1 | 6 | 17,782 | 1 | 6 | 18,508 | 3 | 16 |
| Total (average) | | | 2.0 | | | 2.4 | | | 3.3 |

Source: VCCT record review

## 1.4 PREVENTION OF MOTHER TO CHILD TRANSMISSION (PMTCT)

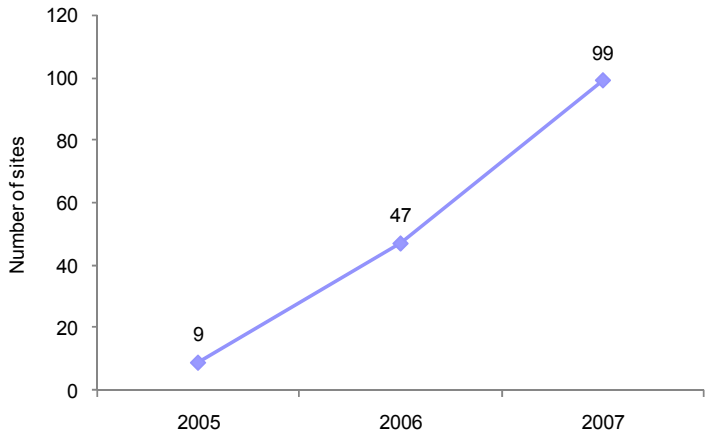
### FINANCING FOR PMTCT PROGRAMS

The information related to PMTCT funding trends was not available to present in this report. Based on the 2006 NASA report, about 66% of the total budget was used in HIV/AIDS prevention and care and treatment categories, of which PMTCT is one of its components.

### QUANTITY AND DISTRIBUTION OF PMTCT SERVICES

The number of ANC clinic offering the minimum package of PMTCT service steeply increased from 9 in 2005 to 47 in 2006 and reached 99 in 2007 (Figure 1.8). This increase strongly suggests availability of funding for PMTCT services. Since the government contributions accounted for only about 13% of total HIV/AIDS expenditures, the expansion of PMTCT package in ANC clinics was due to mainly to the financial support from donors and NGOs.

**Figure 1.8: National trends in the number of ANC clinics offering the minimum package of PMTCT services, 1998-2007**




Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

The number of health centres with PMCTC services per 100,000 reproductive age female population increased in every province from 2005 to 2007. In 2005, every 100,000 women of reproductive age were served by less than 1 health centre with a PMCTC package. In 2007, there were about 3 health centres offering PMCTC services per 100,000 women of reproductive age (Table 1.12).

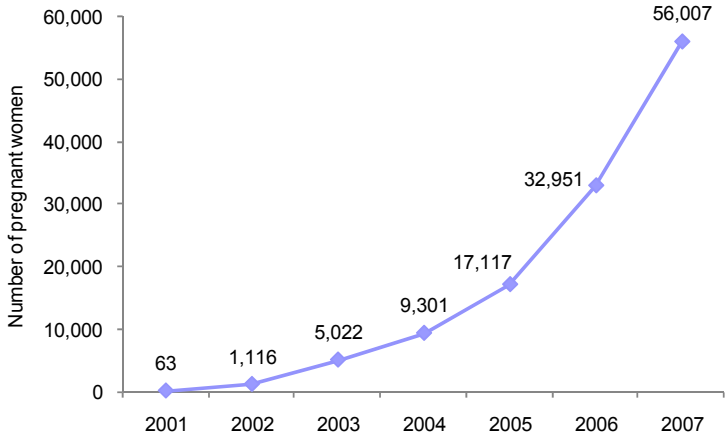
**Table 1.12: Number of ANC clinic offering the minimum package of PMCTC services, 2005-2007, by province (per 100,000 reproduction age female population)**

| Province | 2005 2006 | 2007 | |
|---|---|---|---|
| Banteay Meanchey | 1.00 | 1.45 | 4.22 |
| Battambang | 0.39 | 1.53 | 4.10 |
| Kampong Cham | | 0.40 | 0.98 |
| Kampong Chnang | | 0.76 | 2.22 |
| Kampong Speu | | 1.06 | 2.56 |
| Kampong Thom | 1.15 | 1.67 | 3.25 |
| Kampot | | 0.62 | 1.82 |
| Kandal | | 1.20 | 2.04 |
| Kep | | | 9.64 |
| Koh Kong | 4.29 | 4.11 | 5.90 |
| Kratie | | 1.19 | 1.15 |
| Mondulkiri | | | 10.03 |
| Oddor Meanchey | | 4.11 | 3.95 |
| Pailin | | 12.33 | 11.80 |
| Phnom Penh | 0.25 | 1.95 | 2.84 |
| Preah Vihea | | 2.68 | 2.59 |
| Prey Veng | | 0.67 | 0.98 |
| Pursat | | 1.77 | 4.30 |
| Rattanakiri | | | 6.68 |
| Siem Reap | 0.45 | 0.44 | 1.71 |
| Sihanouk Ville | | 1.77 | 1.70 |
| Stung Treng | | 3.82 | 3.69 |
| Svay Rieng | | 3.26 | 5.73 |
| Takeo | | 0.42 | 1.64 |
| Total | 0.25 | 1.26 | 2.58 |

Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

The number of pregnant women receiving HIV testing climbed quickly from only 63 in 2001 to 56,007 in 2007 (Figure 1.9). The large increase is direct result of expansion of the VCCT sites in all cities/provinces and the implementation of PMTC services in 99 ANC clinics throughout the country.

**Figure 1.9: National trends in the number of pregnant women receiving HIV testing services, 2001-2007**




Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

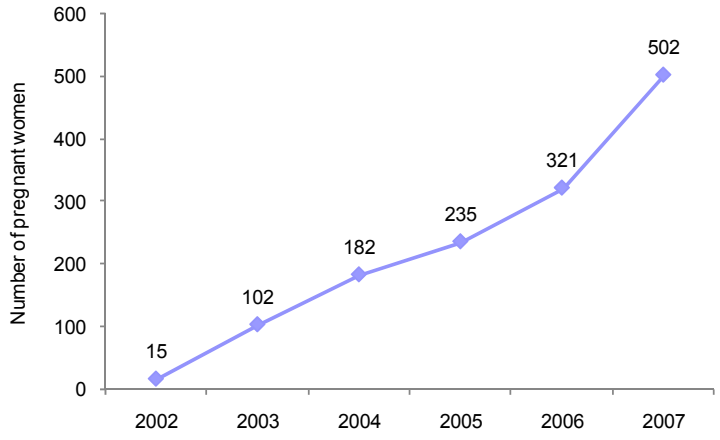
Since the introduction of PMTCT package at ANC clinics, the number of HIV positive pregnant women receiving recommended antiretroviral therapy or treatment to reduce risk of mother to child transmission has increased substantially (Table 1.13). Starting from about 15 women in 2002, in 2007 about 500 HIV-positive pregnant women received treatment to reduce the chance of transmission of HIV to their infant (Figure 1.10 and Table 1.13).

**Table 1.13: Number of pregnant women receiving HIV testing, and number of HIV-positive pregnant women (in parentheses), by province, 2001–2007**

| | Year (#positive) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Province** | **2001** | **2002** | **2003** | **2004** | **2005 2006** | **2007** | | **Grand total** |
| Banteay Meanchey | | | 448(9) | 1,692(63) | 2,402(69) | 2,724(60) | 4,114(61) | 11,380(262) |
| Battambang | | 326(10) | 1,096(29) | 1,468(21) | 2,027(23) | 2,560(30) | 4,626(35) | 12,103(148) |
| Kampong Cham | | | | 72(0) | 528(5) | 1,192(6) | 2,644(10) | 4,436(21) |
| Kampong Chnang | | | | | | 529(11) | 1,541(11) | 2,070(22) |
| Kampong Speu | | | | 40(0) | 628(10) | 979(10) | 1,971(8) | 3,618(28) |
| Kampong Thom | | | | 277(4) | 1,150(7) | 2,168(10) | 2,911(3) | 6,506(24) |
| Kampot | | | | | | 187(2) | 806(4) | 993(6) |
| Kandal | | | | | | 1,165(10) | 3,478(34) | 4,643(44) |
| Kep | | | | | | | 199(3) | 199(3) |
| Koh Kong | | | | | 319(16) | 316(8) | 209(4) | 844(28) |
| Kratie | | | | | | 424(1) | 562(4) | 986(5) |
| Oddor Meanchey | | | | | | 177(0) | 570(3) | 747(3) |
| Pailin | | | | | | 651(10) | 761(11) | 1,412(21) |
| Phnom Penh | 63(1) | 790(22) | 2,763(42) | 4,413(54) | 6,867(111) | 13,020(167) | 20,760(164) | 48,676(561) |
| Preah Vihea | | | | | | 101(0) | 164(1) | 265(1) |
| Prey Veng | | | | | | 717(8) | 1,633(7) | 2,350(15) |
| Pursat | | | 327(7) | 677(12) | 1,823(15) | 1,764(21) | 1,805(17) | 6,396(72) |
| Siem Reap | | | | | 473(1) | 599(1) | 1,406(5) | 2,478(7) |
| Sihanouk Ville | | | | | | 383(3) | 738(10) | 1,121(13) |
| Stung Treng | | | | | | 468(6) | 603(11) | 1,071(17) |
| Svay Rieng | | | 388(5) | 662(7) | 900(10) | 2,805(15) | 3,735(106) | 8,490(143) |
| Takeo | | | | | | 22(1) | 771(3) | 793(4) |
| Grand total | 63(1) | 1,116(32) | 5,022(92) | 9,301(161) | 17,117(267) | 32,951(380) | 56,007(515) | 121,577(1,448) |
| % HIV positive | 1.6 | 2.9 | 1.8 | 1.7 | 1.6 | 1.2 | 0.9 | 6.7 |

Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

**Figure 1.10: National trends in the number of HIV-positive pregnant women receiving recommended antiretroviral prophylaxis or treatment to reduce the risk of MTCT, 2002-2007**




Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

**Table 1.14: Number of HIV-positive pregnant women receiving a recommended antiretroviral prophylaxis or treatment to reduce the risk of MTCT, by province, 2002–2007**

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| **Province** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **Grand total** |
| Banteay Meanchey | | 3 | 28 | 16 | 28 | 33 | 108 |
| Battambang | | 19 | 19 | 21 | 24 | 41 | 124 |
| Kampong Cham | | | | 6 | 6 | 19 | 31 |
| Kampong Chnang | | | | | 7 | 7 | 14 |
| Kampong Speu | | | | 7 | 4 | 9 | 20 |
| Kampong Thom | | | 1 | 2 | 4 | 3 | 10 |
| Kampot | | | | | 1 | 8 | 9 |
| Kandal | | | | | 9 | 35 | 44 |
| Koh Kong | | | | 10 | 6 | 7 | 23 |
| Kratie | | | | | | 3 | 3 |
| Oddor Meanchey | | | | | | 2 | 2 |
| Pailin | | | | | 2 | 12 | 14 |
| Phnom Penh | 15 | 79 | 122 | 158 | 195 | 218 | 787 |
| Prey Veng | | | | | 12 | 11 | 23 |
| Pursat | | | 6 | 11 | 9 | 16 | 42 |
| Siem Reap | | | | | | 2 | 2 |
| Sihanouk Ville | | | | | 2 | 23 | 25 |
| Stung Treng | | | | | 2 | 7 | 9 |
| Svay Rieng | | 1 | 6 | 4 | 9 | 21 | 41 |
| Takeo | | | | | 1 | 25 | 26 |
| Grand total | 15 | 102 | 182 | 235 | 321 | 502 | 1,357 |

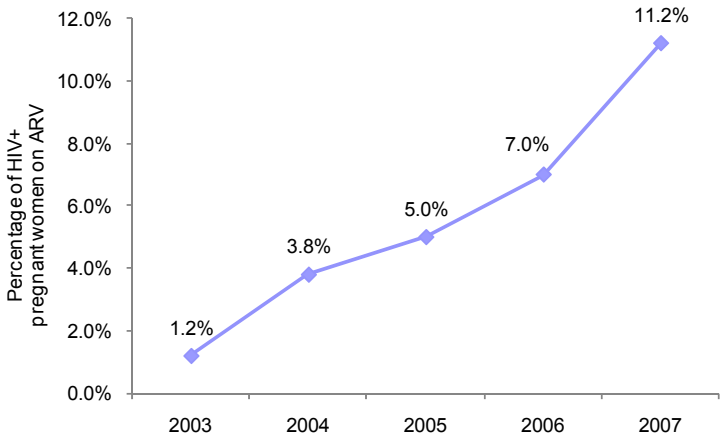
Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

## QUALITY OF PMTCT SERVICES

In the 2008 UNGASS country report, the PMTCT program estimated the number of HIV infected women, based on the estimated HIV prevalence among pregnant women of 1.1% in 2006. As a result, the number of HIV-positive pregnant women was estimated to be 4,417 for 2006 and 4,509 for 2007.

From these estimates, the percentage of pregnant women receiving ARV for reducing risk of mother to child transmission were calculated. Figure 1.11 shows that the percentage has increased gradually from 1.2% in 2003 to 11.2% in 2007.

**Figure 1.11: Percentage of HIV-infected pregnant women who received anti-retrovirals to reduce the risk of mother to child transmission**




Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

## COVERAGE AND DISTRIBUTION OF PMTCT SERVICES

The number of ANC clinics with the minimum package of PMTCT has increased substantially since 2005. This has lead to an increase of PMTCT delivery point per 100,000 women age 15 to 49 years, across all cities/provinces. On average, the number of sites with PMTCT services has tripled from 1.3 to 4.0 per 100,000 women (Table 1.15).

**Table 1.15: Density of PMTCT service delivery points per 100,000 women age 15-49 years by province, 2005–2007**

| Province 2005 | | 2006 | 2007 |
|---|---|---|---|
| Banteay Meanchey | 1.00 | 1.45 | 4.22 |
| Battambang | 0.39 | 1.53 | 4.10 |
| Kampong Cham | | 0.40 | 0.98 |
| Kampong Chnang | | 0.76 | 2.22 |
| Kampong Speu | | 1.06 | 2.56 |
| Kampong Thom | 1.15 | 1.67 | 3.25 |
| Kampot | | 0.62 | 1.82 |
| Kandal | | 1.20 | 2.04 |
| Kep | | | 9.64 |
| Koh Kong | 4.29 | 4.11 | 5.90 |
| Kratie | | 1.19 | 1.15 |
| Mondulkiri | | | 10.03 |
| Oddor Meanchey | | 4.11 | 3.95 |
| Pailin | | 12.33 | 11.80 |
| Phnom Penh | 0.25 | 1.95 | 2.84 |
| Preah Vihea | | 2.68 | 2.59 |
| Prey Veng | | 0.67 | 0.98 |
| Pursat | | 1.77 | 4.30 |
| Rattanakiri | | | 6.68 |
| Siem Reap | 0.45 | 0.44 | 1.71 |
| Sihanouk Ville | | 1.77 | 1.70 |
| Stung Treng | | 3.82 | 3.69 |
| Svay Rieng | | 3.26 | 5.73 |
| Takeo | | 0.42 | 1.64 |
| Total (average) | 1.3 | 2.2 | 4.0 |

Source: PMCTC record review, Global Fund Health Impact Evaluation 2008

## 1.5 HIV/AIDS: ANTI-RETROVIRAL TREATMENT (ART)

### FINANCING FOR ART PROGRAMS

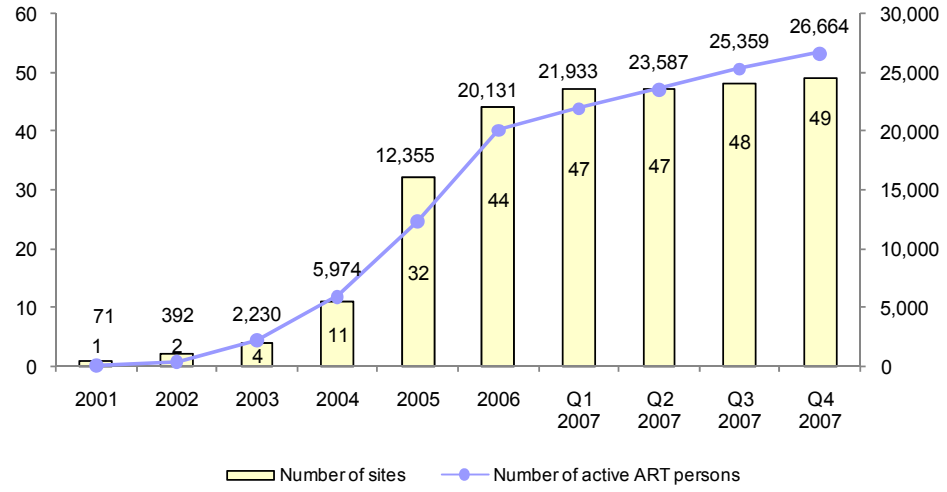
Financial trend information specifically for ART programs is not available. The 2006 National AIDS Spending Assessment (NASA) estimated 21% of HIV/AIDS expenditures were spent on care and treatment, which logically would overlap with ART program spending. Furthermore, NCHADS financial reporting shows a considerable increase in the funding used for HIV/AIDS prevention and care activities.

### AVAILABILITY AND DISTRIBUTION OF ART SERVICES

With sufficient financial support, NCHADS has expanded their AIDS care activities through the expansion of the number of OI/ART sites, to reach a total of 49 sites in 2007 (Figure 1.12). As result, the number of patients receiving ART also increased annually. By the end of 2007, a total of 26,664 patients, including 24,123 adults, have received ART. This translates into 82.6% of those estimated to be in need of ART in 2007 that were actually on ART, of which 51.2% were female.

Regarding OI services, by the end of quarter 4, 2007, there are 8,843 adult patients reported to actively receive OI services and 1,616 children.

**Figure 1.12: National trends in the number of ART service delivery points and active ARV patients from 2001-2001**




Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

The first ART services were provided in 2001 in Phnom Penh. Since then, the numbers of OI/ART sites have increased every year. In order to boost the access to ART services, OI/ART sites have been built in both provincial capitals and remaining districts (Figure 1.13). Based on HIV estimates, it has been found that HIV prevalence is higher in urban compared to rural areas. However, the number of HIV carriers appears to be greater in rural areas where they account for about 80% of Cambodian general population.

**Figure 1.13: Location of OI/ART sites across Cambodia**

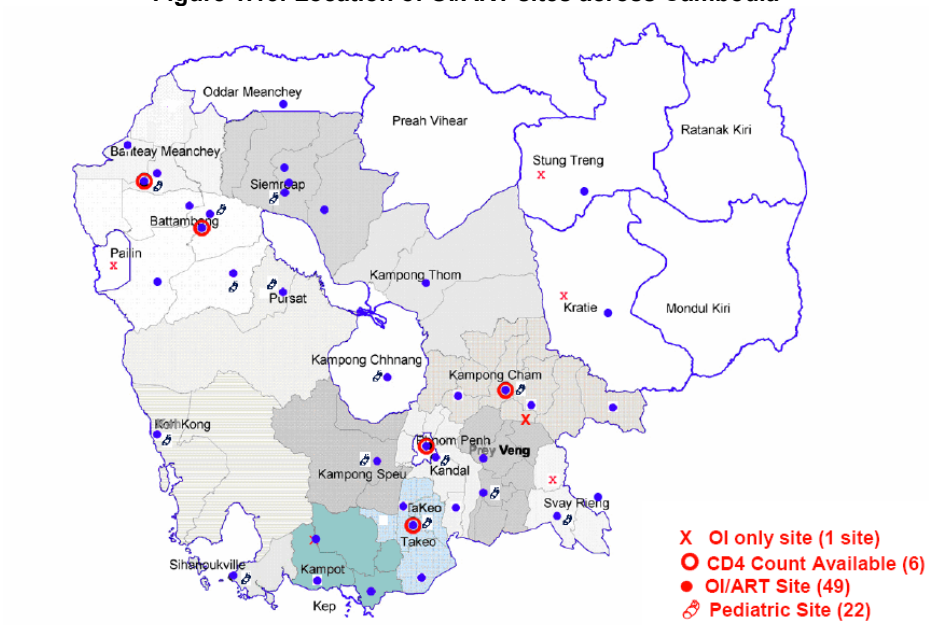


**Table 1.16: Number of ART service delivery points that are urban and rural, by province, 2005-2007**

| | 2005 | | | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Province Urban*** | | **Rural** | **Total** | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** |
| Banteay Meanchey | 2 | | 2 | 2 | 1 | 3 | 2 | 1 | 3 |
| Battambang | 2 | 1 | 3 | 2 | 2 | 4 | 2 | 3 | 5 |
| Kampong Cham | 1 | | 1 | 1 | 3 | 4 | 1 | 3 | 4 |
| Kampong Chhnang | | | | 1 | | 1 | 1 | | 1 |
| Kampong Speu | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Kampong Thom | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Kampot | | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 |
| Kandal | 1 | | 1 | 1 | 1 | 2 | 1 | 1 | 2 |
| Koh Kong | 1 | | 1 | 1 | | 1 | 1 | 1 | 2 |
| Kratie | | | | | | | 1 | | 1 |
| Oddor Meanchey | | | | | | | 1 | | 1 |
| Pailin | | | | | | | 1 | | 1 |
| Phnom Penh | 9 | | 9 | 10 | | 10 | 10 | | 10 |
| Prey Veng | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 3 |
| Pursat | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Siem Reap | 2 | 1 | 3 | 2 | 1 | 3 | 2 | 2 | 4 |
| Sihanouk Ville | | 1 | 1 | | 1 | 1 | 1 | | 1 |
| Stung Treng | | | | | | | 1 | | 1 |
| Svay Rieng | 1 | | 1 | 1 | | 1 | 1 | 1 | 2 |
| Takeo | 1 | 1 | 2 | 1 | 2 | 3 | 1 | 2 | 3 |
| Grand total** | 24 | 6 | 30 | 27 | 13 | 40 | 32 | 17 | 49 |

* Provincial capital was considered urban and other areas are rural, all sites are run by NCHADS or NGOs
** Total number of sites each year could be different from the real number of sites because in this table we count based on sites submitting the routine report. Some newly opened sites may not be able to submit the report before the end of quarter.

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

Table 1.16 shows that in each province the first OI/ART site to be established was in urban area, then the expansion in number of sites was scaled up to cover rural areas also.

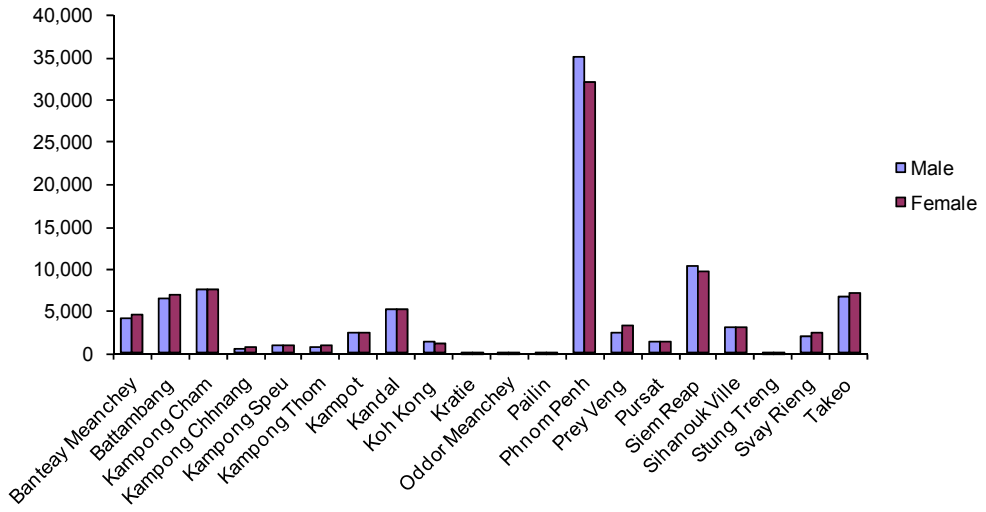
Table 1.17 and Figure 1.14 show an almost 1 to 1 ratio of males and females on ART.

**Table 1.17: Number of patients who are medically eligible for starting ART according to sex and age group, by province, 2005 – 2007**

| | 2005 | | | | 2006 | | | | 2007 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sex | | Age | | Sex | | Age | | Sex | | Age | |
| Province | Male | Female | 15+ | Under 15 | Male | Female | 15+ | Under 15 | Male | Female | 15+ | Under 15 |
| Banteay Meanchey | 183 | 177 | 360 | | 1,560 | 1,650 | 3,200 | 10 | 2,332 | 2,781 | 5,040 | 73 |
| Battambang | 365 | 360 | 725 | | 2,359 | 2,519 | 4,710 | 168 | 3,734 | 3,989 | 7,200 | 523 |
| Kampong Cham | 529 | 528 | 961 | 96 | 3,000 | 2,786 | 5,308 | 478 | 4,080 | 4,100 | 7,452 | 728 |
| Kampong Chhnang | | | | | 172 | 222 | 365 | 29 | 350 | 478 | 745 | 83 |
| Kampong Speu | 27 | 36 | 63 | | 212 | 271 | 462 | 21 | 565 | 567 | 870 | 262 |
| Kampong Thom | 6 | 5 | 11 | | 209 | 221 | 430 | | 477 | 597 | 1,046 | 28 |
| Kampot | 160 | 131 | 291 | | 948 | 828 | 1,776 | | 1,259 | 1,360 | 2,604 | 15 |
| Kandal | 271 | 267 | 538 | | 2,025 | 1,987 | 3,846 | 166 | 2,916 | 2,880 | 5,251 | 545 |
| Koh Kong | 77 | 66 | 143 | | 481 | 385 | 844 | 22 | 702 | 583 | 1,217 | 68 |
| Kratie | | | | | | | | | 86 | 96 | 182 | |
| Oddor Meanchey | | | | | | | | | 106 | 127 | 233 | |
| Pailin | | | | | | | | | 41 | 59 | 100 | |
| Phnom Penh | 2,738 | 2,307 | 4,496 | 549 | 13,959 | 12,470 | 23,468 | 2,961 | 18,333 | 17,285 | 31,981 | 3,637 |
| Prey Veng | 121 | 176 | 287 | 10 | 883 | 1,181 | 1,946 | 118 | 1,489 | 1,906 | 3,149 | 246 |
| Pursat | 56 | 61 | 117 | 0 | 444 | 517 | 961 | | 719 | 847 | 1,464 | 102 |
| Siem Reap | 988 | 917 | 1,664 | 241 | 4,300 | 4,044 | 7,270 | 1,074 | 5,002 | 4,745 | 8,421 | 1,326 |
| Sihanouk Ville | 204 | 181 | 366 | 19 | 1,185 | 1,152 | 2,184 | 153 | 1,708 | 1,753 | 3,231 | 230 |
| Stung Treng | | | | | | | | | 57 | 38 | 95 | |
| Svay Rieng | 147 | 164 | 277 | 34 | 771 | 878 | 1,467 | 182 | 1,025 | 1,278 | 2,028 | 275 |
| Takeo | 556 | 551 | 985 | 122 | 2,661 | 2,796 | 4,779 | 678 | 3,377 | 3,710 | 6,222 | 865 |
| Grand total | 6,428 | 5,927 | 11,284 | 1,071 | 35,169 | 33,907 | 63,016 | 6,060 | 48,358 | 49,179 | 88,531 | 9,006 |

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

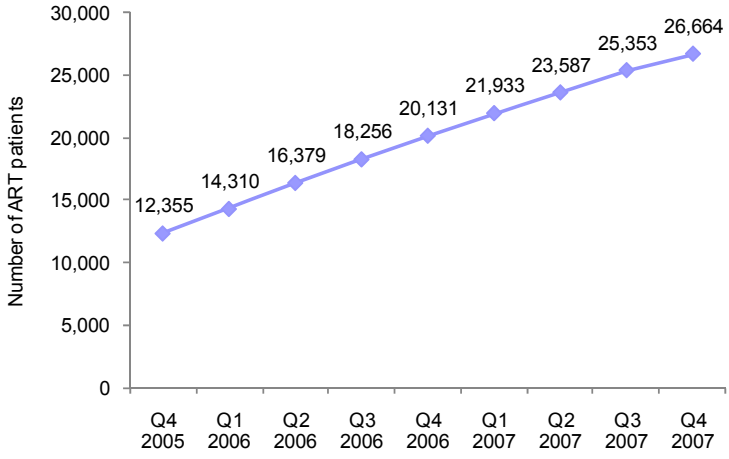
**Figure 1.14: Number of ART patients 2005-2007 (sum), by sex**




Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

The number of ART patients were gradually increased from Q4-2005 to Quarter 4 2007. This is direct result of the increase of number of ART sites across cities/provinces (Figure 1.15 and Table 1.18).

**Figure 1.15: National trends in number of persons currently receiving ART by quarter, 2005-2007**




Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

**Table 1.18: National trends in number of eligible AIDS patients for receiving ART, but not yet on ART, by quarter and province, 2005-2007**

| | 2005 | | 2006 | | | | | 2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Province Q4** | | **Total** | **Q1** | **Q2** | **Q3** | **Q4** | **Total** | **Q1** | **Q2** | **Q3** | **Q4** | **Total** |
| Banteay Meanchey | 360 | 360 | 563 | 740 | 887 | 1,020 | 3,210 | 1,149 | 1,235 | 1,331 | 1,398 | 5,113 |
| Battambang | 725 | 725 | 913 | 1,100 | 1,333 | 1,532 | 4,878 | 1,707 | 1,874 | 1,989 | 2,153 | 7,723 |
| Kampong Cham | 1,057 | 1,057 | 1,140 | 1,311 | 1,564 | 1,771 | 5,786 | 1,909 | 2,041 | 2,080 | 2,150 | 8,180 |
| Kampong Chhnang | 0 | 0 | 58 | 82 | 114 | 140 | 394 | 169 | 187 | 225 | 247 | 828 |
| Kampong Speu | 63 | 63 | 78 | 103 | 129 | 173 | 483 | 207 | 256 | 312 | 357 | 1,132 |
| Kampong Thom | 11 | 11 | 27 | 79 | 148 | 176 | 430 | 198 | 247 | 283 | 346 | 1,074 |
| Kampot | 291 | 291 | 342 | 424 | 485 | 525 | 1,776 | 576 | 631 | 674 | 738 | 2,619 |
| Kandal | 538 | 538 | 794 | 1,017 | 1,035 | 1,166 | 4,012 | 1,335 | 1,388 | 1,514 | 1,559 | 5,796 |
| Koh Kong | 143 | 143 | 167 | 197 | 230 | 272 | 866 | 293 | 289 | 332 | 371 | 1,285 |
| Kratie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 23 | 56 | 93 | 182 |
| Oddor Meanchey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 52 | 72 | 83 | 233 |
| Pailin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 58 | 100 |
| Phnom Penh | 5,045 | 5,045 | 5,670 | 6,368 | 6,908 | 7,483 | 26,429 | 8,033 | 8,608 | 9,296 | 9,681 | 35,618 |
| Prey Veng | 297 | 297 | 377 | 466 | 560 | 661 | 2,064 | 757 | 831 | 878 | 929 | 3,395 |
| Pursat | 117 | 117 | 167 | 211 | 268 | 315 | 961 | 345 | 380 | 408 | 433 | 1,566 |
| Siem Reap | 1,905 | 1,905 | 1,991 | 2,030 | 2,109 | 2,214 | 8,344 | 2,295 | 2,399 | 2,488 | 2,565 | 9,747 |
| Sihanouk Ville | 385 | 385 | 467 | 555 | 631 | 684 | 2,337 | 777 | 843 | 910 | 931 | 3,461 |
| Stung Treng | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 13 | 29 | 47 | 95 |
| Svay Rieng | 311 | 311 | 344 | 380 | 449 | 476 | 1,649 | 510 | 558 | 598 | 637 | 2,303 |
| Takeo | 1,107 | 1,107 | 1,212 | 1,316 | 1,406 | 1,523 | 5,457 | 1,631 | 1,732 | 1,836 | 1,888 | 7,087 |
| Grand total | 12,355 | 12,355 | 14,310 | 16,379 | 18,256 | 20,131 | 69,076 | 21,933 | 23,587 | 25,353 | 26,664 | 97,537 |

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

## QUALITY OF ART SERVICES

In order to be eligible to receive ARV treatment, AIDS patients have to have either CD4 <250 or WHO stage 4 for adults. The reporting tool used in the HIV/AIDS information system does not allow us to separate patients who enrolled into ART program through CD4<250 or WHO stage 4 of the disease. Table 1.19 shows the number of adults and children who became eligible to start treatment.

**Table 1.19: Number of persons starting on 1st line ART by age group and province, 2005-2007***

| | | Year | | | |
|---|---|---|---|---|---|
| **Province A** | **ge** | **2005** | **2006** | **2007** | **Grand total** |
| Banteay Meanchey | 15+ | 127 | 331 | 340 | 798 |
| | Under 15 | 0 | 5 | 27 | 32 |
| Battambang | 15+ | 419 | 961 | 729 | 2,109 |
| | Under 15 | 0 | 31 | 46 | 77 |
| Kampong Cham | 15+ | 227 | 579 | 619 | 1,425 |
| | Under 15 | 21 | 70 | 93 | 184 |
| Kampong Chhnang | 15+ | 0 | 110 | 32 | 142 |
| | Under 15 | 0 | 13 | 9 | 22 |
| Kampong Speu | 15+ | 99 | 199 | 171 | 469 |
| | Under 15 | 0 | 22 | 42 | 64 |
| Kampong Thom | 15+ | 24 | 169 | 173 | 366 |
| | Under 15 | 0 | 0 | 18 | 18 |
| Kampot | 15+ | 71 | 224 | 269 | 564 |
| | Under 15 | 0 | 0 | 11 | 11 |
| Kandal | 15+ | 224 | 908 | 1,441 | 2,573 |
| | Under 15 | 0 | 114 | 229 | 343 |
| Koh Kong | 15+ | 44 | 168 | 254 | 466 |
| | Under 15 | 0 | 8 | 15 | 23 |
| Kratie | 15+ | 0 | 0 | 40 | 40 |
| | Under 15 | 0 | 0 | 0 | 0 |
| Oddor Meanchey | 15+ | 0 | 0 | 132 | 132 |
| | Under 15 | 0 | 0 | 0 | 0 |
| Pailin | 15+ | 33 | 221 | 444 | 698 |
| | under 15 | 5 | 25 | 51 | 81 |
| Phnom Penh | 15+ | 1,088 | 3,692 | 3,239 | 8,019 |
| | Under 15 | 86 | 288 | 411 | 785 |
| Prey Veng | 15+ | 77 | 556 | 521 | 1,154 |
| | Under 15 | 1 | 19 | 31 | 51 |
| Pursat | 15+ | 10 | 63 | 94 | 167 |
| | Under 15 | 3 | 19 | 22 | 44 |
| Siem Reap | 15+ | 180 | 867 | 661 | 1,708 |
| | Under 15 | 0 | 92 | 68 | 160 |
| Sihanouk Ville | 15+ | 117 | 330 | 205 | 652 |
| | Under 15 | 16 | 21 | 18 | 55 |

| Province A | age | Year 2005 | 2006 | 2007 | Grand total |
|---|---|---|---|---|---|
| Stung Treng | 15+ | 0 | 0 | 4 | 4 |
| | Under 15 | 0 | 0 | 0 | 0 |
| Svay Rieng | 15+ | 34 | 118 | 127 | 279 |
| | Under 15 | 4 | 7 | 10 | 21 |
| Takeo | 15+ | 85 | 441 | 524 | 1,050 |
| | Under 15 | 31 | 76 | 122 | 229 |

* Based on National guideline, patient eligible to start ART should have either CD4 count<250 or WHO stage 4 for adult.

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

## ADHERENCE TO SERVICES

The percentage of patients lost to follow-up among those who are on OI (not yet received ART) is calculated by taking the ratio of the annual number of patients lost, died or transferred out prior to starting ARV over the total current number of patients in pre-ARV clinic in the 4th quarter of the year. By doing so, the percentage of lost to follow up in each site is high since there are many pre-ART patients who were transferred out to other ART sites but who were not actually lost to follow up. The overall percentage has not varied much between 2005 and 2007 (Table 1.20).

**Table 1.20: Percentage of patients lost to follow up among pre-ARV patients (not yet receiving ART), by age groups, from 2005-2007**

| Province | Age | Year 2005 2006 | 2007 | |
|---|---|---|---|---|
| Banteay Meanchey | 15+ | 4.65 | 8.42 | 14.35 |
| | Under 15 | | 0.00 | 7.35 |
| Battambang | 15+ | 2.96 | 9.28 | 5.95 |
| | Under 15 | | 5.38 | 5.89 |
| Kampong Cham | 15+ | 11.28 | 13.05 | 14.36 |
| | Under 15 | 10.00 | 8.05 | 9.80 |
| Kampong Chhnang | 15+ | | 20.75 | 12.58 |
| | Under 15 | | 18.87 | 1.98 |
| Kampong Speu | 15+ | 0.00 | 0.97 | 1.36 |
| | Under 15 | | 1.30 | 0.47 |
| Kampong Thom | 15+ | 4.12 | 1.34 | 2.61 |
| | Under 15 | 0.00 | 0.00 | 1.17 |
| Kampot | 15+ | 13.79 | 10.24 | 10.09 |
| | Under 15 | | 0.00 | 5.56 |
| Kandal | 15+ | 8.32 | 7.82 | 9.30 |
| | Under 15 | | 1.30 | 9.76 |
| Koh Kong | 15+ | 18.47 | 18.80 | 13.56 |
| | Under 15 | | 2.33 | 8.96 |
| Kratie | 15+ | | 0.00 | 11.00 |
| | Under 15 | | | |
| Oddor Meanchey | 15+ | | | 3.21 |
| | Under 15 | | | |

| Province | Age | Year 2005 2006 | 2007 | |
|---|---|---|---|---|
| Pailin | 15+ | 0.00 | 16.67 | 7.65 |
| | Under 15 | 0.00 | 5.88 | 9.80 |
| Phnom Penh | 15+ | 12.42 | 9.98 | 6.81 |
| | Under 15 | 3.24 | 6.08 | 5.60 |
| Prey Veng | 15+ | 0.00 | 2.98 | 3.95 |
| | Under 15 | 0.00 | 0.89 | 3.90 |
| Pursat | 15+ | 1.10 | 6.77 | 4.89 |
| | Under 15 | 0.00 | 14.29 | 11.28 |
| Siem Reap | 15+ | 9.50 | 8.34 | 8.04 |
| | Under 15 | | 5.32 | 5.79 |
| Sihanouk Ville | 15+ | 11.70 | 10.04 | 11.82 |
| | Under 15 | 2.17 | 4.47 | 7.01 |
| Stung Treng | 15+ | | 0.00 | 2.40 |
| | Under 15 | | | 0.00 |
| Svay Rieng | 15+ | 13.13 | 4.29 | 8.12 |
| | Under 15 | 0.00 | 4.67 | 1.23 |
| Takeo | 15+ | 12.79 | 8.37 | 5.46 |
| | Under 15 | 3.57 | 5.70 | 4.53 |
| Total (average) | | 7.8 | 8.3 | 7.9 |
| Max | | 18.47 | 20.75 | 14.36 |

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

For patients who are on ART, the percentage lost to follow-up is calculated by taking the annual total number of patients lost to follow-up divided by the total current number of patients on ARV in the 4th quarter of the year. As result, percentage reported at each province in 2007 remained less than 4%, except Kampot province where the lost to follow up among patients on ART under age 15 year was as high as 6.7% (Table 1.21).

**Table 1.21: Percentage of patients lost to follow up among ART patients**

| Province A | ge | Year 2005 | 2006 | 2007 |
|---|---|---|---|---|
| Banteay Meanchey | 15+ | 0.00 | 0.75 | 1.43 |
| | Under 15 | | 0.00 | 0.00 |
| Battambang | 15+ | 0.14 | 0.79 | 0.97 |
| | Under 15 | | 0.00 | 1.53 |
| Kampong Cham | 15+ | 0.31 | 0.72 | 0.82 |
| | Under 15 | 0.00 | 0.42 | 0.14 |
| Kampong Chhnang | 15+ | | 0.00 | 0.00 |
| | Under 15 | | 0.00 | 1.20 |
| Kampong Speu | 15+ | 0.00 | 0.65 | 0.57 |
| | Under 15 | | 0.00 | 0.00 |
| Kampong Thom | 15+ | 0.00 | 0.00 | 0.67 |
| | Under 15 | | | 3.57 |

| Province A | ge | Year 2005 | 2006 | 2007 |
|---|---|---|---|---|
| Kampot | 15+ | 0.00 | 0.06 | 0.15 |
| | Under 15 | | | 6.67 |
| Kandal | 15+ | 0.00 | 2.34 | 0.11 |
| | Under 15 | | 0.00 | 0.55 |
| Koh Kong | 15+ | 0.70 | 0.59 | 3.70 |
| | Under 15 | | 0.00 | 0.00 |
| Kratie | 15+ | | | 0.55 |
| | Under 15 | | | |
| Oddor Meanchey | 15+ | | | 0.00 |
| | Under 15 | | | |
| Pailin | 15+ | | | 0.00 |
| | Under 15 | | | |
| Phnom Penh | 15+ | 0.33 | 0.50 | 0.55 |
| | Under 15 | 0.00 | 0.20 | 0.16 |
| Prey Veng | 15+ | 1.39 | 0.26 | 0.44 |
| | Under 15 | 0.00 | 0.00 | 2.03 |
| Pursat | 15+ | 0.00 | 0.10 | 0.20 |
| | Under 15 | | | 0.00 |
| Siem Reap | 15+ | 1.14 | 0.65 | 0.70 |
| | Under 15 | 0.00 | 0.74 | 0.30 |
| Sihanouk Ville | 15+ | 0.00 | 0.50 | 0.65 |
| | Under 15 | 0.00 | 0.65 | 0.43 |
| Stung Treng | 15+ | | | 0.00 |
| | Under 15 | | | |
| Svay Rieng | 15+ | 0.00 | 0.55 | 0.35 |
| | Under 15 | 0.00 | 0.00 | 0.00 |
| Takeo | 15+ | 0.91 | 0.69 | 0.51 |
| | Under 15 | 0.00 | 0.59 | 0.92 |
| Total (average) | | 0.3 | 0.6 | 0.6 |
| Max | | 1.39 | 2.34 | 3.7 |

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

## QUALITY OF SERVICES

In order to assess the effectiveness of ART services, the percentage of deaths of patients on ARV was calculated by taking (total number of deaths of patients on ARV /(total active number of patients on ARV in the 4$^{th}$ quarter of the year + total number of deaths of patients on ARV). Table 1.22 shows, in 2007, the percentage of adult patients who died (15+ years) decreased in all cities/province over year.

**Table 1.22: Percentage of death of patients on ARV among current patient on ARV**

| | | Year | | |
|---|---|---|---|---|
| **Province A** | **ge** | **2005** | **2006** | **2007** |
| Banteay Meanchey | 15+ | 4.26% | 1.51% | 0.98% |
| | Under 15 | | 0.00% | 3.95% |
| Battambang | 15+ | 2.82% | 1.59% | 1.00% |
| | Under 15 | | 2.89% | 1.51% |
| Kampong Cham | 15+ | 1.23% | 0.97% | 0.61% |
| | Under 15 | 0.00% | 0.21% | 0.55% |
| Kampong Chhnang | 15+ | | 1.88% | 1.46% |
| | Under 15 | | 0.00% | 1.19% |
| Kampong Speu | 15+ | 3.08% | 3.14% | 1.81% |
| | Under 15 | | 0.00% | 0.76% |
| Kampong Thom | 15+ | 0.00% | 1.15% | 1.04% |
| | Under 15 | | | 3.45% |
| Kampot | 15+ | 2.02% | 1.33% | 1.14% |
| | Under 15 | | | 0.00% |
| Kandal | 15+ | 1.65% | 3.37% | 1.78% |
| | Under 15 | | 0.60% | 0.73% |
| Koh Kong | 15+ | 4.03% | 1.17% | 1.06% |
| | Under 15 | | 0.00% | 1.45% |
| Kratie | 15+ | | | 1.62% |
| | Under 15 | | | |
| Oddor Meanchey | 15+ | | | 2.10% |
| | Under 15 | | | |
| Pailin | 15+ | | | 3.85% |
| | Under 15 | | | |
| Phnom Penh | 15+ | 1.10% | 0.69% | 0.56% |
| | Under 15 | 1.26% | 0.57% | 0.14% |
| Prey Veng | 15+ | 1.71% | 1.12% | 0.82% |
| | Under 15 | 0.00% | 1.67% | 1.60% |
| Pursat | 15+ | 0.85% | 2.54% | 3.43% |
| | Under 15 | | | 1.92% |
| Siem Reap | 15+ | 0.60% | 0.68% | 0.66% |
| | Under 15 | 1.23% | 2.72% | 0.60% |
| Sihanouk Ville | 15+ | 1.88% | 1.40% | 0.77% |
| | Under 15 | 13.64% | 0.65% | 0.00% |
| Stung Treng | 15+ | | | 2.06% |
| | Under 15 | | | |
| Svay Rieng | 15+ | 3.15% | 2.07% | 1.51% |
| | Under 15 | 0.00% | 1.09% | 0.72% |

| | | Year | | |
|---|---|---|---|---|
| Province A | ge | 2005 | 2006 | 2007 |
| Takeo | 15+ | 1.30% | 1.12% | 0.64% |
| | Under 15 | 0.81% | 0.15% | 0.69% |
| Total % 15+ | | 1.46% | 1.17% | 0.86% |
| Total % Under 15 | | 1.29% | 0.98% | 0.56% |

Source: OI/ART record review, Global Fund Health Impact Evaluation 2008

On average, the percentage of death among those on ART has been declined in both aged groups since 2005. In 2007, the percentage of death among AIDS patients who were on ART aged less than 15 years old and 15 or more were 0.6% and 0.9%, respectively.

### COVERAGE AND DISTRIBUTION OF ART SERVICES

In order to represent the coverage of ART services, the percentage of adult AIDS patients who received ART treatment was estimated. This percentage was derived from the ratio of the total number of adult AIDS patients aged 15+ who are currently on ART (reported cases) over the total number of AIDS patients aged 15+ in need of ART (estimated numbers from Asian Epidemic model).

As a result, it has been shown that after 6 years of the introduction of ART service, about 80% of estimated AIDS patients in need of ART had received appropriate treatment. The coverage increased considerably from less than 35% in 2005 to 82.6 in 2007 (Table 1.23). This huge increase of ART coverage could not be possible without the availability of the ARV, and proper management of ART sites.

**Table 1.23: Coverage of ART among estimated HIV+ person in need of ART 2005 - 2007**

| 2005 | | 2006 | 2007 |
|---|---|---|---|
| % of coverage adult age 15+ in need of ART | 34.80% | 60.94% | 82.61% |
| Total active ART | 11,284 | 18,344 | 24,123 |
| Estimate adult age 15+ in need of ART | 32,430 | 30,100 | 29,200 |

Source: OI/ART record review and Asian Epidemic Model

## 1.6 HIV/AIDS: OTHER SERVICES

### FINANCING FOR OTHER HIV/AIDS SERVICES

Although specific financial records are not available for other HIV/AIDS services, NCHADS has performed many services that contribute to fight against the spread of HIV/AIDS transmission. Those services include the treatment and care of sexually transmitted infections, laboratory support, AIDS patient mobility across services, and community services.

### AVAILABILITY OF OTHER HIV/AIDS SERVICES

Thanks to the availability of the funding for other services related to HIV/AIDS, STI diagnostic and treatment services have been developed and scaled up throughout the country. By 2007, 30 specialized government STI clinics were in operation in 21 out of 24 cities/provinces. In addition, 18 NGOs clinics were also providing services, in cooperation with the government. Note that,

although the number of specialized STI clinics did not increase, 96% of the existing clinics have upgraded their laboratory facilities to be able to perform RPR testing and basic microscopy.

Continuum of Care (CoC) services were introduced a few years ago. To date, 39 operational districts in 20 provinces have established a continuum of care network. CoC services may be set up in any operational district where OI/ART site is already in place.

Laboratory support is another service to which NCHADS has allocated a part of AIDS budget. In Q4-2007, a total of 17,154 CD4 counts had been conducted. At the moment, CD4 count services are available at Takeo, Kompong Cham, Battambong , Bantey Mean Chey and Phnom Penh. In addition, viral load and DNA PCR testing are available at Institute Pasteur and National Institute of Public Health in Phnom Penh.

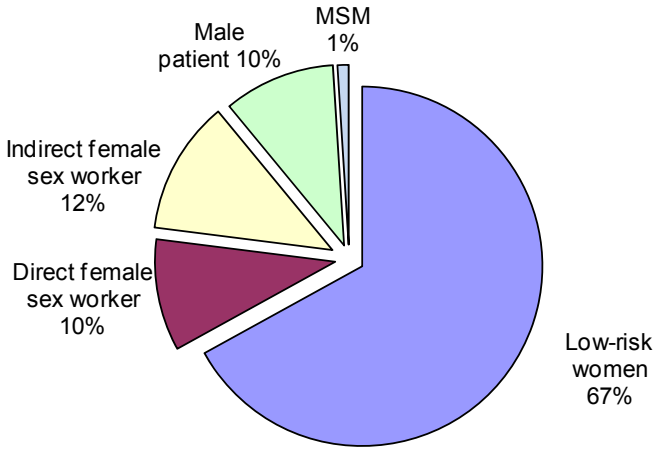
Supporting patient mobility across services is vital in helping to reduce the loss the follow up, to increase the level of adherence, and by and large to increase the access of poorer populations to health services. In 2007, a total of 1409 ART patients were transferred out to new ART sites located closer to their residence.

Community based services which include home-based care, PLHA support groups, and TB/HIV collaboration were also included in the intervention package as a response to HIV/AIDS. It has been observed that in 2007, the number of home-based care teams has declined because some NGOs stopped their activities due to the lack of funding. Currently, there are 683 health centers linked to home based care teams in 18 provinces. Home-based care teams report to have provided support to a total of 25,395 people living with HIV/AIDS. In addition, 38 PLHA support groups have been created in 2007. To date, 723 PLHA support groups are working with 36, 166 HIV/AIDS patients in Q4-2007 in 14 provinces out of 24 cities/provinces. TB/HIV collaboration activities have been intensified in 522 health centers in 16 provinces. The main activity of TB/HIV collaboration is a health center with home-based care teams facilitating the transportation of TB patients from communities to the nearest VCCT sites for HIV testing. At the health centers with TB/HIV collaboration, out of 3,954 newly diagnosed and old TB cases, 33% were reported by home based care teams to have HIV tested at VCCT in Q4-2007.

### ADHERENCE TO SERVICES

In 2007, 196,903 consultations were provided in a total of 48 specialized STI clinics. The majority of STI clients at clinics is low risk women (67%) (Figure 1.16). Since Q3 in 2007, most of STI clinics had started reporting their lab results, in which a total of 28,106 RPR tests were performed.

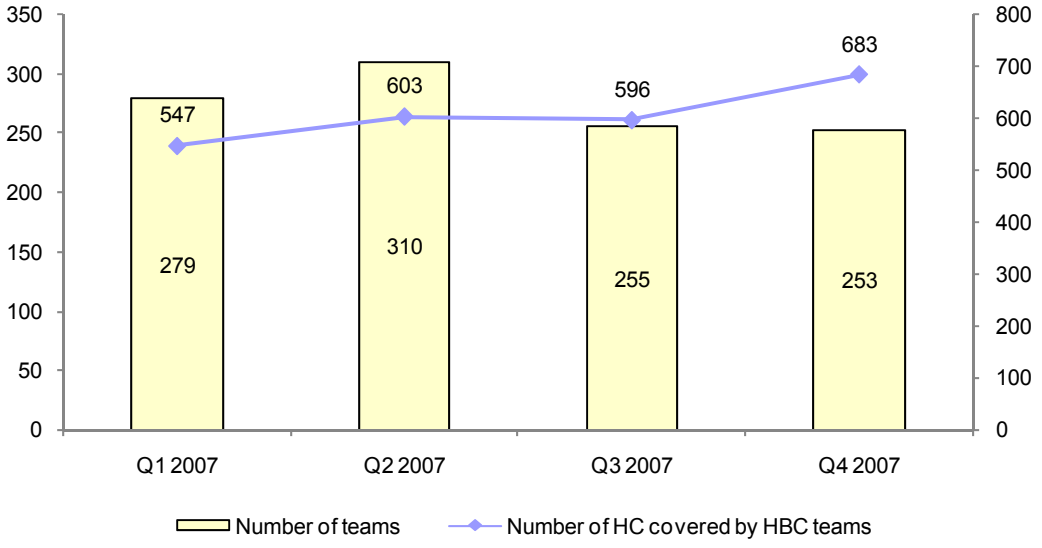
**Figure 1.16: Types of patients receiving consultation at STI clinics in 2007**




Source: NASA report 2006

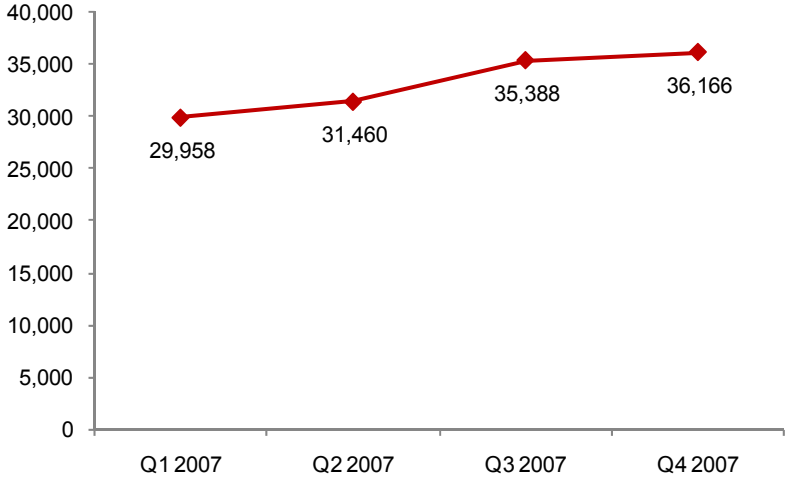
Due to the lack of funding, the number of home based care teams decreased slightly in 2007. The drop was resulted from the severe shortage of numerous basic supports given to people living with HIV/AIDS (Figure 1.17). The number of PLWA benefiting from support groups increased through 2007 (Figure 1.18).

**Figure 1.17: Trend of number of home-based care team and number of health center coverage in 2007**




Source: NCHADS annual report 2007

**Figure 1.18: Trend in number of PLHA supported by PLHA support groups in 2007**




Source: NCHADS annual report 2007

## 1.7 HIV INCIDENCE, PREVALENCE AND MORTALITY

### HIV INCIDENCE

A special study was conducted to estimate the incidence of HIV from blood specimens collected in HIV sentinel surveillance sites from 1999 to 2002. In the survey, a BED incidence test was used to detect new infections among HIV positive specimens. As result, it was shown that the HIV incidence of all high risk groups peaked in 1999 and declined afterward, except among women attending ANC (Table 1.24).

**Table 1.24: National trends in HIV incidence**

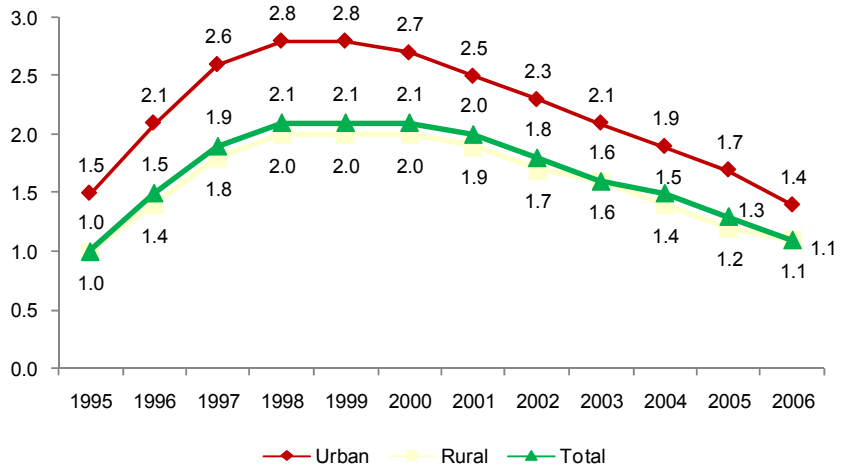
| | 1999 | 2000 | 2002 |
|---|---|---|---|
| Direct female sex worker | 13.90% | 9.02% | 6.45% |
| Indirect female sex worker | 5.08% | 5.08% | 2.87% |
| Women attending antenatal clinic | 0.72% | 1.11% | 0.59% |
| Police | 1.74% | 1.30% | 0.26% |

Source: Part of Dissertation submitted by Dr. Saphonn Vonthanak

### HIV PREVALENCE

Pregnant women attending antenatal clinics have been included in HIV sentinel surveillance since 1995. The HIV prevalence among ANC attendees was adjusted for quality control and residence, and smoothed with EPP to produce a trend from 1995 to 2006. Consequently, in 2006, the prevalence of ANC was found at 1.1% (Figure 1.19).

**Figure 1.19: National trends in HIV prevalence from ANC surveillance, 1995–2006**




In order to estimate the HIV prevalence among the general population, a consensus workshop was conducted in June 2007. Two main sources of HIV prevalence data, from the HIV sentinel surveillance 1995-2006 and from the Demographic Health Survey 2005, were used to estimate the trend. The result from the consensus workshop revealed that the estimated prevalence of HIV among the general adult population (age 15+ years) for both men and women was 0.7% in 2007 (Figures 1.20a and 1.20b).

**Figure 1.20a: Estimated HIV prevalence among male population aged 15 +**

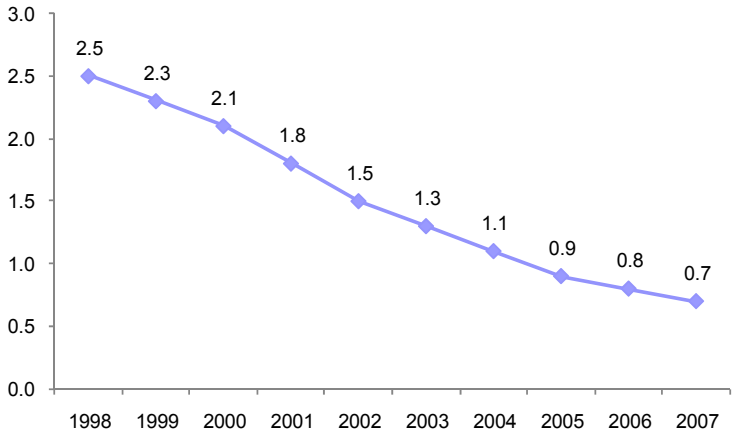
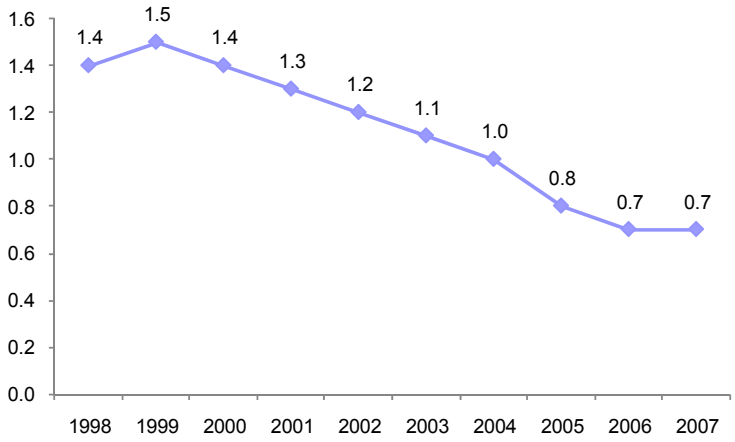


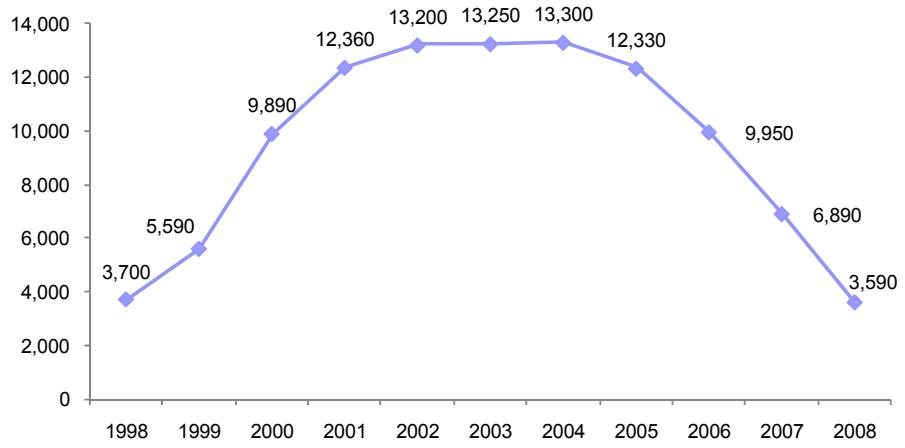
**Figure 1.20b: Estimated HIV prevalence among female population aged 15+**




## HIV MORTALITY

From the Asian Epidemic Model used in the HIV consensus workshop in 2007, it is estimated that the number of deaths due to AIDS among adults age 15+ years, given the availability of ART, declined from 13,300 in 2004 to 6890 in 2007 (Figure 1.21). The decline was not that steep when estimated without the availability of ART.

**Figure 1.21: Estimated number of annual death due to AIDS among adults age 15+**




## 1.8 CONCLUSION: HAS INCREASED HIV FUNDING LED TO A REDUCTION IN THE BURDEN OF DISEASE?

In the fight against HIV/AIDS epidemic, the government allocated about US$1,012,000 in 2004. This figure did not take into account "in kind contribution". However, funding from donors for the national response to HIV/AIDS in Cambodia is over 37 million annually. In 2006, the total amount of HIV/AIDS budget reached record high of US$ 46.3 millions. A large increase of funding available for AIDS activities in 2006 results in an increase in the coverage of ART, VCCT, and other HIV/AIDS related services such as STI service and other support groups.

To date, the national response to HIV/AIDS epidemic in Cambodia focused on 3 main strategies: prevention; care, treatment & support; and impact alleviation. The funding distribution from the 2006 NASA presented the proportion of each component.

The success of prevention has been shown as the incidence of HIV is declining in all high risk groups, followed by the drop of prevalence. In 2006, the prevalence of the general adult population a was 0.9%, and the prediction shows that, given the same effort we have had in the past up to now, the prevalence among general population will go down further in the years ahead. Despite this finding, it is impossible to rule out the possibility of resurgence of HIV/AIDS epidemic since some new high risk groups have not yet been received much attention. Those high risk groups include men who have sex with men and intravenous drug users. Men who have sex with men are a sexually active group and their sexual partners can be either men or women. It has also been found that the prevalence of STI and HIV in this group is alarmingly high. Knowledge and behavioral change is another subtopic discussed in the national strategic plan II. It has been observed that the trend in the percentage of consistent condom use among behavioral sentinel groups increased to 90% or more. However, the level of consistent condom use with non-commercial partners remains low. Another major challenge is the difficulties with HIV/AIDS intervention program reaching women working in entertainment establishments. In short, the effort in prevention has to be maintained and strengthened in order to keep the spread of HIV/AIDS under control. Due to its significance, in 2006, 45% of the total HIV/AIDS budget was used in prevention components.

After about 2 decades of the HIV/AIDS epidemic, care, treatment & support became another priority. In 2006, it was estimated that about 65,000 people were living with HIV/AIDS, in which 30,100 were in need of ART. In response, additional ART sites were established and more services are needed to support PLHA and their families who are mostly poor and live in remote rural areas. Facilities with pediatric ART have also scaled up in response to the rise of number of children living with AIDS. Again, activities within this component would not be done without enough financial resource. In 2006, 21% of AIDS budget, the second largest amount of money after prevention, was allocated to care, treatment & support. The budget for these activities will be even more critical in the coming years since there is a projection of an increase of people in need of ART from 2006 to 2012.

Impact alleviation is another topic of interest in the management of the HIV/AIDS epidemic in Cambodia over this decade. It has been observed that impact mitigation programs and interventions are mainly supported by NGOs. Home-based care teams and PLHA support groups are two approaches used to reach PLHA and their families. In 2007, a national action plan for orphans and vulnerable children was developed despite the lack of data concerning the magnitude of the problem of orphans and vulnerable children and the effects of impact mitigation efforts. With only 5% of the total budget allocated to OVC, not much can be done in 2006. Hence, in the near future, a larger portion of HIV/AIDS budget is needed to be allocated to OVC in order to establish and expand impact alleviation programs and interventions.

In conclusion, the elimination of HIV/AIDS is close to impossible in the foreseeable future. The epidemic will be in Cambodia for many more years. The most the country can do is to prevent this epidemic from resurgence and to provide appropriate care, treatment and support to those who are already affected by the plague. To do so, the minimum requirement is to maintain the efforts used in the past two decades for fighting against the epidemic. In addition, as the epidemic is evolving, new programs or interventions targeting new high risk groups should also be taken into

consideration. The effort needed includes all man power, management, political commitment and, last but not least, funding. Since, the Cambodian government contributes only a small proportion of the overall budget needed to control the spread of the epidemic, funding from donors agencies becomes vital. Therefore, a continuous support, especially financial support, from international communities is necessary for the success of the programs to control the HIV/AIDS epidemic in Cambodia.

# Secondary Analysis of Disease Trends:

# Tuberculosis

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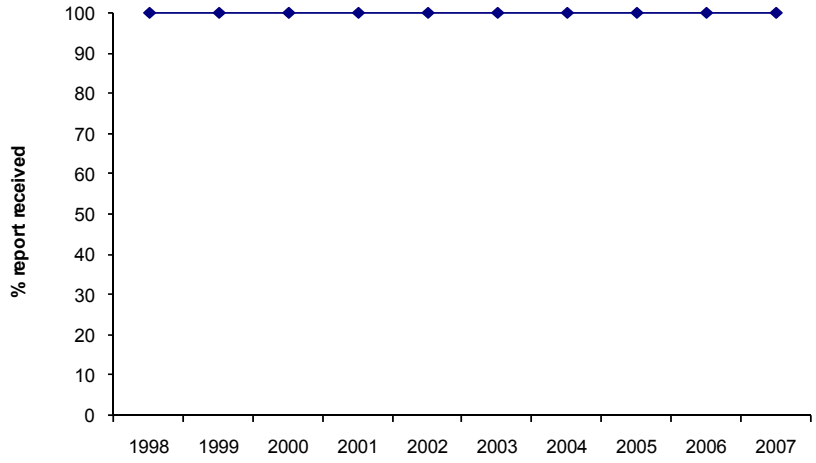
## 2.0 QUALITY OF TB DATA REPORTED FROM THE ROUTINE SURVEILLANCE SYSTEM

The quality of TB data reported by Cambodia National TB Program (NTP) is assessed in terms of completeness of reporting over time and geographical region, timeliness of reporting across regions, and consistency with other databases.

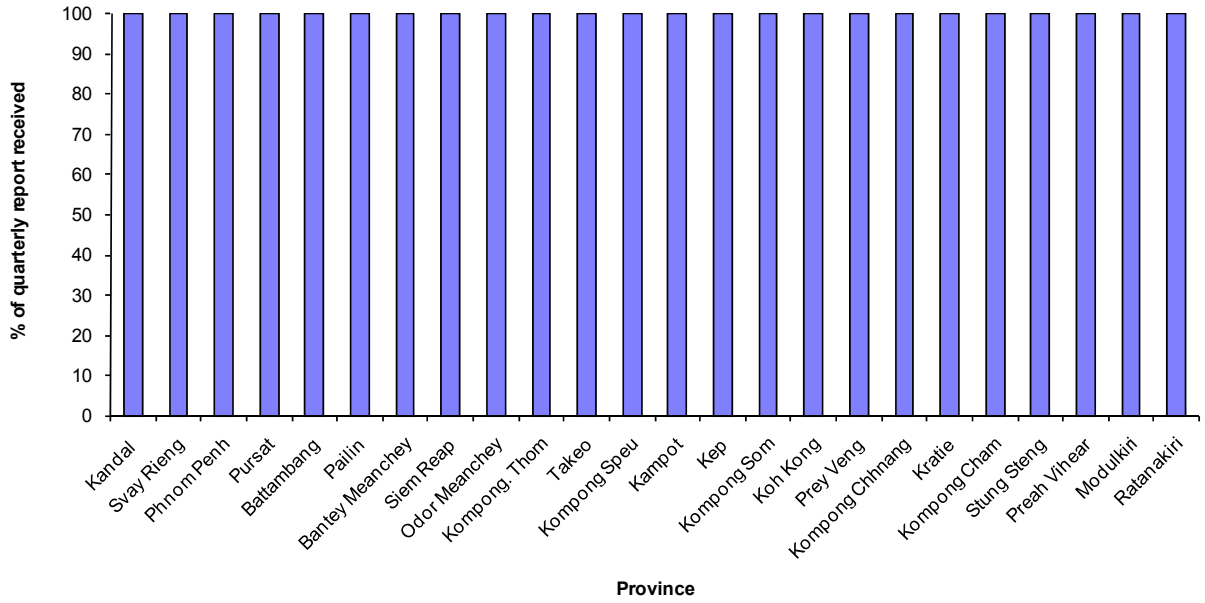
### COMPLETENESS

**Figure 2.1: Completeness of TB reporting over time**




Source: Cambodia NTP

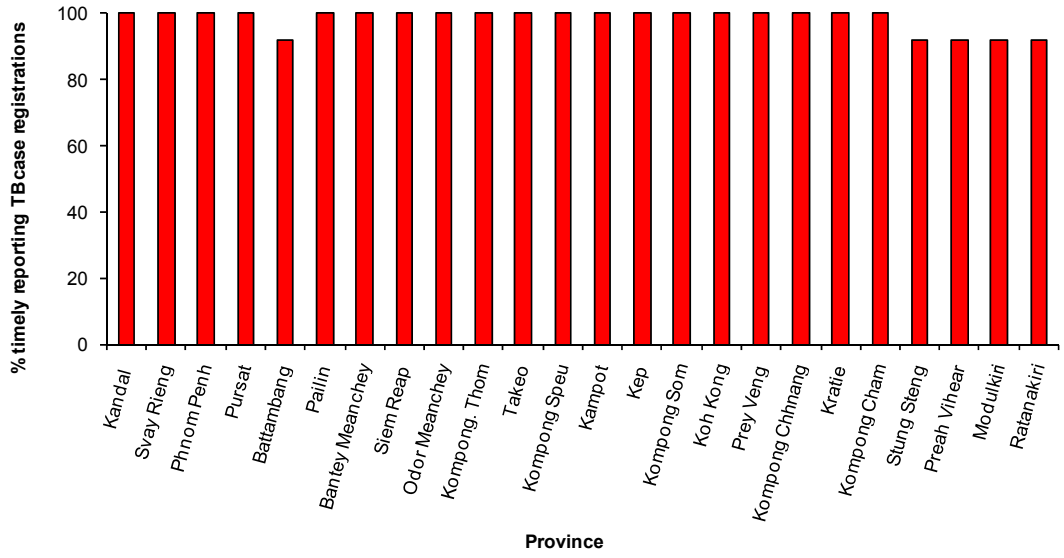
**Figure 2.2: Completeness of TB reporting across region, 2007**




Source: Cambodia NTP

## TIMELINESS

**Figure 2.3: Timeliness of reporting TB case registrations (Q4 2007)**




Source: Cambodia NTP

Between 1998-2007, routine reports were received from all TB basic management units (BMUs), the reporting units for the national TB programme (NTP) (Figures 2.1 and 2.2). It should be noted that the area which BMUs represent has changed over time. Between 1998 to 2001, BMUs represented provinces, whereas from 2002 onwards, as the DOTS expansion and decentralization process progressed, BMUs represent operational districts. Timeliness of reporting has been satisfactory with over 80% of BMUs reporting within the scheduled dates (Figure 2.3). Detailed data pertaining to completeness and timeliness of TB reporting can be found in Annex 2.1.

## CONSISTENCY

Comparison of country TB data with the WHO database for notified new smear-positive cases shows no discrepancies, indicating that the data is of high quality (Table 2.1).

**Table 2.1: Comparison of new smear-positive TB cases: Cambodia county TB data and WHO data**

| | Number of new smear-positive TB cases notified | |
|---|---|---|
| Year | Cambodia county TB data | WHO data |
| 1998 | 13,865 | 13,865 |
| 1999 | 15,744 | 15,744 |
| 2000 | 14,822 | 14,822 |
| 2001 | 14,361 | 14,361 |
| 2002 | 17,258 | 17,258 |
| 2003 | 18,923 | 18,923 |
| 2004 | 18,978 | 18,978 |
| 2005 | 21,001 | 21,001 |

Sources: Cambodia NTP, WHO Data (http://www.who.int/tb/country/global_tb_database/en/)

Similarly, comparison of treatment outcomes for the cohort of new smear-positive TB cases from 1998 to 2005 submitted to WHO and the Global Fund show no major discrepancies (Annex 2.2). The minor discrepancies can be attributed to the different time lines and reporting periods requested by the two agencies, i.e., quarterly versus annual reports. Revisions to quarterly reports are sometimes made to correct inaccuracies reported by the BMUs or while cleaning the data to consolidate them into annual reports. Treatment outcomes for the cohort registered between 1998 and 2001 are available only as a summary of national data.

## CASE REGISTRATIONS RATES

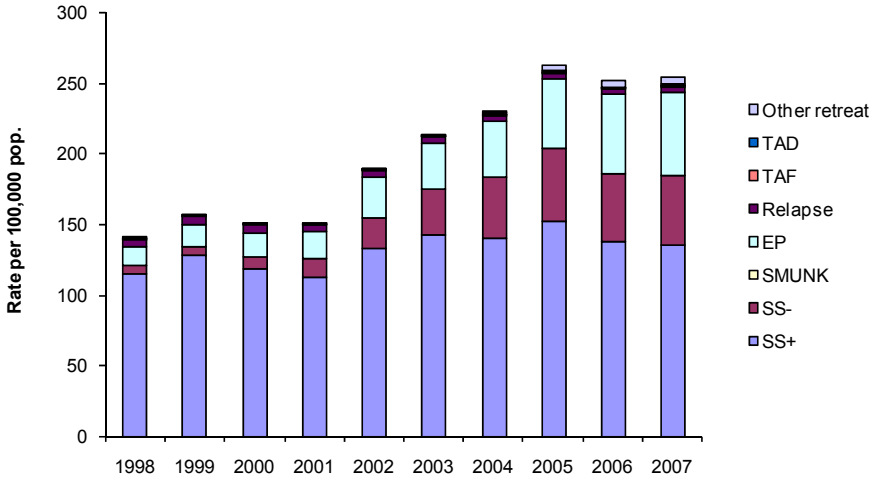
The case notification rates for each type of TB are summarized in Table 2.2 and Figure 2.4.

**Table 2.2: Annual case notification rates by TB type, per 100,000 population**

| TB type | 1998 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| New | | | | | | | | | |
| SS+ | 114 | 127 | 118 | 112 | 132 | 142 | 140 | 152 | 137 | 135 |
| SS- | 6 | 6 | 9 | 13 | 22 | 32 | 43 | 51 | 49 | 50 |
| EP | 14 | 16 | 17 | 19 | 28 | 32 | 40 | 49 | 55 | 59 |
| Retreatment (culture+ or/& ss+) | | | | | | | | | | |
| Relapse | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 |
| Failure | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Default | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 5 | 6 |
| Total new and relapse | 140 | 156 | 150 | 150 | 189 | 212 | 228 | 257 | 246 | 248 |

Source: Cambodia NTP

**Figure 2.4: Annual case notification rate by TB type**




Source: Cambodia NTP

Case notifications show substantial variations (i.e., more than 10%) in overall case notifications from year to year—particularly as observed from 2002 to 2003, and 2004 to 2005, when the number of smear-negative TB cases grew proportionally more than other types. Possible reasons include improved capacity to diagnose SS- and extra pulmonary forms of TB, as well as progress made in

implementing TB/HIV collaborative activities, including intensified TB case finding among HIV positive individuals who are more likely to have such types of TB.

### UNFAVORABLE OUTCOMES

Throughout 1998-2006, the proportion of patients with unfavorable treatment outcomes has remained below 9%, much lower than the international target of 15%, and thus reflecting good performance of the TB program in Cambodia (Table 2.3).

**Table 2.3: Unfavorable treatment outcomes, as percent of new ss+**

| Unfavorable outcomes (% of ss+) | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|
| Died | 2.3 | 2.6 | 3.6 | 4.0 | 3.8 | 3.5 | 4.1 | 3.3 | 3.0 |
| Failed | 0.4 | 0.4 | 0.3 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 |
| Defaulted | 2.2 | 3.0 | 3.9 | 2.9 | 2.4 | 2.1 | 2.2 | 2.0 | 1.6 |
| Transferred | 0.5 | 0.5 | 0.8 | 0.9 | 1.1 | 1.4 | 1.2 | 1.8 | 1.6 |
| Total unfavorable treatment outcomes | 5.4 | 6.5 | 8.6 | 8.2 | 7.6 | 7.2 | 7.7 | 7.4 | 6.5 |

## 2.1 HISTORICAL PERSPECTIVE

### EPIDEMIOLOGY

Cambodia is ranked 21st among the high TB burden countries of the world (Global Tuberculosis Control, WHO Report 2008). Tuberculosis affects the economically productive age group (15-55 years) among vulnerable and marginalized populations, especially those in remote rural areas, those in indigenous and ethnic minorities, and those in poor areas and overcrowded slums. The WHO-estimated prevalence of all forms of TB is 665 per 100,000 population. The estimated incidence is 220 per 100,000 population for smear-positive TB cases and 500 per 100,000 population for all cases. The estimated mortality due to TB is 92 deaths per 100,000 population (Global Tuberculosis Control, WHO Report 2008). WHO estimates that incidence is declining at a rate of 1% per year.

During the last 10 years, from 1998 to 2007, TB cases notified under the Cambodia National TB Control Program (NTP) have increased from 17,093 to 36,495 for all cases, and from 13,865 to 19,421 for new smear-positive cases.

### PROGRAMMING

Despite great efforts made over the last ten years in tuberculosis (TB) control, the disease is still a major global public health problem.

In its overall national health policies and strategies, the Ministry of Health of the Kingdom of Cambodia gives the highest priority to the control of communicable diseases in the country with tuberculosis being ranked as one of the most important.

In response to the need for controlling the disease, the National Tuberculosis Control Program (NTP) has been set up since 1980. From 1980 to 1993, treatment approaches of long duration were applied. In 1994, the Ministry of Health adopted the Directly Observed Treatment, Short-course

(DOTS) strategy, which is one of the most cost-effective health interventions recommended by WHO for developing countries.

The Cambodia NTP has been operating under the responsibility of the National Center for Tuberculosis and Leprosy Control (CENAT) of the Ministry of Health, within the overall national health system.

The main goals and objectives of NTP are as follows:

- To contribute to improving the health of the Cambodian people in order to promote socio-economic development and poverty reduction in Cambodia by reducing the morbidity and the mortality rates due to tuberculosis.
- [Medium term] To ensure equity and access to quality TB services and to maintain a high cure rate of more than 85% and a high case detection rate of over 70% during the period from 2006 to 2010.
- [Long term] To reduce the prevalence of TB and death due to tuberculosis in order to contribute to attaining MDG goals by 2015.

The National Center for Tuberculosis and Leprosy Control (CENAT) assumes overall responsibility for the National Tuberculosis Control Program (NTP) to be implemented countrywide through the health care delivery system in Cambodia.

The major roles and functions of the NTP are:

- Formulation, monitoring and evaluation of the national policies, strategies, guidelines, protocols and plans for TB control.
- Capacity building for health workers involved in TB control at all levels.
- Provision and/or reinforcement of supervision, monitoring and evaluation of TB control activities at all levels.
- Organization of surveillance and research on topics relevant to the NTP.
- Promotion of information-education-communication activities for TB control.
- Strengthening of the National TB Reference Laboratory and the TB laboratory network.
- Coordination of TB control activities including those conducted by other government agencies, IOs, NGOs, private providers and communities.
- Coordination of partners, advocacy and resource mobilization for TB control.
- Contribution to the strengthening of the health care system in both public and private sectors.

At the central level, within the CENAT, there are three structures: the NTP headquarters; the TB Referral Hospital (one of eight national hospitals in Cambodia), offering clinical and para-clinical TB services; and the National TB Reference Laboratory (NRL).

At the intermediate level (provincial level), Provincial TB supervisors are responsible for program planning and management including training and supervision. At least two full time staff persons work for the TB programme at this level. At the operational district (OD) level, an OD TB supervisor has a role similar to provincial TB supervisors.

At the service provision level, there are TB units and Health Centers (HC). Until 1998, DOTS was offered only at the hospital level, in the TB unit. In 1999, a pilot testing of the decentralization of TB control activities was started in nine health centers, and in 2001 the national DOTS expansion plan was approved. Thanks to the rapid DOTS expansion between 2001 and 2004, all health centers were able to provide DOTS and TB services by the end of 2004.

In a broad sense, the TB laboratory network includes health centers where sputum specimens are collected, microscopy centers situated in some HCs, TB units, and some central hospitals, the National Reference Laboratory at CENAT in Phnom Penh, and the supra-national TB laboratory in Tokyo, Japan.

At present, the TB laboratory network consists of around 200 microscopy centers situated in 70 referral hospitals, 5 central hospitals, 75 former district hospitals and the remaining in health centers. It should be noted that 75 microscopy centers are integral parts of general laboratories within all 70 referral hospitals and five central hospitals (three national hospitals, one military hospital, and one police hospital). Presently, there are three public laboratories in Cambodia with TB culture capabilities, one in CENAT, one in Kampong Cham referral Hospital, and one in Battambang referral Hospital.

Sputum collection has been extended to all health centers and corresponding microscopy centers are located in former district hospitals and referral hospitals. In 2006, a total of 458,646 slides were examined for AFB from 138,516 suspects. The laboratory network includes 328 technicians.

The quality assurance program is an essential component of the laboratory services of the NTP. Rapid feedback of QA results is the key to providing quality laboratory diagnosis of TB. The NTP has established the foundation for a quality assurance system of slide review according to WHO standards.

In 1993, before the introduction of the DOTS strategy, the NTP performance was not satisfactory. The cure rate for smear positive cases was only 69% and the detection rate was just 44%. In 1995, the National Committee for TB Control, headed by the Honorable Prime Minister, was established. Improvements since this time clearly demonstrates the political commitment of the government to TB control.

Since 1995, the NTP has attained and maintained the objective of more than 85% cure rate of infectious cases. For instance, the cure rates were 85% in 1995, 89% in 2001 and 90% in 2005.

Cambodia accelerated case-finding activities by expanding DOTS in 100% of health centers, including preparation of smear slides in health centers. NTP has made progress in the implementation and decentralization of laboratory services. Decentralization of slide preparation to the health center level has contributed to increasing access to diagnostic services. There has also been great progress in the implementation of quality assurance programmes. Primary culture for Mycobacterium tuberculosis is now available in three laboratories. A drug management system was

also successfully implemented countrywide, ensuring uninterrupted treatment. Plans were completed to secure supply through Global Drug Facility (GDF) pre-qualified manufacturers until 2010.

Countrywide implementation of training activities has been achieved. TB Records and registers are well kept and of good quality.

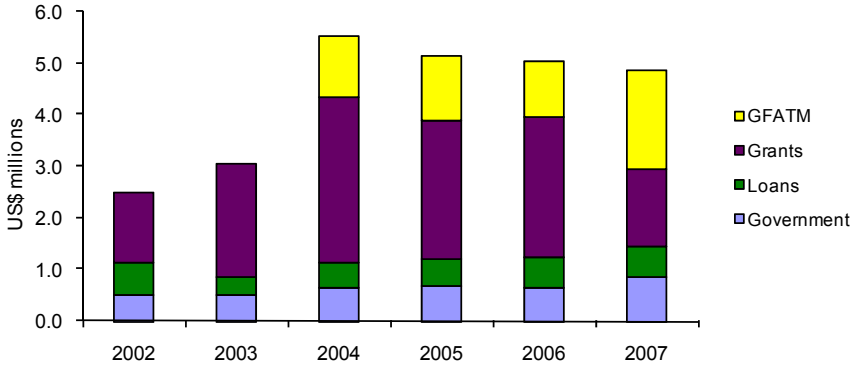
## 2.2 STUDY QUESTION 1: HAS FUNDING/SPENDING INCREASED FOR TUBERCULOSIS PROGRAMS? [INPUT INDICATORS]

The major donors for TB control in Cambodia are WB, JICA/Japan, WHO, USAID, and GFATM. There has been an increase in financing especially within the period of DOTS expansion from late 2001 until 2004 (Table 2.4 and Figure 2.5). There was not an increase in funding from 2004 to 2007 although the amount did not decrease much since 2004, thus permitting maintenance of existing DOTS facilities and other new approaches.

**Table 2.4: TB expenditure by funding source**

| US$ millions | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| Government (excluding loans) | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 | 0.9 |
| Grants (excluding GFTAM) | 1.4 | 2.2 | 3.2 | 2.7 | 2.7 | 1.5 |
| Loans | 0.7 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 |
| GFATM | 0.0 | 0.0 | 1.2 | 1.3 | 1.1 | 1.9 |
| Total | 2.5 | 3.1 | 5.5 | 5.1 | 5.0 | 4.9 |

**Figure 2.5: NTP expenditure by source of funding**




Source: Cambodia NTP

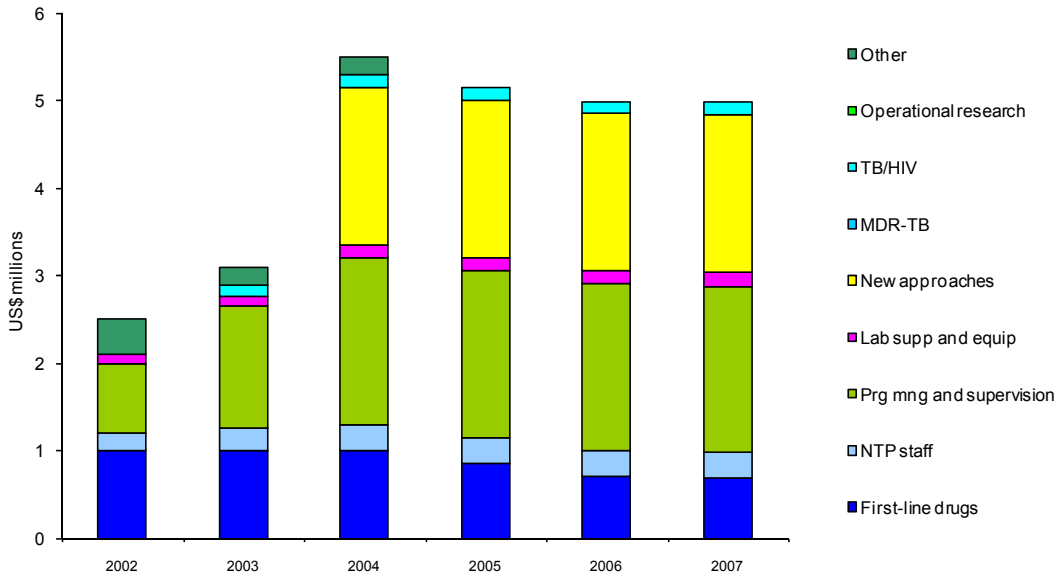
NTP expenditure by line items shows that the major areas of expenditure initially was on programme management and supervision and first line drugs, reflecting activities needed to establish and expand the basic DOTS programme at that time (Table 2.5 and Figure 2.6). Full DOTS coverage was achieved in 2004 and since then the major line item was on introducing new approaches to strengthen the programme including community-DOTS activities to improve access and advocacy, communication, and social mobilization (ACSM). Although the number of patients initiated on treatment increased with DOTS coverage, the amount spent on drugs decreased over the years largely because the price of first line anti-TB drugs decreased significantly.

**Table 2.5: TB expenditure by line items**

| US$ millions | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| DOTS | | | | | | |
| First-line drugs | 1 | 1 | 1 | 0.85 | 0.7 | 0.68 |
| NTP staff | 0.2 | 0.25 | 0.3 | 0.3 | 0.3 | 0.3 |
| Programme management and supervision | 0.8 | 1.4 | 1.9 | 1.9 | 1.9 | 1.9 |
| Laboratory supplies and equipment | 0.1 | 0.12 | 0.15 | 0.15 | 0.15 | 0.15 |
| New approaches† | | | 1.8 | 1.8 | 1.8 | 1.8 |
| MDR-TB | | | | | | |
| TB/HIV | | 0.12 | 0.14 | 0.15 | 0.14 | 0.15 |
| Operational research | | | | | | |
| Other | 0.4 | 0.2 | 0.2 | | | |
| Total | 2.5 | 3.1 | 5.5 | 5.1 | 5.0 | 4.9 |

†New approaches include: public-private mix (PPM); advocacy, communication, and social mobilization (ACSM); practical approach to lung health (PAL); and community-based TB care (CTBC).

**Figure 2.6: NTP expenditure by line item**




Source: Cambodia NTP

## 2.3 STUDY QUESTION 2: HAS THE AVAILABILITY OF QUALITY TUBERCULOSIS SERVICES INCREASED? [OUTPUT INDICATORS]

### HAS THE QUANTITY AND COVERAGE OF TB SERVICES INCREASED? ARE THEY EQUITABLY DISTRIBUTED?

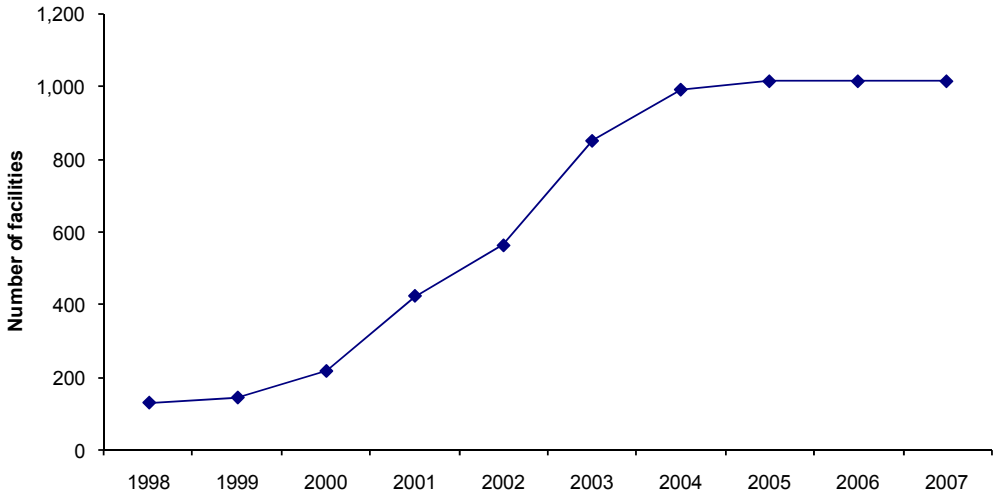
The availability and coverage of TB services are summarized in this section. As reflected in Table 2.6 and Figure 2.7, accelerated expansion of DOTS began at the end of 2001, reaching 100% coverage in health centres in 2004. By 2007, DOTS services were available in 1,016 health facilities across the country.

**Table 2.6: Number of facilities providing TB services**

| Province | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Kandal | 11 | 11 | 11 | 34 | 34 | 97 | 97 | 97 | 97 | 97 |
| Svay Rieng | 7 | 7 | 8 | 8 | 31 | 40 | 40 | 40 | 40 | 40 |
| Phnom Penh | 9 | 10 | 15 | 15 | 22 | 22 | 24 | 24 | 24 | 24 |
| Pursat | 5 | 5 | 5 | 30 | 30 | 33 | 33 | 33 | 33 | 33 |
| Battambang | 8 | 9 | 25 | 38 | 30 | 50 | 75 | 79 | 79 | 79 |
| Pailin | | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 |
| Banteay Meanc | 7 | 7 | 10 | 30 | 38 | 46 | 54 | 56 | 56 | 56 |
| Siem Reap | 5 | 8 | 25 | 25 | 51 | 59 | 59 | 59 | 59 | 59 |
| Odormeanchey | | | | 4 | 4 | 5 | 11 | 14 | 14 | 14 |
| Kompong Thom | 5 | 8 | 8 | 29 | 50 | 53 | 53 | 53 | 53 | 53 |
| Takeo | 10 | 10 | 10 | 10 | 10 | 67 | 76 | 76 | 76 | 76 |
| Kompong Speu | 6 | 6 | 6 | 6 | 31 | 53 | 53 | 53 | 53 | 53 |
| Kampot | 7 | 7 | 7 | 32 | 32 | 38 | 51 | 51 | 51 | 51 |
| Kompong Som | 3 | 3 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 |
| Kep | | 1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 |
| Koh Kong | 3 | 3 | 6 | 6 | 9 | 15 | 12 | 15 | 15 | 15 |
| Prey Veng | 13 | 13 | 13 | 38 | 38 | 80 | 99 | 99 | 99 | 99 |
| Kompong Chhna | 7 | 7 | 18 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Kratie | 5 | 5 | 5 | 5 | 17 | 17 | 28 | 28 | 28 | 28 |
| Kompong Cham | 13 | 13 | 13 | 46 | 68 | 104 | 135 | 140 | 140 | 140 |
| Stung Treng | 3 | 5 | 5 | 5 | 5 | 5 | 8 | 11 | 11 | 11 |
| Preah Vihear | 1 | 1 | 7 | 7 | 7 | 7 | 10 | 13 | 13 | 13 |
| Modulkiri | 1 | 1 | 5 | 5 | 5 | 5 | 7 | 7 | 7 | 7 |
| Ratanakiri | 2 | 4 | 4 | 4 | 4 | 4 | 11 | 11 | 11 | 11 |
| **National total** | **131** | **145** | **218** | **425** | **564** | **852** | **993** | **1,016** | **1,016** | **1,016** |

Source: Cambodia NTP

**Figure 2.7: Number of facilities providing TB services**




Source: Cambodia NTP

In terms of population coverage, DOTS facilities are widely accessible. By 2004, there were on average seven health facilities providing TB services for every 100,000 population (Table 2.7).

**Table 2.7: Number of health facilities providing any TB services per 100,000 population**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| # of health facilities with TB services/ 100,000 population | 1.08 | 1.17 | 1.73 | 3.32 | 4.32 | 6.41 | 7.33 | 7.36 | 7.22 | 7.07 |
| Proportion of population covered by DOTS treatment | 50% | 55% | 62% | 70% | 75% | 80% | 100% | 100% | 100% | 100% |

Source: Cambodia NTP

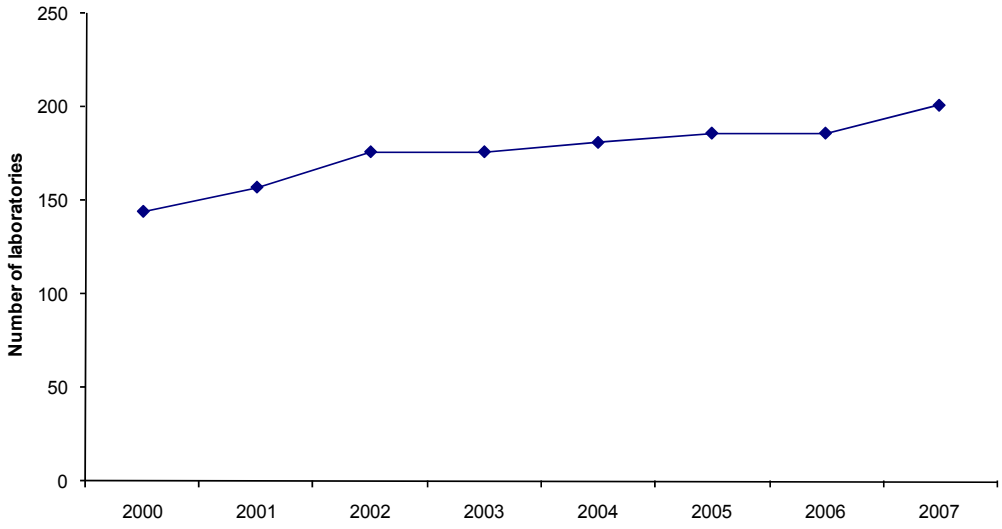
By 2007, there were 201 laboratories providing sputum smear microscopy services (Table 2.8 and Figure 2.8).

**Table 2.8: Number of laboratories with smear microscopy services**

| Province | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Kandal | | | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Svay Rieng | | | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 10 |
| Phnom Penh | | | 7 | 8 | 9 | 9 | 10 | 10 | 10 | 10 |
| Pursat | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 |
| Battambang | | | 11 | 11 | 13 | 13 | 13 | 13 | 13 | 13 |
| Pailin | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Banteay Meanc | | | 7 | 7 | 9 | 9 | 9 | 10 | 10 | 10 |
| Siem Reap | | | 8 | 10 | 12 | 12 | 12 | 12 | 12 | 12 |
| Odormeanchey | | | | 4 | 5 | 5 | 6 | 6 | 6 | 7 |
| Kompong Thom | | | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 |
| Takeo | | | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Kompong Speu | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Kampot | | | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Kompong Som | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Kep | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Koh Kong | | | 2 | 4 | 5 | 5 | 6 | 6 | 6 | 6 |
| Prey Veng | | | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Kompong Chhna | | | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Kratie | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 |
| Kompong Cham | | | 12 | 12 | 14 | 14 | 14 | 14 | 14 | 14 |
| Stung Treng | | | 5 | 5 | 8 | 8 | 10 | 10 | 10 | 10 |
| Preah Vihear | | | 1 | 2 | 5 | 5 | 5 | 9 | 9 | 13 |
| Modulkiri | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Ratanakiri | | | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 10 |
| Total | | | **144** | **157** | **176** | **176** | **181** | **186** | **186** | **201** |

Source: Cambodia NTP

**Figure 2.8: Number of laboratories with smear microscopy services**




Source: Cambodia NTP

In terms of population coverage, on average, 1.4 TB diagnostic laboratories were available for every 100,000 population (Table 2.9)—a slightly better coverage than that recommended by WHO, to establish one TB laboratory for every 100,000 population.

**Table 2.9: Number of laboratories with smear microscopy services per 100,000 population**

| | 1998 | 1999 | 2000 | 2001 | 2002 2003 | 2004 | 2005 | 2006 | | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| # of laboratories with microscopy/ 100,000 population | | | 1.15 | 1.23 | 1.35 | 1.32 | 1.34 | 1.35 | 1.32 | 1.40 |
| Proportion of population covered by DOTS lab services | | | 62% | 70% | 75% | 80% | 100% | 100% | 100% | 100% |

Source: Cambodia NTP

In terms of trends in the number of TB staff, Table 2.10 presents the number of personnel by district, province and central levels.

**Table 2.10: Number of TB staff in district, province and central level**

| Full-time TB personnel at level | 1998 | 1999 2000 | | 2001 2002 | | 2003 2004 | | 2005 2006 | | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Central unit | 22 | 25 | 28 | 30 | 32 | 35 | 40 | 40 | 40 | 40 |
| Region/province | 42 | 46 | 46 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| District | 597 | 653 | 945 | 1,704 | 2,170 | 3,106 | 3,664 | 3,759 | 3,760 | 3,760 |
| Other (drivers, etc.) | 8 | 10 | 12 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |

Source: Cambodia NTP

During the early 2000s, the period when rapid DOTS expansion took place, the number of staff at the central and provincial levels increased marginally whereas it increased more sharply at the district

level. This reflects the increased demand due to the scaling up of TB facilities and services at the district and health centre level.

## HAS THE QUALITY OF TB SERVICES IMPROVED?

Regarding the quality of TB services, information on some relevant indicators is presented in this section. Table 2.11 and Figure 2.9 show the growth in the number of cases notified from 1998 to 2005, and then leveling off through 2007. While the number of SS+ cases did not vary substantially from 1998 to 2007, the share of SS+ among all notified cases largely diminished since 2002 when more SS- and extrapulmonary cases started being detected. This trend is seen clearly in the rates of notified cases, by type of TB (Table 2.12 and Figure 2.10).

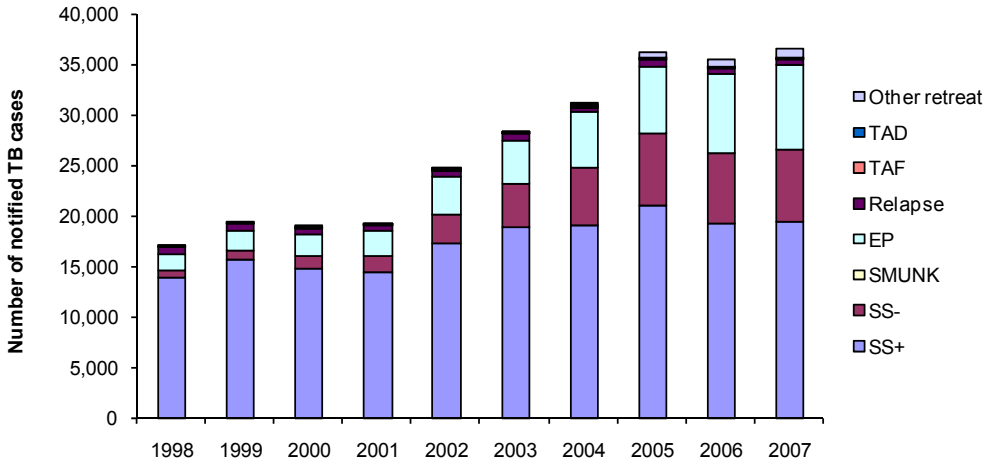
### CASE NOTIFICATION TRENDS

**Table 2.11: Number of notified TB cases by case types**

| No. TB case type | 1998 | 1999 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 2007 | |
|---|---|---|---|---|---|---|---|---|---|
| New | | | | | | | | | |
| SS+ | 13,865 | 15,744 | 14,822 | 14,361 | 17,258 | 18,923 | 18,978 | 21,001 | 19,294 | 19,421 |
| SS- | 705 | 725 | 1,108 | 1,658 | 2,852 | 4,307 | 5,800 | 7,057 | 6,875 | 7,120 |
| EP | 1,671 | 2,005 | 2,147 | 2,430 | 3,711 | 4,232 | 5,415 | 6,759 | 7,800 | 8,412 |
| Retreatment | | | | | | | | | | |
| (culture+ or/& ss+) | | | | | | | | | | |
| Relapse | 705 | 792 | 814 | 721 | 789 | 754 | 645 | 718 | 691 | 648 |
| Failure | 54 | 50 | 52 | 57 | 45 | 51 | 41 | 62 | 71 | 75 |
| Default | 93 | 55 | 64 | 56 | 35 | 28 | 29 | 46 | 26 | 20 |
| Other | 0 | 0 | 0 | 0 | 20 | 91 | 197 | 480 | 709 | 799 |
| Total all cases | 17,093 | 19,371 | 19,007 | 19,283 | 24,710 | 28,386 | 31,105 | 36,123 | 35,466 | 36,495 |

Source: Cambodia NTP

**Figure 2.9: Number of notified TB cases by case types**



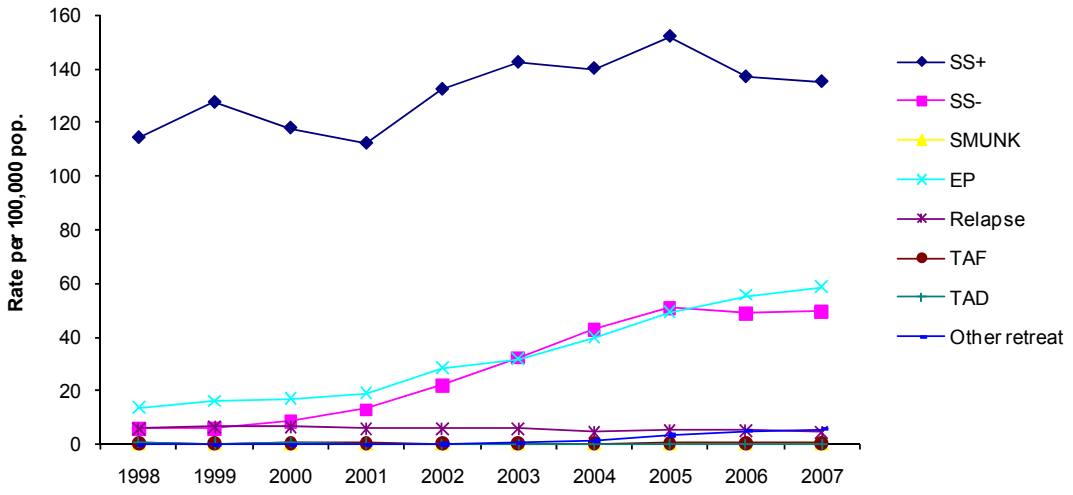

Source: Cambodia NTP

**Table 2.12: Rate of notified TB cases by case types (per 100,000 population)**

| TB case type per 100,000 pop | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| New | | | | | | | | | |
| SS+ | 114 | 127 | 118 | 112 | 132 | 142 | 140 | 152 | 137 | 135 |
| SS- | 6 | 6 | 9 | 13 | 22 | 32 | 43 | 51 | 49 | 50 |
| EP | 14 | 16 | 17 | 19 | 28 | 32 | 40 | 49 | 55 | 59 |
| Retreatment (culture+ or/& ss+) | | | | | | | | | | |
| Relapse | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 |
| Failure | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Default | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 5 | 6 |

Source: Cambodia NTP

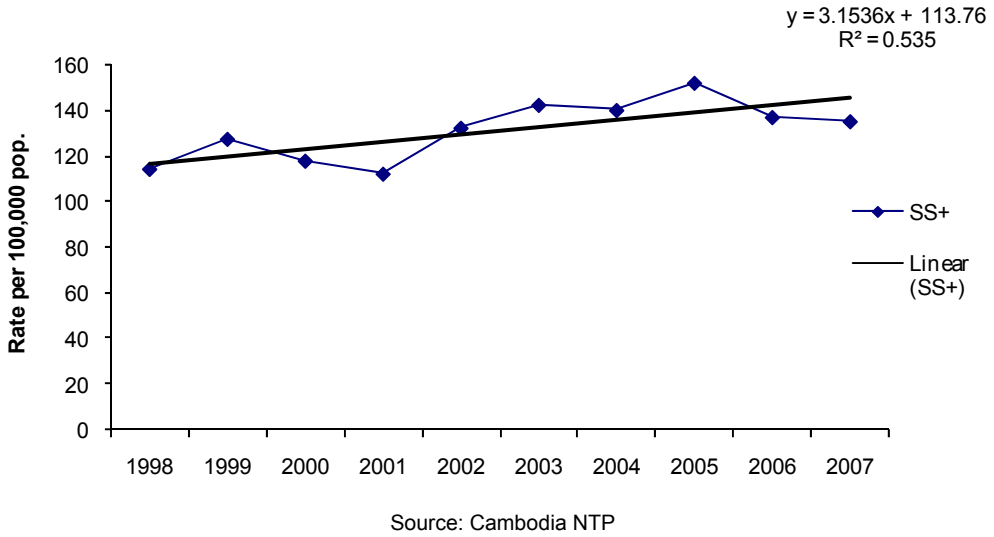
**Figure 2.10: Notification rate per 100,000 population of TB cases**




Source: Cambodia NTP

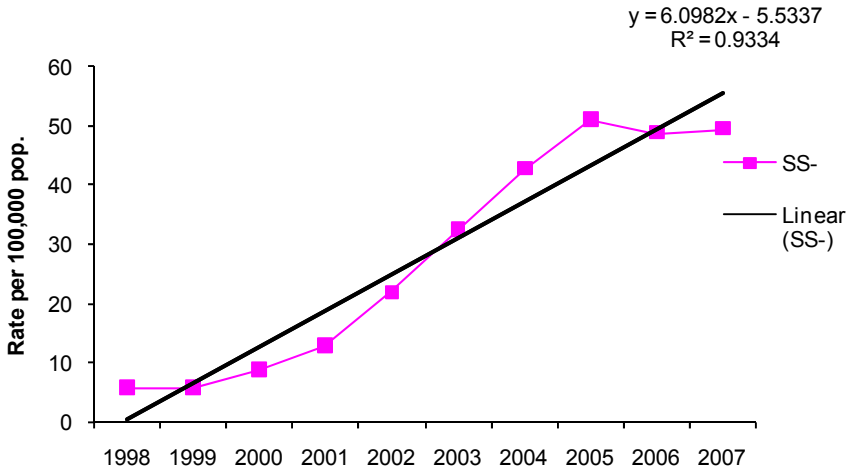
Figures 2.11, 2.12 and 2.13 show that for the period 1998-2007, there is an average of three additional smear-positive cases per 100,000 population, six additional smear-negative cases per 100,000 population, and five additional extra-pulmonary cases per 100,000 population.

**Figure 2.11: Rate per 100,000 population of new smear-positive TB**



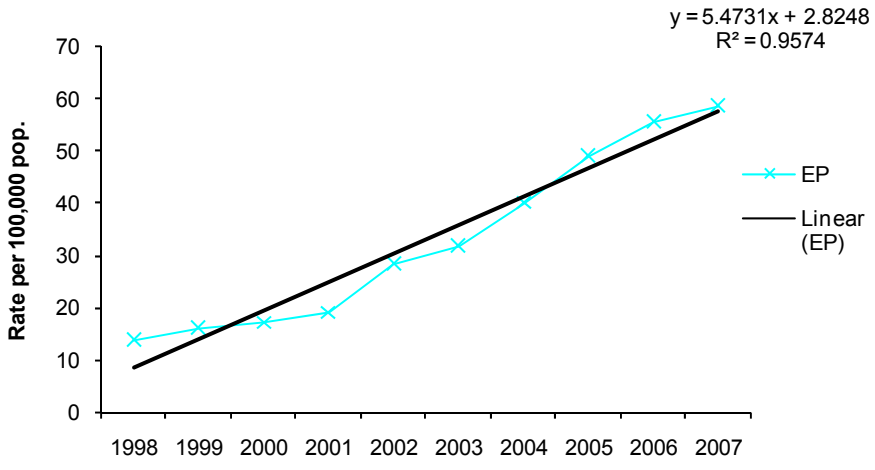

Source: Cambodia NTP

**Figure 2.12: Rate per 100,000 population of smear-negative TB**




Source: Cambodia NTP

**Figure 2.13: Rate per 100,000 population of extra-pulmonary TB**




Source: Cambodia NTP

The number of smear-negative and extra-pulmonary cases of TB have grown disproportionally more than the number of SS+ cases (Table 2.13). Possible reasons include improved capacity to diagnose SS- and extra pulmonary forms of TB, and progress in implementing TB/HIV collaborative activities which results in intensified TB case finding among HIV positive individuals-- who are more likely to have such types of TB other than SS+.

**Table 2.13: Annual change (& average change) of notified TB cases by case types**

| Annual change (%) e.g. change 2006-2007 = [ln(2007/2006)]*100 | 1998-1999 | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 |
|---|---|---|---|---|---|---|---|---|---|
| New | | | | | | | | | |
| SS+ | 13 | -6 | -3 | 18 | 9 | 0 | 10 | -8 | 1 |
| SS- | 3 | 42 | 40 | 54 | 41 | 30 | 20 | -3 | 4 |
| EP | 18 | 7 | 12 | 42 | 13 | 25 | 22 | 14 | 8 |
| Retreatment (culture+ or/& ss+) | | | | | | | | | |
| Relapse | 12 | 3 | -12 | 9 | -5 | -16 | 11 | -4 | -6 |
| Failure | -8 | 4 | 9 | -24 | 13 | -22 | 41 | 14 | 5 |
| Default | -53 | 15 | -13 | -47 | -22 | 4 | 46 | -57 | -26 |
| Other | | | | | 152 | 77 | 89 | 39 | 12 |

Source: Cambodia NTP

## DIAGNOSTIC TRENDS

Tables 2,14, 2.15 and 2.16 show that over time *more* suspects' sputum are being examined, and relatively *smaller* proportion of suspects and slides tested are resulting in ss+ cases. A plausible explanation is that the slight increase in ss+ case notifications could be due to better case detection, and not a worsening epidemic. Trends in TB notifications for other types of TB have also gone up, and at much faster rate (e.g. EP and ss-). This suggests that case detection efforts are also finding these types of TB cases.

**Table 2.14: Number of TB suspects examined for sputum, per 100,000 population**

| | 1998 | 1999 2000 | 2001 | 2002 | 2003 | 2004 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| # of TB suspects examined for sputum/100,000 pop | | | 414 | 601 | 795 | 889 | 1,003 | 984 | 1,030 |

Source: Cambodia NTP

**Table 2.15: Smear positivity: Number of new smear-positive cases, per TB suspect**

| | 1998 | 1999 2000 | 2001 2002 | 2003 | 2004 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| # SS+/# TB suspects | | | 0.27 | 0.22 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 |

Source: Cambodia NTP

**Table 2.16: Number of slides examined, per total number of SS+ cases**

| | 1998 | 1999 2000 | 2001 2002 | 2003 | 2004 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| # slides examined/ total SS+ cases | | | 11 | 13 | 16 | 19 | 19 | 21 | 22 |

Source: Cambodia NTP

## TREATMENT OUTCOMES

Regarding TB treatment outcomes, information on some relevant indicators is presented in Tables 2.17, 2.18 and 2.19.

**Table 2.17: Percentage of treatment cures among those who completed treatment**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| % cured (countrywide) | 92 | 91 | 88 | 89 | 89 | 90 | 90 | 89 | 90 |
| % completed treatment | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 3 |
| % cured among completed treatment | 97% | 97% | 96% | 97% | 97% | 97% | 97% | 96% | 97% |

Source: Cambodia NTP

**Table 2.18: Percentage of new SS+ cases registered for treatment, per total number of notified new SS+ cases**

| | 1998 | 1999 | 2000 2001 | 2002 | 2003 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| # of SS+ cases registered for treatment / # of notified SS+ cases*100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Source: Cambodia NTP

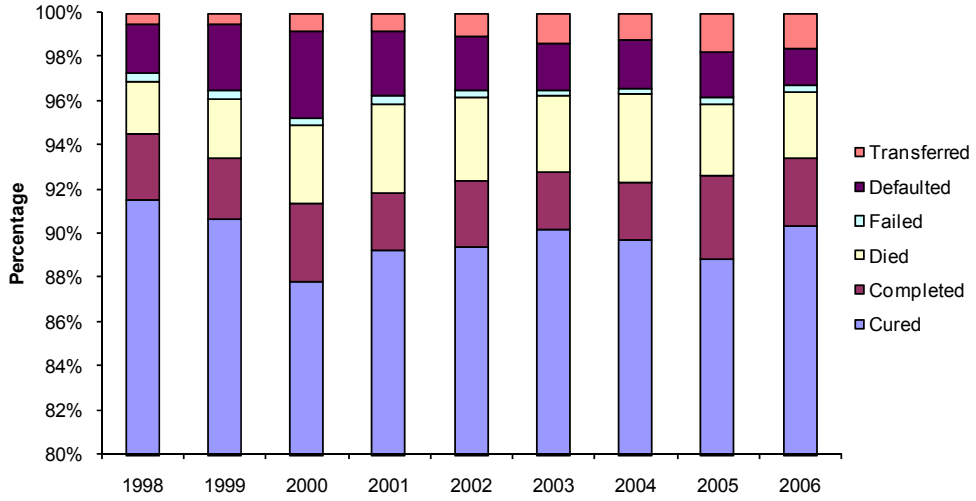
**Table 2.19: Number of each unfavorable new SS+ outcomes**

| Unfavorable outcomes | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Died | 311 | 411 | 528 | 578 | 661 | 665 | 765 | 684 | 583 | |
| Failure | 49 | 64 | 45 | 58 | 59 | 45 | 39 | 71 | 59 | |
| Default | 290 | 469 | 582 | 408 | 419 | 404 | 413 | 414 | 314 | |
| Transfer | 72 | 83 | 123 | 123 | 187 | 263 | 231 | 377 | 313 | |
| Non-evaluated | | | | | | | | | | |

Source: Cambodia NTP

The NTP has consistently maintained cure rate of over 88% and a success rate (including cure and completed treatment combined) of over 90% throughout the reporting period, surpassing national and global targets of 85% success rate (Figure 2.14). The proportion of TB patients with an unfavorable outcome has remained below 9% (Table 3), also better than the maximum acceptable level of 15%. The main reasons for patients with unfavorable outcomes is due to patients defaulting from treatment, or dying, rather than failure of treatment or transfer of patients.

**Figure 2.14: Treatment outcomes**




## 2.4 STUDY QUESTION 3: HAS THE INCIDENCE, PREVALENCE, MORBIDITY, AND MORTALITY RELATED TO TUBERCULOSIS CHANGED? [OUTCOME/IMPACT INDICATORS]

### TUBERCULOSIS INCIDENCE

Regarding the tuberculosis incidence, the estimated incidence of tuberculosis in Cambodia is:

- Incidence of Tuberculosis (all cases/100,000 pop./yr) is going down from 539 per 100,000 population in 1997 (JAMA) to the level of 500 per 100,000 population in 2006 (WHO report 2008).
- Incidence of Tuberculosis (ss+/100,000 pop./yr) is going down from 241 per 100,000 population in 1997 (JAMA) to the level of 220 per 100,000 population in 2006 (WHO report 2008).

(Sex and age distribution of new ss+ cases in absolute numbers and rates per 100,000 population is in Annex 2.3.)

Figure 2.15 shows an average rate of 139 male notifications and 124 female notifications for 1998-2007, both increasing slightly over time. The male female notification ratio is on average 105 male notifications to every 100 female notifications. This is to be expected since in Cambodia, as in most countries, males are usually higher risk for TB infection than women.

**Figure 2.15: Ratio of new smear-positive TB cases, male vs female (rate)**


Figure 2.16 shows that peak age for ss+ *rate* is 55-64 years for both sexes. However, for women the peak drops off after 64 years, for men it remains stable for 64+ years. In absolute numbers (Figure 2.17), men peak earlier than women-- the largest share of infected men are those in age group 35-44, while for women it is 45-54.

**Figure 2.16: Peak rate of smear-positive TB cases, by sex, 1998-2007**

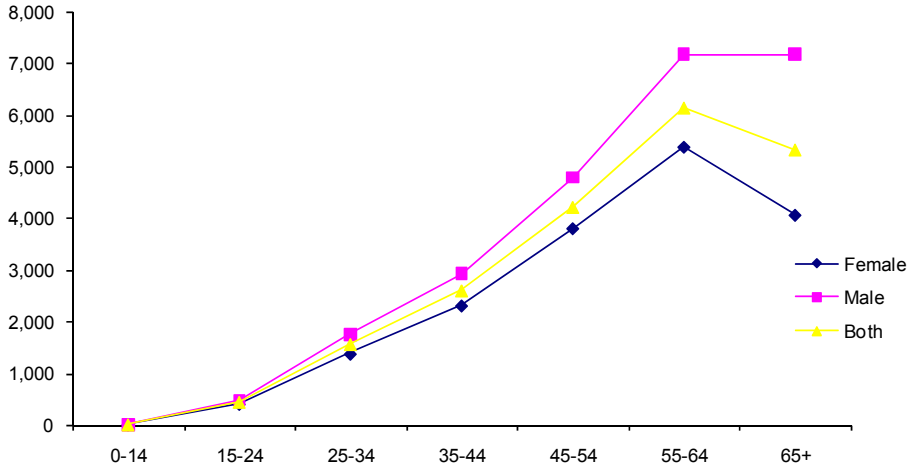
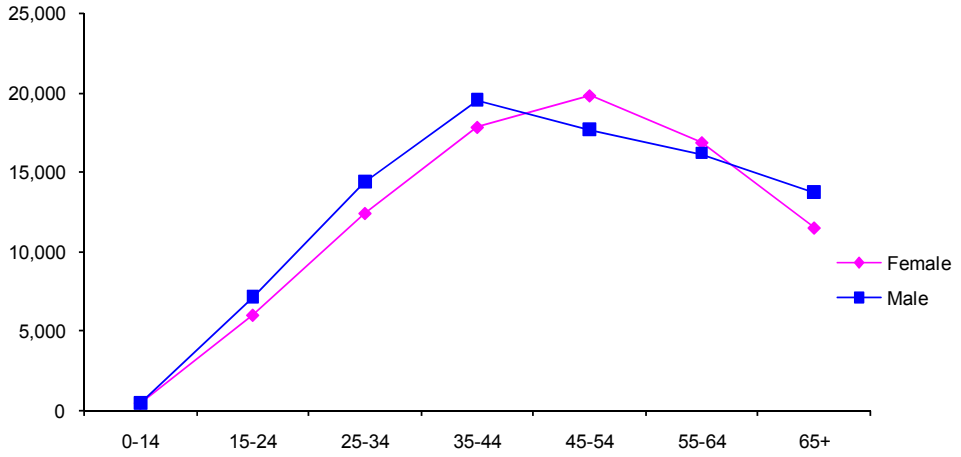


**Figure 2.17: Peak number of SS+, by sex, 1998-2007**




Figures 2.18 and 2.19 compare peak ages for men and women over time. The peak age group in both sexes has not changed over the years. In absolute numbers, women peak at 45-54 then drop off; men peak at earlier age and remain elevated.

**Figure 2.18: Women peak age for ss+ over time**

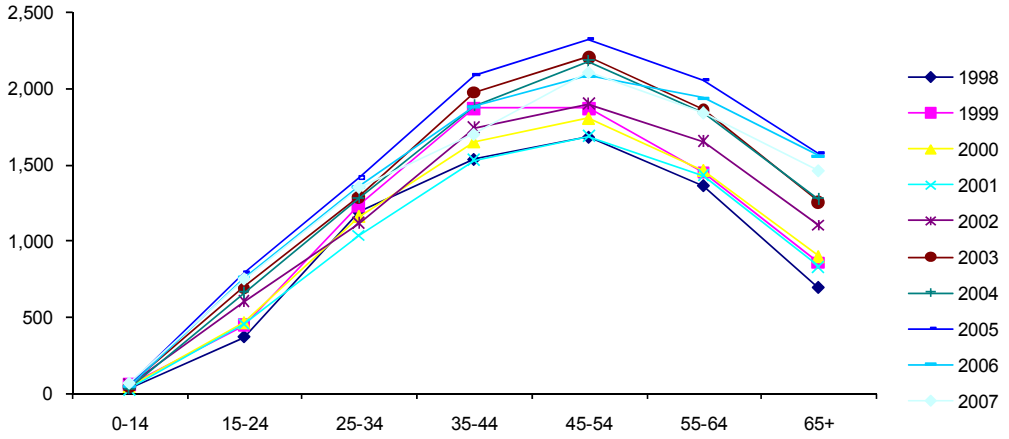
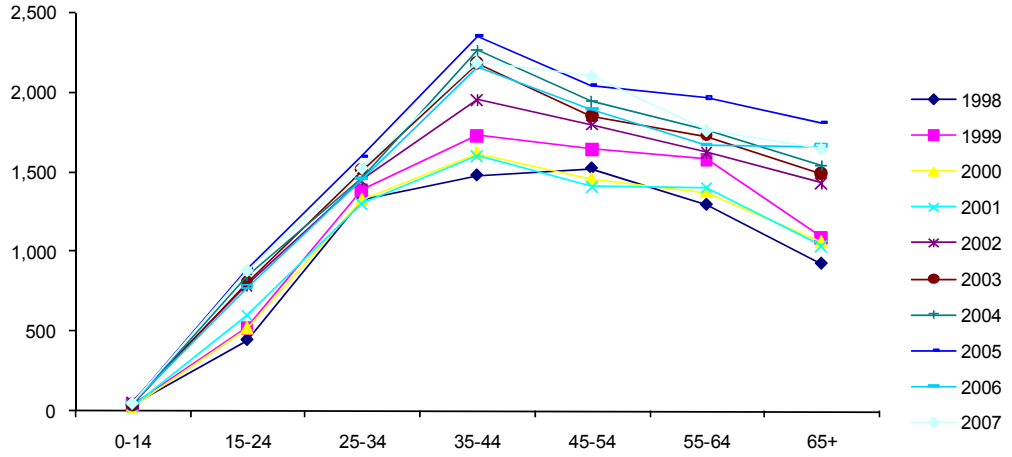


**Figure 2.19: Men peak age for ss+ over time**




## TUBERCULOSIS PREVALENCE

The tables below present the main findings from the National TB Prevalence Survey conducted in 2002.

### TABLES OF MAIN FINDINGS

**Participation rate by age and sex**

| | Number Participa | | tion rate | | |
|---|---|---|---|---|---|
| **Age group** | **Eligible participated** | | **Total** | **Male** | **Female** |
| 0-9 | 7,966 | 7,872 | 98.8% | 98.8% | 98.8% |
| 10-14 | 4,598 | 4,519 | 98.3% | 98.0% | 98.6% |
| 15-24 | 6,439 | 6,055 | 94.0% | 93.5% | 94.6% |
| 25-35 | 3,808 | 3,645 | 95.7% | 94.4% | 96.8% |
| 35-44 | 3,323 | 3,201 | 96.3% | 94.8% | 97.5% |
| 45-54 | 2,276 | 2,199 | 96.6% | 96.2% | 96.9% |
| 55-64 | 1,359 | 1,312 | 96.5% | 95.1% | 97.6% |
| 65+ | 1,281 | 1,229 | 95.9% | 95.7% | 96.1% |
| All ages | 31,050 | 30,032 | 96.7% | 96.2% | 97.2% |
| Age ≥ 10 | 23,084 | 22,160 | 96.0% | 95.2% | 96.7% |

**Estimated TB prevalence, Cambodia, 2002**

| | Rate (/100,000) | | |
|---|---|---|---|
| | Point estimate | 95% C.I. | No. of cases |
| (For population aged 10 or more) | | | |
| S (+) TB | 362 | 284-461 | 33,998 |
| S (-) C (+) TB | 846 | 675-1,059 | 79,450 |
| S (-) C (-) x-ray active TB suggestive** | 1,370 | 1,117–1,680 | 128,657 |
| Bacteriologically positive TB | 1,208 | 997-1,463 | 113,447 |
| Pulmonary active TB suggestive** | 2,579 | 2,205-3,013 | 242,095 |
| (For all ages*) | | | |
| S (+) TB | 269 | 211-343 | |

* Assuming that there was no smear-positive case in children aged less than 10
2002 population re-estimate from Cambodia Inter-Census Population Survey '03: 12,630,000
74.34% of eligible population was aged 10 or more in this prevalence survey: 9,389,000
** Including active TB suspected only by a single x-ray examination

**Results of BCG scar survey**

| | | BCG scar | | | | |
|---|---|---|---|---|---|---|
| Age group | Evaluated | No scar | Scar + | Total % | Boy % | Girl % |
| 1-4 | 2,827 | 1,001 | 1,826 | 64.6% | 65.0% | 64.2% |
| 5-9 | 4,470 | 2,273 | 2,197 | 49.1% | 51.3% | 46.9% |
| 10-14 | 4,469 | 2,588 | 1,881 | 42.1% | 44.3% | 40.4% |
| Total | 11,766 | 5,862 | 5,904 | 50.2% | 51.9% | 48.6% |

**Annual risk of TB infection by different methods**

| Cut | -off 10mm | | 16mm mirror | |
|---|---|---|---|---|
| Age group | Point estimate | 95% C.I. | Point estimate | 95% C.I. |
| 1-4 | 0.96% | 0.56-1.64 | 0.42% | 0.13-1.38 |
| 5-9 | 2.06% | 1.77-2.40 | 1.00% | 0.69-1.43 |
| 10-14 | 3.23% | 2.88-3.62 | 1.64% | 1.25-2.15 |

In summary, the prevalence of tuberculosis (smear-positive) in Cambodia is decreasing from 426 per 100,000 population in 1997 (JAMA) to the level of 269 per 100,000 population in 2002 (National TB Prevalence Survey 2002, Cambodia). Further details of the 2002 TB prevalence survey are attached in Annex 2.4.

The second national TB prevalence survey is planned for 2010. Findings of this survey will be important to observe the trends and document the impact of TB control efforts on the burden of Tuberculosis.

## OTHER STUDIES (HIV SERO-PREVALENCE SURVEY AMONG TB PATIENTS)

Since 2003, Cambodia has been conducting HIV sero-prevalence surveys among TB patients on a two-year basis in order to establish a baseline and to observe trends over time. These surveys have shown that the HIV incidence among new TB patients dropped from **11.8%** in 2003 to **9.9%** in 2005, and to **7.8%** in 2007. Further details of the surveys are attached in Annex 2.5.

## 2.5 OVERALL STUDY QUESTION: IS INCREASED TUBERCULOSIS FUNDING ASSOCIATED WITH A REDUCTION IN THE BURDEN OF DISEASE?

Although there was a lack of detailed information of overall funding for TB control before 2002, a significant increase in funding has been observed from 2002 (DOTS expansion period: late 2001 to 2004). The GFATM-TB Round 2 started in 2004.

The increase in funding for TB control has resulted in:

- An increase in the coverage of TB services, reaching 100 % DOTS coverage by 2004.
- An increase in TB case finding and maintain the high treatment success rate.

Finally, an increase in funding for TB control has helped the NTP to embark on new approaches to improve access to services, and to improve diagnostic capacity to detect ss- and EP forms of TB that are frequently associated with children and TB/HIV co-infected patients. Intensified activities made possible though increased funding can be associated with the reduction of prevalence and incidence of tuberculosis (as described in the incidence and prevalence sections); sustained funding enables the maintenance of existing DOTS facilities, scaling-up of related activities, and can be expected to contribute to a further reduction in the burden of disease.

To ensure equitable detection, coverage and treatment, more efforts will be needed to detect and treat TB among older population, increase the uptake for HIV testing among TB patients and initiate appropriate prophylaxis or treatment.

# ANNEX 2.1: COMPLETENESS AND TIMELINESS OF TB REPORTING

## COMPLETENESS OF TB REPORTING OVER TIME

**Percentage of expected quarterly report received by all BMUs [country, year]**

| Reporting periods | *Completeness:* Percentage of BMUs reporting per quarter | Total number of BMUs expected to report |
|---|---|---|
| 2007 | 100 | 77 |
| 2006 | 100 | 76 |
| 2005 | 100 | 76 |
| 2004 | 100 | 74 |
| 2003 | 100 | 73 |
| 2002 | 100 | 73 |
| 2001 | 100 | 24 |
| 2000 | 100 | 23 |
| 1999 | 100 | 23 |
| 1998 | 100 | 21 |

Source: Cambodia NTP

## COMPLETENESS OF TB REPORTING ACROSS REGION

**Percentage of expected quarterly reports received, by region [Cambodia, 2007]**

| Region/province | *Completeness:* Percentage of all expected quarterly reports | Total number of expected quarterly reports |
|---|---|---|
| Kandal | 100 | 32 |
| Svay Rieng | 100 | 12 |
| Phnom Penh | 100 | 16 |
| Pursat | 100 | 8 |
| Battambang | 100 | 20 |
| Pailin | 100 | 4 |
| Bantey Meanchey | 100 | 16 |
| Siem Reap | 100 | 16 |
| Odor Meanchey | 100 | 4 |
| Kompong. Thom | 100 | 12 |
| Takeo | 100 | 20 |
| Kompong Speu | 100 | 12 |
| Kampot | 100 | 16 |
| Kep | 100 | 4 |
| Kompong Som | 100 | 4 |
| Koh Kong | 100 | 8 |
| Prey Veng | 100 | 28 |
| Kompong Chhnang | 100 | 12 |
| Kratie | 100 | 8 |
| Kompong Cham | 100 | 40 |
| Stung Steng | 100 | 4 |
| Preah Vihear | 100 | 4 |
| Modulkiri | 100 | 4 |
| Ratanakiri | 100 | 4 |
| **Overall 100** | | **308** |

Source: Cambodia NTP

## TIMELINESS OF TB REPORTING

**Percentage of BMUs reporting timely case registrations and timely treatment outcomes, by region [country, year]**

| Region/province | Percent of BMUs in region reporting TB case registrations Q4 2007 | Percent of BMUs in region reporting treatment outcomes Q1 2007 | Number of case registration reports expected Q4 2007 | Number of case treatment outcome reports expected Q1 2007 |
|---|---|---|---|---|
| Kandal | 100 | 100 | 8 | 8 |
| Svay Rieng | 100 | 100 | 3 | 3 |
| Phnom Penh | 100 | 100 | 4 | 4 |
| Pursat | 100 | 100 | 2 | 2 |
| Battambang | 92 | 92 | 5 | 5 |
| Pailin | 100 | 100 | 1 | 1 |
| Bantey Meanchey | 100 | 100 | 4 | 4 |
| Siem Reap | 100 | 100 | 4 | 4 |
| Odor Meanchey | 100 | 100 | 1 | 1 |
| Kompong. Thom | 100 | 100 | 3 | 3 |
| Takeo | 100 | 100 | 5 | 5 |
| Kompong Speu | 100 | 100 | 3 | 3 |
| Kampot | 100 | 100 | 4 | 4 |
| Kep | 100 | 100 | 1 | 1 |
| Kompong Som | 100 | 100 | 1 | 1 |
| Koh Kong | 100 | 100 | 2 | 2 |
| Prey Veng | 100 | 100 | 7 | 7 |
| Kompong Chhnang | 100 | 100 | 3 | 2 |
| Kratie | 100 | 100 | 2 | 2 |
| Kompong Cham | 100 | 100 | 10 | 10 |
| Stung Steng | 92 | 92 | 1 | 1 |
| Preah Vihear | 92 | 92 | 1 | 1 |
| Modulkiri | 92 | 92 | 1 | 1 |
| Ratanakiri | 92 | 92 | 1 | 1 |

Source: Cambodia NTP

# ANNEX 2.2: COMPARISON OF TREATMENT OUTCOMES FOR THE COHORT OF NEW SMEAR-POSITIVE TB CASES

**WHO**

| Treatment outcomes | 1998 | 1999 2000 | | 2001 2002 | | 2003 2004 | 2005 | |
|---|---|---|---|---|---|---|---|---|
| New S(+) reg. for treatment | 13,290 | 15,744 | 14,775 | 14,277 | 17,396 | 18,923 | 18,978 | 21,001 |
| Cured | 12,166 | 14,278 | 12,974 | 12,746 | 15,551 | 17,226 | 16,875 | 18,643 |
| Completed | 402 | 433 | 523 | 364 | 519 | 495 | 484 | 785 |
| Died | 311 | 411 | 528 | 578 | 661 | 665 | 765 | 684 |
| Failed | 49 | 64 | 45 | 58 | 59 | 45 | 39 | 71 |
| Defaulted | 290 | 472 | 582 | 408 | 419 | 404 | 429 | 415 |
| Transferred | 72 | 83 | 123 | 123 | 187 | 263 | 386 | 378 |

**GF**

| Treatment outcomes 1998 | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| New S(+) reg. for treatment | 13,287 | 15,700 | 14,775 | 14,277 | 17,258 | 18,923 | 18,978 | 21,001 |
| Cured | 12,164 | 14,236 | 12,974 | 12,746 | 15,551 | 17,226 | 16,875 | 18,591 |
| Completed | 401 | 437 | 523 | 364 | 519 | 495 | 484 | 782 |
| Died | 311 | 411 | 528 | 578 | 661 | 665 | 765 | 684 |
| Failed | 49 | 64 | 45 | 58 | 59 | 45 | 39 | 71 |
| Defaulted | 290 | 469 | 582 | 408 | 419 | 404 | 413 | 414 |
| Transferred | 72 | 83 | 123 | 123 | 187 | 263 | 231 | 377 |

# ANNEX 2.3: SEX AND AGE DISTRIBUTION OF NEW SS+ CASES IN ABSOLUTE NUMBERS AND RATES PER 100,000 POPULATION

**Sex and age distribution of new ss+ cases in absolute numbers**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| **No. new SS+** | | | | | **Female** | | | | | |
| 0-14 | 29 | 51 | 38 | 25 | 54 | 46 | 28 | 45 | 43 | 64 |
| 15-24 | 367 | 443 | 457 | 455 | 600 | 691 | 658 | 790 | 760 | 749 |
| 25-34 | 1,184 | 1,227 | 1,157 | 1,033 | 1,114 | 1,287 | 1,276 | 1,413 | 1,354 | 1,351 |
| 35-44 | 1,531 | 1,863 | 1,647 | 1,526 | 1,737 | 1,975 | 1,882 | 2,089 | 1,882 | 1,698 |
| 45-54 | 1,677 | 1,867 | 1,801 | 1,687 | 1,898 | 2,208 | 2,176 | 2,323 | 2,079 | 2,105 |
| 55-64 | 1,359 | 1,445 | 1,459 | 1,428 | 1,650 | 1,857 | 1,836 | 2,058 | 1,933 | 1,839 |
| 65+ | 691 | 852 | 892 | 829 | 1,100 | 1,256 | 1,270 | 1,573 | 1,556 | 1,459 |
| **Total female** | **6,838** | **7,748** | **7,451** | **6,983** | **8,153** | **9,320** | **9,126** | **10,291** | **9,607** | **9,265** |
| **No. new SS+** | | | | | **Male** | | | | | |
| 0-14 | 36 | 41 | 26 | 29 | 54 | 37 | 36 | 49 | 51 | 50 |
| 15-24 | 446 | 525 | 519 | 600 | 791 | 805 | 850 | 894 | 780 | 883 |
| 25-34 | 1,330 | 1,389 | 1,323 | 1,302 | 1,449 | 1,514 | 1,466 | 1,600 | 1,462 | 1,526 |
| 35-44 | 1,477 | 1,732 | 1,616 | 1,601 | 1,956 | 2,183 | 2,261 | 2,349 | 2,162 | 2,190 |
| 45-54 | 1,521 | 1,645 | 1,455 | 1,406 | 1,799 | 1,848 | 1,942 | 2,043 | 1,895 | 2,102 |
| 55-64 | 1,293 | 1,578 | 1,374 | 1,403 | 1,624 | 1,729 | 1,759 | 1,964 | 1,671 | 1,761 |
| 65+ | 924 | 1,089 | 1,058 | 1,037 | 1,432 | 1,487 | 1,538 | 1,811 | 1,666 | 1,644 |
| **Total male** | **7,027** | **7,999** | **7,371** | **7,378** | **9,105** | **9,603** | **9,852** | **10,710** | **9,687** | **10,156** |
| **No. new SS+** | | | | | **Both** | | | | | |
| 0-14 | 65 | 92 | 64 | 54 | 108 | 83 | 64 | 94 | 94 | 114 |
| 15-24 | 813 | 968 | 976 | 1,055 | 1,391 | 1,496 | 1,508 | 1,684 | 1,540 | 1,632 |
| 25-34 | 2,514 | 2,616 | 2,480 | 2,335 | 2,563 | 2,801 | 2,742 | 3,013 | 2,816 | 2,877 |
| 35-44 | 3,008 | 3,595 | 3,263 | 3,127 | 3,693 | 4,158 | 4,143 | 4,438 | 4,044 | 3,888 |
| 45-54 | 3,198 | 3,512 | 3,256 | 3,093 | 3,697 | 4,056 | 4,118 | 4,366 | 3,974 | 4,207 |
| 55-64 | 2,652 | 3,023 | 2,833 | 2,831 | 3,274 | 3,586 | 3,595 | 4,022 | 3,604 | 3,600 |
| 65+ | 1,615 | 1,941 | 1,950 | 1,866 | 2,532 | 2,743 | 2,808 | 3,384 | 3,222 | 3,103 |
| **Total both** | **13,865** | **15,747** | | **14,822** | **14,361** | **17,258** | **18,923** | **18,978** | **21,001** | **19,294** | **19421** |

**Sex and age distribution of new ss+ cases in rate per 100,000 population**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Rates per 100,000 pop** | | | | | **Female** | | | | | |
| 0-14 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 |
| 15-24 | 33 | 38 | 36 | 34 | 42 | 46 | 42 | 50 | 47 | 46 |
| 25-34 | 132 | 138 | 132 | 120 | 131 | 150 | 146 | 157 | 143 | 135 |
| 35-44 | 224 | 264 | 227 | 205 | 228 | 253 | 235 | 255 | 225 | 200 |
| 45-54 | 389 | 415 | 384 | 345 | 373 | 416 | 394 | 405 | 349 | 340 |
| 55-64 | 500 | 520 | 512 | 488 | 547 | 595 | 566 | 610 | 548 | 499 |
| 65+ | 292 | 347 | 351 | 315 | 404 | 447 | 437 | 523 | 500 | 453 |
| **Total female** | **109** | **121** | | **115** | **106** | **121** | **136** | **131** | **145** | **133** | **125** |
| **Rates per 100,000 pop** | | | | | **Male** | | | | | |
| 0-14 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| 15-24 | 43 | 46 | 42 | 45 | 55 | 53 | 54 | 55 | 47 | 52 |
| 25-34 | 163 | 172 | 166 | 167 | 188 | 195 | 185 | 195 | 169 | 166 |
| 35-44 | 275 | 304 | 269 | 254 | 297 | 319 | 319 | 321 | 289 | 288 |
| 45-54 | 483 | 510 | 442 | 417 | 518 | 510 | 509 | 504 | 439 | 457 |
| 55-64 | 642 | 769 | 658 | 658 | 744 | 770 | 759 | 817 | 670 | 682 |
| 65+ | 549 | 630 | 598 | 572 | 772 | 782 | 788 | 903 | 808 | 775 |
| **Total male** | **120** | **134** | | **121** | **119** | **144** | **149** | **150** | **160** | **142** | **146** |
| **Rates per 100,000 pop** | | | | | **Both** | | | | | |
| 0-14 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 |
| 15-24 | 38 | 42 | 39 | 39 | 49 | 50 | 48 | 52 | 47 | 49 |
| 25-34 | 147 | 154 | 149 | 142 | 158 | 172 | 165 | 175 | 156 | 150 |
| 35-44 | 246 | 282 | 246 | 228 | 260 | 284 | 275 | 286 | 255 | 242 |
| 45-54 | 429 | 455 | 408 | 375 | 432 | 454 | 441 | 446 | 387 | 390 |
| 55-64 | 561 | 626 | 574 | 560 | 630 | 668 | 647 | 696 | 599 | 574 |
| 65+ | 399 | 464 | 452 | 420 | 553 | 582 | 578 | 675 | 622 | 581 |
| **Total both** | **114** | **127** | | **118** | **112** | **132** | **142** | **140** | **152** | **137** | **135** |

**Age-sex distribution of new ss+ cases, change in rate**

| | 1998-1999 | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 |
|---|---|---|---|---|---|---|---|---|---|
| **No. new SS+** | | | | | **Female** | | | | |
| 0-14 | 56 | -29 | -42 | 77 | -16 | -50 | 47 | -5 | 40 |
| 15-24 | 19 | 3 | 0 | 28 | 14 | -5 | 18 | -4 | -1 |
| 25-34 | 4 | -6 | -11 | 8 | 14 | -1 | 10 | -4 | 0 |
| 35-44 | 20 | -12 | -8 | 13 | 13 | -5 | 10 | -10 | -10 |
| 45-54 | 11 | -4 | -7 | 12 | 15 | -1 | 7 | -11 | 1 |
| 55-64 | 6 | 1 | -2 | 14 | 12 | -1 | 11 | -6 | -5 |
| 65+ | 21 | 5 | -7 | 28 | 13 | 1 | 21 | -1 | -6 |
| **Total female** | **12** | **-4** | **-6** | **15** | **13** | **-2** | **12** | **-7** | **-4** |
| **No. new SS+** | | | | | **Male** | | | | |
| 0-14 | 13 | -46 | 11 | 62 | -38 | -3 | 31 | 4 | -2 |
| 15-24 | 16 | -1 | 15 | 28 | 2 | 5 | 5 | -14 | 12 |
| 25-34 | 4 | -5 | -2 | 11 | 4 | -3 | 9 | -9 | 4 |
| 35-44 | 16 | -7 | -1 | 20 | 11 | 4 | 4 | -8 | 1 |
| 45-54 | 8 | -12 | -3 | 25 | 3 | 5 | 5 | -8 | 10 |
| 55-64 | 20 | -14 | 2 | 15 | 6 | 2 | 11 | -16 | 5 |
| 65+ | 16 | -3 | -2 | 32 | 4 | 3 | 16 | -8 | -1 |
| **Total male** | **13** | **-8** | **0** | **21 5 3** | | | **8** | **-10** | **5** |
| **No. new SS+** | | | | | **Both** | | | | |
| 0-14 | 35 | -36 | -17 | 69 | -26 | -26 | 38 | 0 | 19 |
| 15-24 | 17 | 1 | 8 | 28 | 7 | 1 | 11 | -9 | 6 |
| 25-34 | 4 | -5 | -6 | 9 | 9 | -2 | 9 | -7 | 2 |
| 35-44 | 18 | -10 | -4 | 17 | 12 | 0 | 7 | -9 | -4 |
| 45-54 | 9 | -8 | -5 | 18 | 9 | 2 | 6 | -9 | 6 |
| 55-64 | 13 | -6 | 0 | 15 | 9 | 0 | 11 | -11 | 0 |
| 65+ | 18 | 0 | -4 | 31 | 8 | 2 | 19 | -5 | -4 |
| **Total both** | **13** | **-6** | **-3** | **18 9 0** | | | **10** | **-8** | **1** |

## ANNEX 2.4: NATIONAL TB PREVALENCE SURVEY 2002

With regard to the Tuberculosis Prevalence, the Cambodia NTP would like to provide the summary results of the National TB Prevalence Survey conducted in 2002 as follows:

The National TB Program of the National Center for Tuberculosis and Leprosy Control (CENAT), Cambodia, successfully conducted the 1st National TB Prevalence Survey in 2002. 97% of the population was covered by the survey except for four remote and population scattered provinces due to logistical difficulties. A high participation rate of 96.7% was achieved: 30,032 out of 31,050 eligible subjects in 42 clusters across the country participated in the study.

An interview by a physician or a medical assistant and an X-ray examination were given to each study subject aged 10 or more to identify TB suspects for sputum examination. Out of 22,160 study participants aged 10 or more, 3,301 were examined for sputum. 81 smear positive and 191 smear negative / culture positive pulmonary TB cases were detected.

Weighed prevalence rates of the population aged 10 or more were 362 (95% C.I.: 284-461) for smear positive and 846 (675-1059) for smear negative/culture positive per 100,000 respectively. If we assume that we can neglect smear positive cases among children aged less than 10, a prevalence rate of smear positive TB becomes 269 per 100,000 populations. Around 34,000 smear positive TB patients, more than 110,000 bacteriologically positive TB patients, lived in Cambodia at the survey time in 2002. While the prevalence rate of smear positive TB was lower than expected, the prevalence rate of smear negative/culture positive TB was much higher than expected. However, no-MDR TB strain was isolated from the survey subjects.

Although 60% of smear positive cases belonged to adults aged between 15 and 54, the older age groups occupied a significant portion of the prevalence. The older the age group is, the higher the prevalence rate is. A smear positive prevalence rate in the age group 65 or more was as high as 1,512 per 100,000. The prevalence rate in male was 2.5 times higher than that in female. Areas with better access to DOTS facilities such as Phnom Penh, provincial capital towns and villages within 5 km from the DOTS centers tended to have lower prevalence rates of smear positive TB.

According to the interview, 6.8% of the study participants aged 10 or more experienced cough for 3 weeks or more in the past one month. The prevalence rate of chronic cough increased as age increased. When we define TB suspects as those who had "cough for 3 weeks or more" and/or "blood contained sputum", 7.3% fell in the category of TB suspects by symptom screening. However, out of 81 smear positive TB cases, only 50 or 62%, belonged to the category of TB suspects. For bacteriological positive cases including smear negative/culture positive, only 39.1% were screened by the interview. The X-ray examination could detect all bacteriologically positive cases except for a few smear negative culture positive subjects.

Children less than 15 year old received a BCG scar check and a tuberculin test. A BCG scar was observed in 50.2% of children aged between 1 and 14. The BCG scar rate among children aged 1-4 was as low as 64.6% with no sex and geographical differences. This figure was consistent with the government estimation of the vaccination coverage. When we applied the cut-off point of 10 mm as tuberculin reaction, 2.7% of children were infected with TB by age 2.8, 13.7% by age 7.2, and 32.7% by age 12.. The annual risk of TB infection in the age group between 5 and 9 was estimated at 2.06%.

Despite the fact that the numbers of case notifications in male and female have been almost at the same level in Cambodia, the survey saw a considerable difference in the prevalence between male and female. The Prevalence/Notification ratios were relatively constant across all age groups in both sexes. However, male always showed higher ratios than female in every age group. Since there was no difference in delays of diagnosis between male and female, the case detection rate in male might be much lower than that in female.

As the TB prevalence rate increases along the age, it was suggested that, at present, a significant portion of TB diseases in Cambodia are developed from latent infection and reactivation, not from new infections.

Using other available information and some additional studies on TB and HIV in Cambodia, the incidence of TB was estimated. The point estimate of incidence of new smear positive TB was 229/100,000, which was very close to the WHO's recent estimation. The incidence of all forms of TB was estimated approximately at 600/100,000. HIV/AIDS attributed around 13% of incidence of smear positive. However, since the prevalence of smear negative and culture positive TB was much higher than expected, and since we might have more TB cases than expected among children, the total TB burden, or an incidence rate of all TB, could be as high as 700/100,000.

Compared with the past studies from the 1980s and 1990s, the observed prevalence rate of smear positive was much lower in this study, especially in the younger adult population. The better access to DOTS shortened a delay of diagnosis and cut the infection chain. The exerted efforts of expanding DOTS in the past 8 years seemed to have made a significant impact on the TB burden. However, a large pool of latent infection in the middle and elder generations and the impact of HIV/AIDS account for the high TB incidence in Cambodia. As a result, the country still remains a high TB burden country.

The below tables are the main finding from the above National TB Prevalence Survey

## TABLES OF MAIN FINDINGS

**Participation rate by age and sex**

| | Number Participa | | tion rate | |
|---|---|---|---|---|
| Age group | Eligible participated | Total | Male | Female |
| 0-9 | 7,966 | 7,872 | 98.8% | 98.8% | 98.8% |
| 10-14 | 4,598 | 4,519 | 98.3% | 98.0% | 98.6% |
| 15-24 | 6,439 | 6,055 | 94.0% | 93.5% | 94.6% |
| 25-35 | 3,808 | 3,645 | 95.7% | 94.4% | 96.8% |
| 35-44 | 3,323 | 3,201 | 96.3% | 94.8% | 97.5% |
| 45-54 | 2,276 | 2,199 | 96.6% | 96.2% | 96.9% |
| 55-64 | 1,359 | 1,312 | 96.5% | 95.1% | 97.6% |
| 65+ | 1,281 | 1,229 | 95.9% | 95.7% | 96.1% |
| All ages | 31,050 | 30,032 | 96.7% | 96.2% | 97.2% |
| Age ≥ 10 | 23,084 | 22,160 | 96.0% | 95.2% | 96.7% |

**Estimated TB prevalence, Cambodia, 2002**

| | Rate (/100,000) | | |
|---|---|---|---|
| | Point estimate | 95% C.I. | No. of cases |
| (For population aged 10 or more) | | | |
| S (+) TB | 362 | 284-461 | 33,998 |
| S (-) C (+) TB | 846 | 675-1,059 | 79,450 |
| S (-) C (-) x-ray active TB suggestive** | 1,370 | 1,117–1,680 | 128,657 |
| Bacteriologically positive TB | 1,208 | 997-1,463 | 113,447 |
| Pulmonary active TB suggestive** | 2,579 | 2,205-3,013 | 242,095 |
| (For all ages*) | | | |
| S (+) TB | 269 | 211-343 | |

* Assuming that there was no smear-positive case in children aged less than 10
2002 population re-estimate from Cambodia Inter-Census Population Survey '03: 12,630,000
74.34% of eligible population was aged 10 or more in this prevalence survey: 9,389,000
** Including active TB suspected only by a single x-ray examination

**Results of BCG scar survey**

| | | BCG scar | | | | |
|---|---|---|---|---|---|---|
| Age group | Evaluated | No scar | Scar + | Total % | Boy % | Girl % |
| 1-4 | 2,827 | 1,001 | 1,826 | 64.6% | 65.0% | 64.2% |
| 5-9 | 4,470 | 2,273 | 2,197 | 49.1% | 51.3% | 46.9% |
| 10-14 | 4,469 | 2,588 | 1,881 | 42.1% | 44.3% | 40.4% |
| Total | 11,766 | 5,862 | 5,904 | 50.2% | 51.9% | 48.6% |

**Annual risk of TB infection by different methods**

| Cut | -off 10mm | | 16mm mirror | |
|---|---|---|---|---|
| Age group | Point estimate | 95% C.I. | Point estimate | 95% C.I. |
| 1-4 | 0.96% | 0.56-1.64 | 0.42% | 0.13-1.38 |
| 5-9 | 2.06% | 1.77-2.40 | 1.00% | 0.69-1.43 |
| 10-14 | 3.23% | 2.88-3.62 | 1.64% | 1.25-2.15 |

In summary, the prevalence of tuberculosis (smear-positive) in Cambodia is decreasing from 426 per 100,000 population in 1997 (JAMA) to the level of 269 per 100,000 population in 2002 (National TB Prevalence Survey 2002, Cambodia).

# ANNEX 2.5: REPORT OF HIV SEROPREVALENCE SURVEY AMONG TB PATIENTS IN 2007

## BACKGROUND

Cambodia has been still struggling with the highest burden of TB and HIV epidemic in the South East Asia. The first HIV prevalence population surveys among TB patients were conducted in 2003 as a complement of National Tuberculosis Prevalence Survey by Cambodian National Tuberculosis Control Program (NTP). The 2nd HIV prevalence population survey among TB patients was conducted in 2005 in order to monitor the trend of HIV epidemic among TB patients by comparing the results to those in 2003.

In the population survey, the HIV prevalence among all TB patients and new smear positive pulmonary TB were 11.8 % and 8.2 % in 2003, 9.9% and 9.7% in 2005, respectively. In Phnom Penh, the capital city of Cambodia, the figures were 34.3 % and 22.7% in 2003, 26.0% and 26.5%, respectively.

Thus, HIV seroprevalence population survey of the TB patients in 2003 and 2005 provided vital information for TB/HIV control in Cambodia. However, the situation concerning TB/HIV is constantly changing: for example, in 2001 the free antiretroviral treatment was introduced to some HIV patients and the ambulatory DOTS is being continuously expanded to rural areas since that year.

In order to grasp the trend of the epidemic and also to gain the assessment of the current intervention, the periodic surveys are quite useful. WHO recommends periodic surveys as a well-established surveillance method for resource poor countries with undeveloped surveillance systems.

## OBJECTIVES

- To determine HIV prevalence rate among confirmed TB patients (both smear positive pulmonary TB and other forms of TB)
- To complement the National TB Prevalence survey results by assessing the impact of the HIV epidemic on the TB situation
- To monitor the trend of the HIV epidemic by comparing the results with those in year 2003 and 2005 and assess the effectiveness of the TB/HIV control strategies

## METHODOLOGY

This study is anonymous unlinked cross-sectional survey within the period of one month (1st Nov–30th Nov, 2007).

Eligible criteria for enrollment of study are all TB patients newly diagnosed and registered to the NTP in Nov 2007 will be contacted as eligible persons.

All TB facilities under the NTP will be involved in the study:

- Newly registered TB patients including the Re-treatment case during November 2007
- Any forms of TB (smear positive and negative pulmonary TB, and extra-pulmonary TB) regardless of diagnostic means
- Any age and any nationality
- TB patients with both known and unknown HIV status

Exclusion criteria are TB patients who are transferred in from other operational district (OD) will be excluded from this surveillance.

## LABORATORY PROCEDURES

**HIV Testing:** The HIV testing strategy of the surveillance in the population with an HIV prevalence less that 10% recommended by UNAIDS and WHO will be applied. The first test should have as high sensitivity as possible. It is ideal to have a more sensitive test to detect all positives. The first test will be performed using immunochromatography: ICA (Determine HIV1/2, ABOTT, USA). If the first test is negative, the sample will be considered as negative. The positive results in the first test will be confirmed by ICA (Uni Gold, USA). The sample with positive results will be considered as positive and the sample with negative result will be considered as negative. This HIV testing strategy is according to the recommendation of NCHADS.

**Logging:** A laboratory logbook for the surveillance will be kept at CENAT, recording the HIV test results by the corresponding code. The logbook will be accessible only to CENAT laboratory staff and National Supervisory Team staff and it will be stored in a cabinet with a lock. It will not be accessible to the TB unit staff members in charge of the blood collection. The logbook will contain the information only on the study numbers and corresponding HIV test results; no personally identifiable information will be recorded on the logbook.

**Laboratory quality assurance:** All laboratory procedures for the HIV testing at CENAT will be directly supervised by a technical adviser of CENAT/JICA National TB Control Project.

## ETHICAL CONSIDERATION

Unlinked anonymous HIV testing will be applied to this surveillance, just like it was in the survey of January 2003 and 2005. The survey will be carried out in accordance with Cambodian Ethical Guidelines for Health Research Involving Human Subjects. Oral informed consent will be obtained prior to HIV testing. Information about age, sex, nationality, site of TB, TB treatment history, bacteriological status of TB and clinical findings of a person consented to HIV testing will be recorded in the Data Collection Form.

In order to protect the confidentiality of patients, only specimens with an unique study number which is not linked to personal identifier will be passed to the laboratory, and not the form.

Eligible patients will be informed that:

1. the confidentiality of each participant is assured;

2. the purpose of this survey is to identify the national HIV seroprevalence, so the CENAT would provide no HIV test counseling nor follow-up (we will give the information about TB/HIV and VCCT in case they want to know their HIV status). Therefore, it will not be possible to trace back HIV positive participants;

3. the TB patients can refuse to participate in the surveillance at any time.

## RESULTS

2,572 patients were contacted in total. 25 were excluded due to missing the data collection forms. Finally, 2,547 patients were analyzed in the surveillance. Of 2,547, 198 TB patients were tested with HIV positive results.

Overall HIV sero-prevalence among all TB patients was 7.8%.

Characteristics of the all participants and the HIV sero-prevalence rates by these characteristics were shown in Table 1. The HIV sero-prevalence among male and female were 8.5% and 7.1%, respectively. Higher HIV sero-prevalence was seen more among the sexually active age groups (age 25 to34, and 35 to 44). This table showed sex distribution and the HIV sero-prevalence in each age group.

**Table1: Result of HIV test among TB patients in 2007, by age and sex**

| | Total | HIV-positive | | |
|---|---|---|---|---|
| | No(%) | No(%) | OR | p-value |
| Sex | (not recorded 25) | | | |
| Male | 1,262(49.5) | 107(8.5) | reference | 0.208 |
| Female | 1,285(50.5) | 91(7.1) | 0.82 | |
| Age-group | (not recorded 2) | | | |
| 0-14 | 82(3.2) | 5(6.1%) | 9.22 | <0.01 |
| 15-24 | 220(8.6) | 9(4.1) | 6.06 | <0.01 |
| 25-34 | 400(15.6) | 75(18.8) | 32.77 | <0.01 |
| 35-44 | 475(18.5) | 76(16.0) | 27.05 | <0.01 |
| 45-54 | 527(20.5) | 27(5.1) | 7.67 | <0.01 |
| 55-64 | 437(17.0) | 5(1.1) | 1.64 | 0.73 |
| >=65 | 429(16.7) | 3(0.7) | reference | |

Table 2 shows the most of TB patients enrolled for the study are Cambodian (98.4%) but HIV positive rate are high in Non-Cambodian group (24.4%). 2,410 (93.7) new cases were recorded and HIV seropositve rate is only 7.6% comparing with 8.9% for relapse cases. There is high HIV positive among TB patients presented PTB and EPTB together 38.5% comparing with 5.1% for PTB alone.

**Table 2: Characteristics of participants and HIV prevalence**

| | Total | HIV+ | | |
|---|---|---|---|---|
| | No(%) | No(%) O | R | p-value |
| Nationality | (not recorded 16) | | | |
| Cambodian | 2,515(98.4) | 190(7.6) | reference | <0.01 |
| No Cambodian | 41(1.6) | 10(24.4) | 3.95 | |
| Treatment category | (not recorded 27) | | | |
| New | | | | |
| Relapse | 2,410(93.7) | 187(7.8) | reference | 0.67 |
| re-treatment | 79(3.1) | 7(8.9) | 1.16 | - |
| Others | 4(0.2) | 0(0) | - | 1.00 |
| | 52(2.0) | 4(7.7) | 0.99 | |
| TB site | (not recorded 17) | | | |
| Pulmonary TB | 2,018(79.0) | 103(5.1) | reference | |
| EP TB | 524(20.5) | 91(17.4) | 3.91 | <0.01 |
| P TB+EP TB | 13(0.5) | 5(38.5) | 11.62 | <0.01 |

Table 3 shows the HIV sero-prevalence in difference year from 2003, 2005 and 2007. All provinces were categorized by five areas according to geographical and socio-economical similarities (Phnom Penh, Thai border area, Coastal area, North east area, and Others). Phnom Penh, Thai border area and Coastal area are high prevalence of HIV comparing (21.7%, 13% and 14.2%, respectively) with North East area and Other.

**Table 3: HIV prevalence of all TB patients by provinces in the Cambodia TB/HIV surveillance 2003, 2005 and 2007**

| Province | 2003 Total | 2003 HIV-positive No(%) | 2005 Total | 2005 HIV-positive No(%) | 2007 Total | 2007 HIV-positive No(%) |
|---|---|---|---|---|---|---|
| **Total** | 2,244 | 265(11.8) | 2,632 | 261(9.9) | 2,572 | 2,00(7.8) |
| **Phnom Penh** | **289** | **99(34.3)** | **235** | **61(26.0)** | **212** | **46(21.7)** |
| **Thai Border Provinces** | **445** | **57(12.8)** | **568** | **85(15.0)** | **537** | **70(13.0)** |
| Oudor Meanchey | | | | | | |
| B. Meanchey | 31 | 4(12.9) | 23 | 0(0) | 14 | 1(7.1) |
| Siem Reap | 86 | 10(11.6) | 175 | 32(18.3) | 155 | 26(16.8) |
| Batam Bang | 216 | 27(12.5) | 184 | 12(6.5) | 235 | 19(8.1) |
| Pailin | 106 | 14(13.2) | 172 | 39(22.7) | 122 | 24(19.7) |
| | 6 | 2(33.3) | 14 | 2(14.3) | 11 | 0(0) |
| **Coastal Provinces** | **134** | **22(16.4)** | **154** | **21(13.6)** | **148** | **21(14.2)** |
| Kampot | 77 | 6(7.8) | 108 | 11(10.2) | 95 | 3(3.2) |
| Krong Kep | 4 | 1(25.0) | 7 | 0(0) | 4 | 0(0) |
| Kg Som | 33 | 11(33.3) | 24 | 7(29.2) | 28 | 11(39.3) |
| Koh Kong | 20 | 4(20.0) | 15 | 3(20.0) | 21 | 7(33.3) |
| **North East Provinces** | **58** | **3(5.2)** | **68** | **3(4.4)** | **51** | **3(5.9)** |
| Stung Treng | | | | | | |
| Preah Vihear | 15 | 1(6.7) | 15 | 1(6.7) | 17 | 3(17.6) |
| Mondul Kiri | 27 | 1(3.7) | 36 | 0(0) | 24 | 0(0) |
| Rattanakiri | 6 | 0(0) | 4 | 1(25.0) | 6 | 0(0) |
| | 10 | 1(10.0) | 13 | 1(7.7) | 4 | 0(0) |
| **Others** | **1,318** | **84(6.4)** | **1,607** | **67(4.2)** | **1,624** | **60(3.7)** |
| Kandal | 154 | 15(9.7) | 225 | 13(5.8) | 203 | 12(6.4) |
| Svay Rieng | 164 | 6(3.7) | 180 | 5(2.8) | 152 | 2(1.3) |
| Pursat | 72 | 4(5.6) | 61 | 5(8.2) | 99 | 2(2.0) |
| Kg. Thom | 115 | 2(1.7) | 137 | 3(2.2) | 121 | 6(5.0) |
| Takeo | 137 | 9(6.6) | 216 | 26(12.0) | 138 | 9(6.5) |
| Kg. Speu | 105 | 4(3.8) | 112 | 3(2.7) | 147 | 2(1.4) |
| Prey Veng | 211 | 22(10.4) | 244 | 5(2.0) | 218 | 9(4.1) |
| Kg. Chunang | 109 | 6(5.5) | 93 | 6(6.5) | 186 | 6(3.2) |
| Kratie | 46 | 5(10.9) | 46 | 3(6.5) | 29 | 1(3.4) |
| Kg. Cham | 205 | 11(5.4) | 293 | 22(7.5) | 331 | 10(3.0) |

## CONCLUSION

The TB/HIV surveillance is effective for monitoring the serious impact of TB/HIV dual epidemics, estimating the trend and future course, and identifying the risk factors for HIV infection among TB patients.

# Secondary Analysis of Disease Trends:

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## 3.0 DATA SOURCES AND QUALITY

### DESCRIPTION OF HMIS: FOCUS ON MALARIA RECORDS

The current HIS consists of four mains components, including supporting tools for data collection. Monthly routine reporting covers major health problems and the activities of health services and consists of 4 standardized forms.[2]

- HC1: for health centers
- HO2: for referral hospitals
- DO3: an aggregation of all health centers and referral hospitals data within an operational district's jurisdiction, and
- PRO4: an aggregation of data from all operational districts within a province's jurisdiction. This last form, after compilation, is sent to the department of planning and Health information on a monthly basis in both copies (hard and soft).

The data collection starts at the facility level (health center) through daily registers for curative outpatient consultation. Data from health facilities are recorded in the daily registers. Similarly, in hospitals, there is a separate register for each health service ward, for instance, general medicine, etc. In health centers and hospitals, patient registers record the date of admission and discharge, the patient's name, sex, age address and diagnosis.

The reporting period covers the entire month from the first to the last day of the month. At the end of each month, data are entered into report forms at health facility levels via tally sheets. Monthly reports generated by health centers (form HC1) and referral hospitals (form HO2) are required to be sent to operational district health offices by the fifth day of the following month. These data are aggregated and by the tenth day are sent to the Technical Bureau of the Provincial Health Departments (PHD) through the standardized form DO3. Finally, each PHD aggregates the OD data through the PRO4 form and sends it to the Department of Planning and Health Information (DPHI) and the National Malaria Center (CNM) by the 20$^{th}$ day in soft copy and hard copy. (At the MOH, health information by operational district level was available since 2006, when the district software had been set up.) At CNM Epidemiology unit, the PRO4 forms are processed and analyzed through EPIDATA computerized database and the data are used to produce the annual national malaria statistics report, which is disseminated to all stakeholders free of charge. Although the health information system does not include the data from outreach, home based treatment, and the private sector, it is the main source of data on the number of malaria cases, confirmed cases, and malaria deaths in the country.

In addition, since 2003 in order to gather malaria information from operational districts and make it available in time for analysis at the central level, the epidemiology department of the National Malaria Program has designed specific formats for malaria data collection for the provincial malaria supervisor (PMS) to collect malaria data from 77 operational districts and 24 provinces. The malaria data collected from public health facilities are the aggregated number of malaria outpatients, the number of inpatient treated cases including simple, complicated and severe, the number of deaths, and laboratory results from outpatients and inpatients. The detailed information includes the total

[2] The forms are found in, "Ministry of Health, Kingdom of Cambodia. September 2005. Department of Planning and Health Information: Health Information System Guidelines. Section 2: Current HIS Components."

number of malaria cases treated, total malaria cases tested by age group, total malaria cases confirmed by species and age group (microscope and RDT), and the total number of malaria deaths.

## DATA QUALITY ASSESSMENT

In recent years, the malaria data transferred from facilities up to national level have improved gradually and the importance of data quality has assumed greater significance within the health system. As seen in Tables 3.1 and 3.2, from 2005 to 2007 the overall completeness and comprehensiveness objectives were met, as virtually all reports were deemed complete and comprehensive for each of the time periods.

**Table 3.1: Quality of malaria surveillance data**

**Percentage of Operational Districts (OD) with complete and comprehensive reporting for malaria, by year**

| Reporting year | *Overall Completeness:* Percentage of OD reporting | *Completeness:* Percentage of OD providing information from all activity sites | *Comprehensiveness:* Percentage of OD reporting data by age groups | Total number of OD expected to report |
|---|---|---|---|---|
| 2007 | 100% | 100% | 99% | 77 |
| 2006 | 100% | 96% | 99% | 77 |
| 2005 | 100% | 100% | 99% | 76 |
| 2004 | 100% | 100% | 99% | 75 |
| 2003 | 100% | 98% | 99% | 74 |
| Overall | | | | |

Source: National HMIS (MoH), CNM

**Table 3.2: Quality of malaria HMIS data**

**Percentage of Operational Districts (OD) with complete and comprehensive reporting for malaria, by quarter, 2003-2007**

| Reporting quarter | *Overall Completeness:* Percentage of OD reporting | *Completeness:* Percentage of OD providing information from all activity sites | *Comprehensiveness:* Percentage of OD reporting data by age groups | Total number of OD expected to report |
|---|---|---|---|---|
| 2007 Q4 | 100% | 100% | 96.9 % | 77 |
| 2007 Q3 | 100% | 100% | 96.1% | 77 |
| 2007 Q2 | 100% | 100% | 100% | 77 |
| 2007 Q1 | 100% | 100% | 100% | 77 |
| 2006 Q4 | 100% | 96% | 99.5% | 77 |
| 2006 Q3 | 100% | 95% | 98.7% | 77 |
| 2006 Q2 | 100% | 98% | 98.2% | 77 |
| 2006 Q1 | 100% | 100% | 97.4% | 77 |
| 2005 Q4 | 100% | 100% | 99.5% | 76 |
| 2005 Q3 | 100% | 100% | 98.6% | 76 |
| 2005 Q2 | 100% | 100% | 99.5% | 76 |
| 2005 Q1 | 100% | 100% | 98.2% | 76 |
| 2004 Q4 | 100% | 100% | 99.1% | 75 |
| 2004 Q3 | 100% | 100% | 99.5% | 75 |
| 2004 Q2 | 100% | 100% | 97.3% | 75 |
| 2004 Q1 | 100% | 100% | 96.4% | 75 |
| 2003 Q4 | 100% | 97% | 97.3% | 74 |
| 2003 Q3 | 100% | 96% | 96.8% | 74 |
| 2003 Q2 | 100% | 98% | 94.6% | 74 |
| 2003 Q1 | 100% | 100% | 94.6% | 74 |
| Overall | | | | |

Source: National HMIS, CNM

The reasons for improved data are not difficult to discern. First, with the introduction of the revised planning cycle and decentralized planning, each level of the health system is now required to draw up its annual operational plan based on a situation analysis, and setting of objectives and targets. Each level also is required to conduct monthly and quarterly meetings where data pertaining to the current period are reviewed for the purposes of monitoring the implementation of the plan. Data quality plays a critical role in this process since any compromise in their integrity will be an inadequate reflection of the implementation. Second, with the introduction of quality assurance initiatives, data quality plays a key role in the promotion of higher standards of care. Finally, data quality is critical since it has direct implications for the government budget and resource allocation. However, despite the increased significance, the accuracy and reliability of data generated from the health facilities continue to be of concern. This section outlines steps that may be taken by monitoring teams to address these concerns.

## 3.1 MALARIA: BACKGROUND

### EPIDEMIOLOGY

Cambodia has a total area of 180,000 $km^2$ and a population of 14.3 million. Thick forests and jungle covers sixty-two per cent of its landmass and these areas provide refuge for *Anopheles dirus* and *Anopheles minimus* which are the main vectors of malaria in the region.

An estimated two million people are at risk of malaria and 1.6 million of these live in high transmission areas within 1 km of the forest. These areas are sparsely populated with an average of just 5 inhabitants per square kilometer (compared to 132 inhabitants per square kilometer in non-malarious central areas of the country). There are four main categories of people affected by malaria in Cambodia, and the epidemiology of the disease varies from one group to another. The groups are summarized below and in Table 3.3:

**Ethnic minority groups** (population ~ 200,000). These traditional forest inhabitants live mainly in the northeastern part of the country. All age groups are exposed seasonally to long periods of intense transmission. Adults are usually partially immune but children and pregnant women are extremely vulnerable.

**Forest fringe inhabitants** (population ~ 1,300,000). Many people live in rice-growing communities close to the forest. Villagers (predominantly young men) make frequent overnight visits to the forest to hunt and to collect construction wood and other materials. These visits frequently result in falling ill with malaria. Infected persons returning to the village can infect anopheles mosquitoes breeding in and around the rice fields. Although these species are less efficient vectors of malaria than the ones found in the forest, limited local transmission can still occur. All age groups are therefore at risk but the majority of cases are found in adult males. A further 400,000 people live 1-2 km from the forest and this group is also at an elevated risk of contracting malaria.

**Temporary migrants** (population ~ 300,000). People working in the forest for extended periods such as gem miners, loggers, sandal wood collectors and soldiers are at high risk of contracting malaria. Most are adult males. They may come from villages near the forest but many also come from far-flung regions of the country when seasonal demand for labor in those areas is low. Often they have little or no immunity to malaria. Most seek treatment at health facilities (~80% private sector) close to the forest where they work but many also seek treatment when they return to their homes.

**New forest settlers** (population ~ 100,000). Families who, for economic or political reasons, relocate to forested areas to establish farms are initially at high risk of contracting malaria since their immunity is usually low. Malaria transmission typically diminishes year by year with continued development and deforestation of the settled area.

**Table 3.3: Schematic summary of features of the four main risk groups for malaria in Cambodia**

| Risk group | Ethnic group | Composition | Access to medical facilities | Immunity | Highest at risk |
|---|---|---|---|---|---|
| Traditional Forest inhabitants (montagnards) | Mixed non Khmer minority groups | Families | Little due to remoteness and linguistic barrier | Adults only | Children and pregnant women |
| Forest workers | Khmer and foreigners | Mostly adult males | Relatively good due to high mobility | None | Adult males |
| Forest fringe inhabitants | Khmer | Mostly adult males | Relatively good due to high mobility | Semi-immune | Adult males |
| New forest settlers | Khmer | Families | None, not even private sector | None | Children and adults alike |

Source: National malaria control programme, Annual progress report 2002

## THE CURRENT BURDEN OF MALARIA

Malaria is among the leading causes of mortality and morbidity in Cambodia. In 2007, it was the most common cause of outpatient visits (accounting for 0.7% of patients), the principal cause of hospitalization (accounting for 2% of inpatients), and the leading cause of hospital mortality (accounting for 5.6% of deaths). It is also a key contributor to anaemia, complications during pregnancy, low-birth weight and poor child growth.

According to the latest CNM Annual Report, a total of 59,848 people were treated for malaria by the public health services in 2007 (Table 3.4). 42,521 (74%) of these cases were confirmed either through the use of microscopy or rapid diagnostic tests (RDTs). RDTs accounted for 20,384 (48%) of confirmed cases (Table 3.5). 36,902 (86%) of the confirmed cases were *falciparum* malaria in 2007, and of these 2649 were classified as severe. 241 deaths were reported giving a severe case fatality rate of 9.0% (Tables 3.4 & 3.5).

**Table 3.4: Recent epidemiological data based on statistics from public sector health facilities issued by the National Malaria Centre in Phnom Penh**

| | | Confirmed cases | | Deaths |
|---|---|---|---|---|
| Year Total | cases | *(% falciparum)* | Severe cases | *(severe case fatality rate)* |
| 1996 | 107,265 | 80,691 (94%) | 4,372 | 741 (17.0%) |
| 1997 | 170,387 | 88,029 (93%) | 5,645 | 865 (15.3%) |
| 1998 | 140,843 | 58,874 (93%) | 4,580 | 621 (13.6%) |
| 1999 | 139,107 | 64,679 (93%) | 6,570 | 891 (13.6%) |
| 2000 | 129,167 | 62,442 (93%) | 6,207 | 608 (9.8%) |
| 2001 | 115,614 | 53,601 (92%) | 5,453 | 476 (8.7%) |
| 2002 | 110,762 | 46,902 (89%) | 4,214 | 457 (10.8%) |
| 2003 | 133,064 | 71,265 (88%) | 4,936 | 492 (9.9%) |
| 2004 | 102,316 | 59,745 (82%) | 3,720 | 382 (10.2%) |
| 2005 | 74,185 | 49,436 (65%) | 2,560 | 296 (10.4%) |
| 2006 | 101,003 | 78,014 (75%) | 4,391 | 396 (7.9 %) |
| 2007 | 59,848 | 42,521 (74%) | 2,649 | 241 (9.0 %) |

Source: MoH/CNM (1996- 2007)

**Table 3.5: Malaria confirmed cases and proportion of parasite species distributed by province, Cambodia 2007**

| ID | Provinces | *P. Falciparum* | | | *P. Vivax* | | | | % of | % of | % of |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slide | RDT | Total | Slide | RDT | Total | *Mix* | P.F | P.V | Mix |
| 1 | BT.Chey | 68 | 83 | 151 | 295 | 2 | 297 | 9 | 18.3 | 79.3 | 2.4 |
| 2 | B.Bang | 1,227 | 2,430 | 3,657 | 374 | 0 | 374 | 74 | 73.3 | 22.3 | 4.4 |
| 3 | Kg.Cham | 739 | 917 | 1,656 | 308 | 0 | 308 | 30 | 68.6 | 28.6 | 2.8 |
| 4 | Kg.Chhna | 432 | 402 | 834 | 108 | 0 | 108 | 14 | 78.0 | 19.5 | 2.5 |
| 5 | Kg.Speu | 665 | 1,824 | 2,489 | 112 | 0 | 112 | 17 | 83.8 | 14.1 | 2.1 |
| 6 | Kg.Thom | 726 | 960 | 1,686 | 165 | 2 | 167 | 26 | 79.2 | 18.0 | 2.8 |
| 7 | Kampot | 518 | 1,178 | 1,696 | 272 | 0 | 272 | 13 | 64.5 | 33.9 | 1.6 |
| 8 | Kandal | 29 | 15 | 44 | 28 | 0 | 28 | 0 | 50.9 | 49.1 | 0.0 |
| 9 | Koh Kong | 211 | 382 | 593 | 81 | 0 | 81 | 12 | 69.4 | 26.6 | 3.9 |
| 10 | Kratie | 1,615 | 1,980 | 3,595 | 81 | 0 | 81 | 74 | 91.2 | 4.6 | 4.2 |
| 11 | Mon.Kiri | 812 | 1,118 | 1,930 | 75 | 0 | 75 | 4 | 91.1 | 8.4 | 0.4 |
| 12 | Ph.Penh | 19 | 0 | 19 | 19 | 0 | 19 | 2 | 47.5 | 47.5 | 5.0 |
| 13 | Pr.Vihear | 3,955 | 1,085 | 5,040 | 503 | 0 | 503 | 48 | 87.8 | 11.2 | 1.1 |
| 14 | Prey Veng | 117 | 4 | 121 | 20 | 0 | 20 | 1 | 84.8 | 14.5 | 0.7 |
| 15 | Pursat | 1,924 | 1,127 | 3,051 | 686 | 32 | 718 | 31 | 72.9 | 26.0 | 1.2 |
| 16 | Ratt.kiri | 850 | 1,831 | 2,681 | 154 | 0 | 154 | 4 | 84.3 | 15.3 | 0.4 |
| 17 | Siem Reap | 646 | 2,598 | 3,244 | 79 | 0 | 79 | 15 | 87.3 | 10.7 | 2.0 |
| 18 | Sihanouk | 12 | 86 | 98 | 3 | 0 | 3 | 0 | 80.0 | 20.0 | 0.0 |
| 19 | St.Treng | 763 | 446 | 1,209 | 79 | 0 | 79 | 4 | 90.2 | 9.3 | 0.5 |
| 20 | SvayRieng | 78 | 0 | 78 | 29 | 0 | 29 | 2 | 71.6 | 26.6 | 1.8 |
| 21 | Takeo | 105 | 141 | 246 | 83 | 2 | 85 | 8 | 53.6 | 42.3 | 4.1 |
| 22 | Odd.Chey | 743 | 999 | 1,742 | 953 | 0 | 953 | 176 | 39.7 | 50.9 | 9.4 |
| 23 | Kep | 24 | 19 | 43 | 5 | 0 | 5 | 0 | 82.8 | 17.2 | 0.0 |
| 24 | Pailin | 240 | 759 | 999 | 475 | 15 | 490 | 12 | 33.0 | 65.3 | 1.7 |
| Total | | 16,518 | 20,384 | 36,902 | 4,987 | 53 | 5,040 | 576 | 74.8 | 22.6 | 2.6 |

Note: The proportion of parasite species only calculated from blood slide

Source: MoH/CNM

During 2007, a further 24,303 confirmed *falciparum* cases were detected through passive case detection in the 315 highly endemic villages covered by the Village Malaria Worker Project. In addition, military sources suggest that around 15,500 clinically diagnosed cases were treated in army health facilities.

A cross-sectional survey of community drug practices carried out in October 2002 in four Cambodian provinces along the Cambodia-Thai border revealed that more than 80% of patients seek treatment outside the public sector. Similar findings were reported by PSI[3] when they carried out a 'willingness to pay' study in December 2003: 79% of respondents sought treatment for malaria from pharmacies and private practitioners. Unfortunately no malaria case detection data are available for this group.

[3] PSI/Cambodia: Willingness to Pay Survey for Anti-malarial Drugs, 2003.

A nation-wide malaria baseline study[4] incorporating a prevalence survey was conducted in October and November 2004 (rather late in the year, however, as transmission tends to peak in August and September). Prevalence ranged from 1.4% in sampled villages located between 1 and 2 km from the forest edge, to ~3.5% in villages within 1 km of the forest.

On the basis of all these figures, CNM estimates that at least 300,000 new cases of *falciparum* malaria were treated in Cambodia in 2007. While it is not possible to estimate the number of deaths with certainly, it is clear that the number reported in the public sector through the government's health information system is a gross underestimate. A factor that contributes to this under-reporting is that it is common practice for very sick patients to be taken away from health facilities in order to die at home.

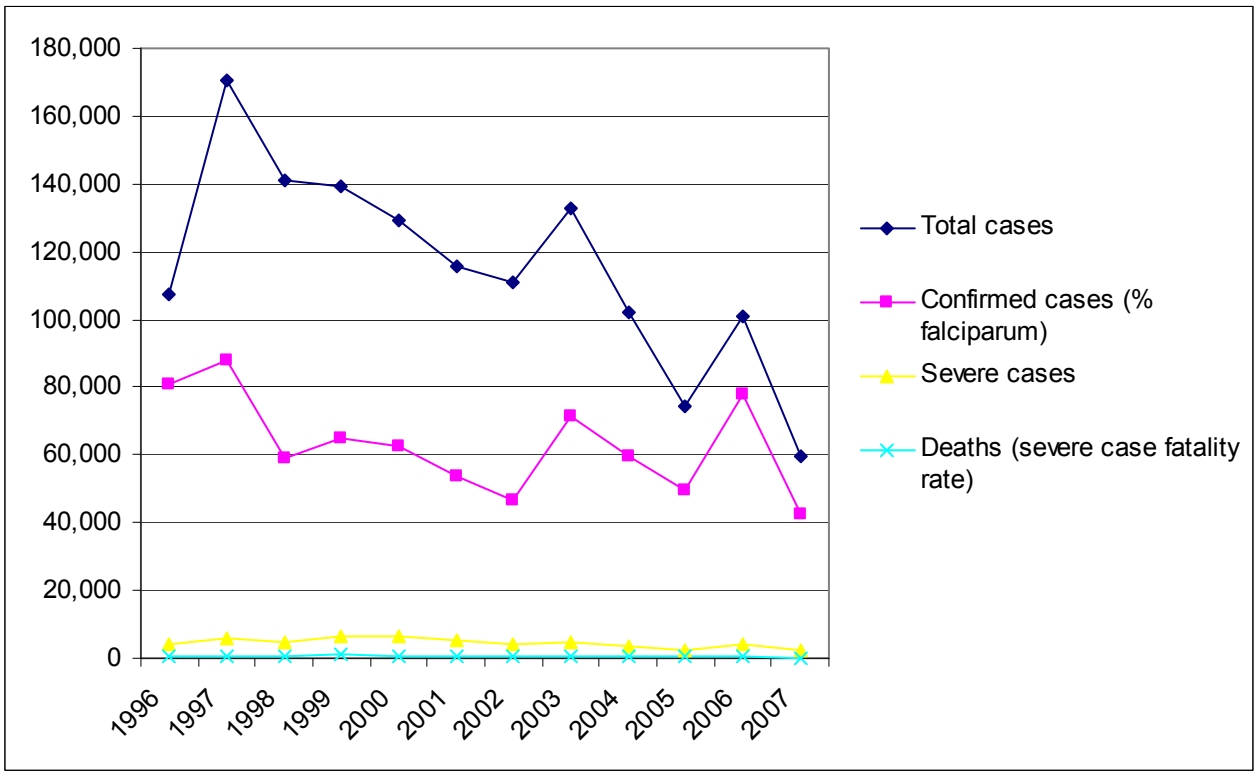
There has been a steady reduction in the severe case fatality rate down from about 20% in 1996 to about 10% in 2007, reflecting improvements in patient care in public health facilities (Figure 3.1). There has also been a steady decline in the number of cases reported across provinces between 2006 and the 1997 peak (Table 3.4 and Figure 3.2), despite the confounding effect of recent improvements in the reporting system. This trend is confirmed by an examination of long-term changes in parasite composition by species. Numbers of *P.vivax* malaria cases tend to be quite stable and so the slow but steady decline in the proportion of cases caused by *P.falciparum* is a relatively robust indicator that the malaria situation is improving (Table 4).

**Figure 3.1: Severe case fatality rate, 1996-2007**


Source: MoH/CNM (2006- 2007)

[4] NIPH and Malaria Consortium: Cambodia National Malaria Baseline Survey, 2004.

**Figure 3.2: Malaria burden: Total cases, confirmed *falciparum* cases, severe cases and deaths, 1996-2007**

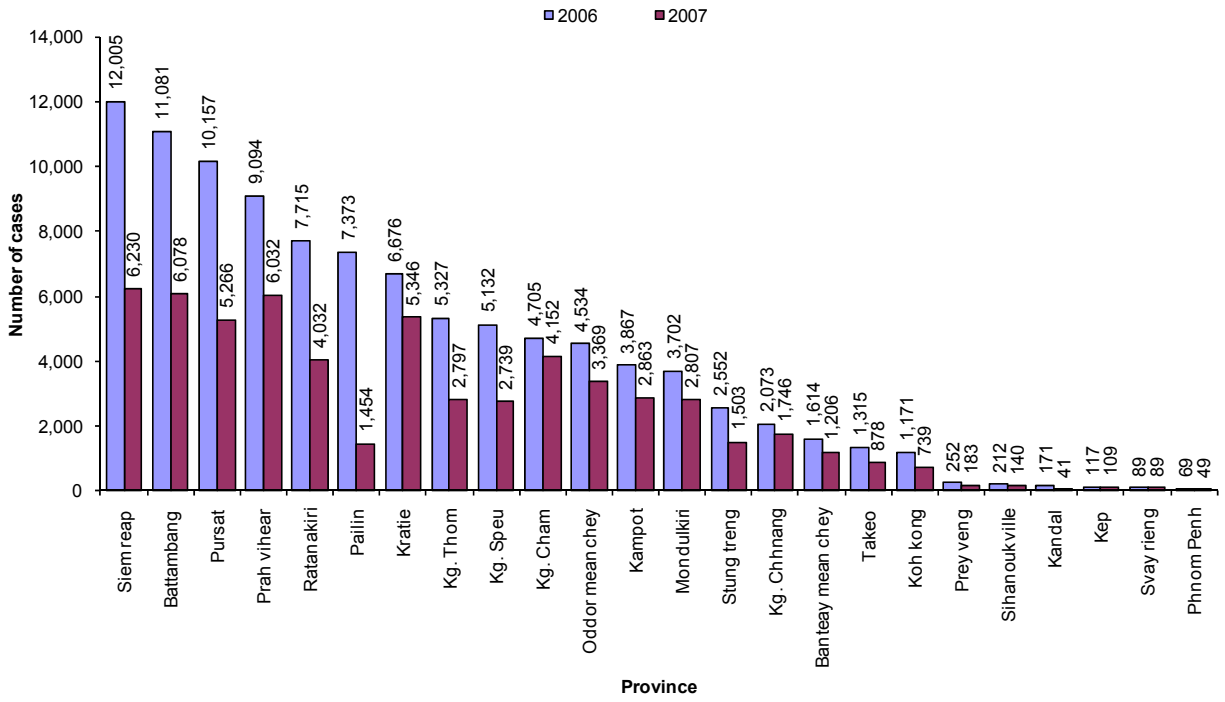



Source: MoH/CNM (2006- 2007)

Improved malaria prevention and control activities have undoubtedly played a major part in reducing burden, but other factors have also had a positive impact. Over the past few years a number of social and political changes have resulted in reduced man-vector contact. First, initially rampant deforestation led to a reduction in suitable vector habitats, but a government-enforced ban on illegal logging has greatly reduced the numbers of people venturing into forests to collect timber. Second, increased political stability has resulted in a reduction in military activities in forested areas.

The data at the provincial level reveals that the situation varies from province to province. Most provinces have recorded a significant decrease in the number of treated cases in 2007 compared with the previous year, 2006 (Figure 3.3). The variations in the number of treated malaria cases among the different provinces may be attributed to differences in geographical conditions including terrain, rainfall, forest density and population movement-- as well as differences in intensity and success of malaria control activities.

**Figure 3.3: Number of cases treated for malaria, by province, 2006 and 2007**




Source: MoH/CNM (2006- 2007)

## NATIONAL MALARIA CONTROL POLICIES

The Mission of the Ministry of Health, Royal Government of Cambodia is commitment to ensuring widely accessible, equitable, and quality health care for all the people of Cambodia through targeting of resources especially to the poor and to areas in greatest need. To achieve this mission, the ministry has developed a national health policy statement outlining the directions for the five years (2003-2007). In summary, the policy asserts that all people in Cambodia, whatever gender, age, place of residence or ability to pay, should have equal access to good quality, basic and essential specialized health services, staffed by competent health professionals, and at a cost people can afford, as well as having information that empowers them to make informed choices about matters affecting the health and well-being of themselves and their families. In line with the national health policy, malaria education, prevention, control and treatment services should be universally made available in Cambodia through the implementation of a comprehensive national malaria control programme. The Government of Cambodia is currently overseeing the implementation of a number of policies related to malaria control in the country. The National Malaria Policies deal with preventive measures, vector control, insecticide choice and usage, bed-net treatment with insecticide and treatment protocols for those suffering from the disease. These help in standardizing control methods and treatment. It is recognized that such policies and guidelines need to be updated from time to time, in line with changing knowledge and situations.

Four key strategic approaches to achieving access to effective interventions by those most in need underpin the direction of the NMCP: 1) Improved access to early diagnosis and appropriate treatment; 2) improved access to effective prevention; 3) increased community awareness; and 4) strengthened national capacity to control malaria effectively.

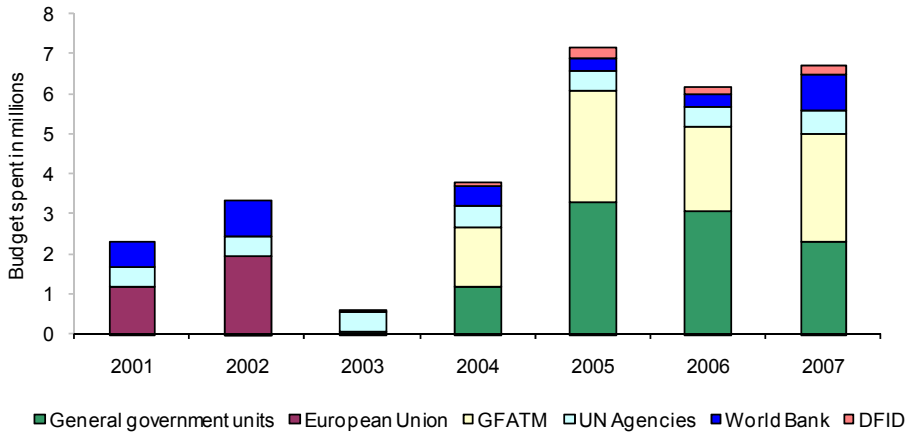
## 3.2 FINANCING FOR MALARIA PROGRAMS

Since 2001, the country has benefited from major external budget support from World Bank (through IDA funding), WHO, World, DFID, and USAID grants for the malaria programme (Table 3.6 and Figure 3.4). Some of this support is channeled through the Health Sector Support Project, some through the WHO, and some goes directly to CNM or its implementing partners via the MoH.

**Table 3.6: Funding for malaria by financing sources, Cambodia 2001-2007**

| Financing source | 2001 | 2002 2003 | 2004 | | 2005 2006 | 2007 | |
|---|---|---|---|---|---|---|---|
| Governmental sources | 40,000 | 60,000 | 120,000 | 1,200,000 | 3,300,000 | 3,100,000 | 2,300,000 |
| European Union | 1,200,000 | 1,900,000 | | | | | |
| UN Agencies | 500,000 | 500,000 | 500,000 | 500,000 | 520,000 | 500,000 | 600,000 |
| World Bank | 600,000 | 900,000 | 50,000 | 490,000 | 290,000 | 300,000 | 900,000 |
| DFID | | | | 100,000 | 300,000 | 200,000 | 2,000,000 |
| GFATM | | | | 1,500,000 | 2,800,000 | 2,100,000 | 2,700,000 |
| Total | 2,340,000 | 3,360,000 | 670,000 | 3,790,000 | 7,210,000 | 6,200,000 | 8,500,000 |

**Figure 3.4: Trends in national and external funding for malaria, by financing sources 2001 – 2007**




Source: MoH/CNM (2003-2007)

The Ministry of Health has in recent years increased its spending on malaria control and, on average, spends US $400,000 to US $2.3 million per year, mainly covering procurement of drugs, bed nets, insecticide, health promotional material such as T-shirts and caps, supervision costs, government staff salaries, establishment and maintenance charges, POL, etc.

An additional loan from the World Bank for the ongoing Health Sector Support Project (HSSP) (2003-2007) has earmarked $2.3 million for malaria control activities. The World Bank loan supports the procurement of drugs and commodities such as bed nets, insecticide, and diagnostic dipsticks as well as limited civil works, key control operations, monitoring and supervision, training and capacity building.

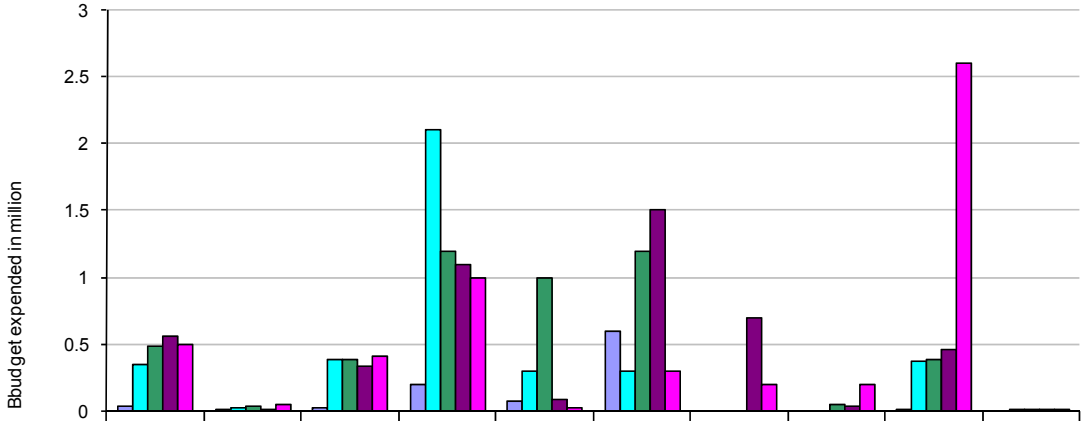
The NMCP is currently in receipt of two grants from the Global Fund. Under Round 2, $9.9M was approved for "Partnership for Going to Scale with Proven Interventions for Malaria"; under

Round 4 a further $9.7M was approved for "Strengthening of the National Malaria Control Program by Broadening Partnerships and taking to Scale Proven BCC Interventions and Ushering in a 'People's Movement for Malaria Control".

Through the Health Sector Support Project, DFID provides funding to support TAs and capacity building activities. USAID funds the NMCP through the WHO with an average annual allocation of $500,000 to mainly support therapeutic efficacy studies in sentinel sites in order to update national antimalarial policy and to provide salaries for TAs.

Figure 3.5 shows that funding has increased for several budget items, and most notably in human resources, RDTs, ITN, insecticides and project implementation. Overall, increasing trends in the amount and type of funding for malaria control has increased substantially and has broadened in terms of the number of supporters and the breadth of interventions and issues supported.

**Figure 3.5: Budget spent by items for malaria control, Cambodia 2003 – 2007**




| | Human resources | Office equipment | Workshop training | Drugs | RDTs | ITNs | LLINs | Insecticides | Project implement-ation | Transport |
|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 0.04 | 0.009 | 0.02 | 0.2 | 0.07 | 0.6 | | | 0.005 | |
| 2004 | 0.35 | 0.02 | 0.38 | 2.1 | 0.3 | 0.3 | | | 0.37 | 0.009 |
| 2005 | 0.48 | 0.03 | 0.39 | 1.2 | 1 | 1.2 | | 0.05 | 0.38 | 0.001 |
| 2006 | 0.56 | 0.01 | 0.33 | 1.1 | 0.08 | 1.5 | 0.7 | 0.04 | 0.46 | 0.003 |
| 2007 | 0.49 | 0.05 | 0.41 | 1 | 0.02 | 0.3 | 0.2 | 0.2 | 2.6 | 0.01 |

Source: MoH/CNM (2003-2007)

## 3.3 MALARIA SERVICES

### QUANTITY AND DISTRIBUTION OF MALARIA SERVICES

To assess the availability of quality malaria services, the program record and two CMS 2004 & 2007 have been reviewed. The findings from these studies indicate that Cambodia's malaria control programme is advanced both in terms of its large scale use of state-of-the-art RDTs & pre-packaged combination therapy and in terms of its innovative public-private mixed approach to the provision of EDAT. The CNM has a three-pronged approach to the provision of diagnostic and treatment services in Cambodia: free provision through public health facilities; free provision through village based volunteers (public sector); and subsidized provision through the private sector. CNM has taken the lead role within the public sector and PSI has taken the lead role for activities relating to the private sector.

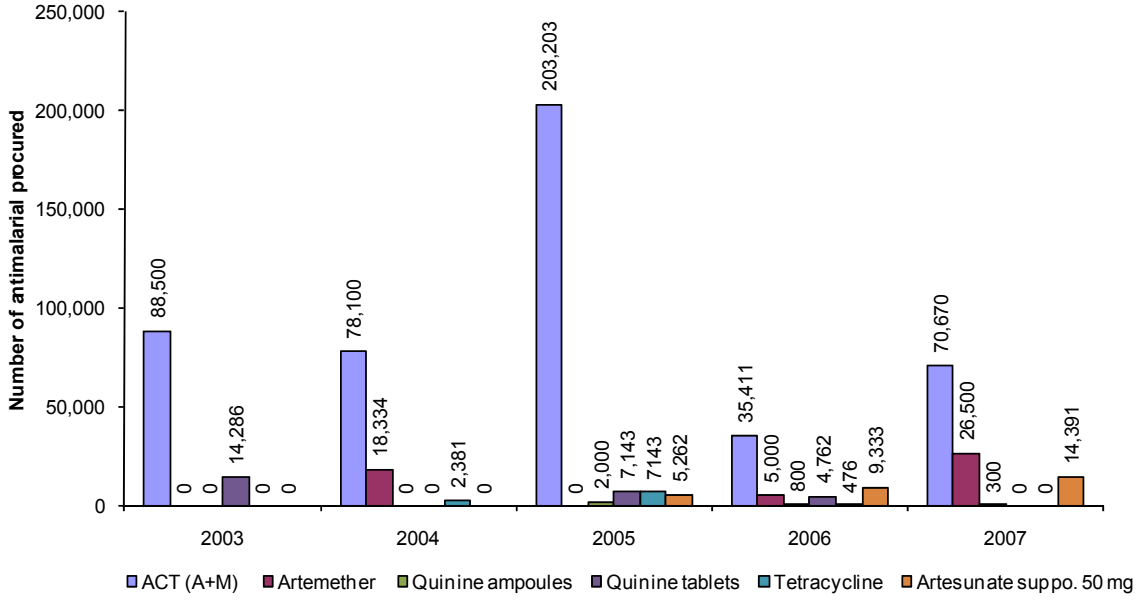
In addition, the targeting of malaria intervention efforts has been based on a system of stratification, which assigns potential risk in terms of a village's or population's proximity to the forest where malaria vectors transmit most the disease. The populations living close to the forest are also the poorest people and face greater challenges reaching public services, including health care.

### MALARIA CASE MANAGEMENT—DIAGNOSTICS AND TREATMENT

The public sector has improved the availability, quality and use of anti-malarial drugs and diagnostics in public health facilities through: procurement of first-line drugs (ACT), RDTs, and microscopes; improvement of diagnosis and case-management practices through training and improved referral of severely ill patients; and community-based EDAT in selected highly endemic and remote communities. The private sector offers ACT and RDTs through an established social marketing approach (PSI) (MoH /CNM 2003-2007). (See Annex 1 Table A.1, related to the categories of Coverage, Outputs, Process, and Inputs modified according relevant to National Record Review and Malaria Survey 2004 and 2007 data for the CNM).

CNM requires that drugs be purchased through the procurement efforts of MoH/GF, and that they are distributed to all the public health facilities through routine delivery by Central Medical Store (CMS). Since 2003, ACT has been procured in greater quantities than other antimalarials (Figure 3.6).

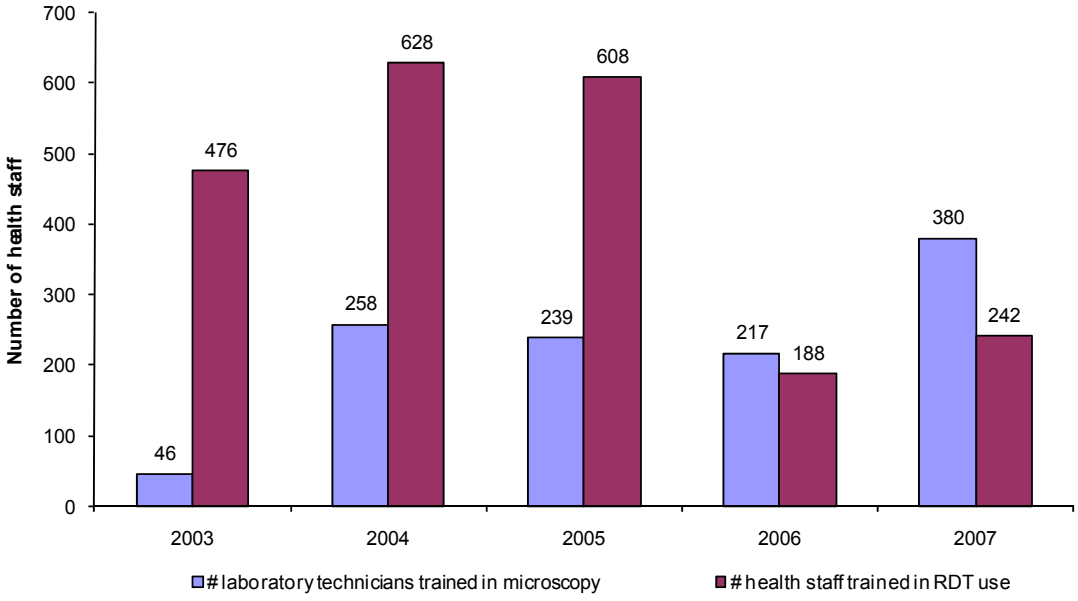
**Figure 3.6: Trends in the number of antimalarial medicines procured, 2003 – 2007**




Source: MoH/CNM (2003-2007)

In order to strengthen the capacity of laboratory technicians working at referral hospital and health centers, the CNM teams from lab departments were invited to be trained or to facilitate training laboratory personnel. Figure 3.7 shows significant improvement each year in the number of health staff trained in microscopic and RDT.

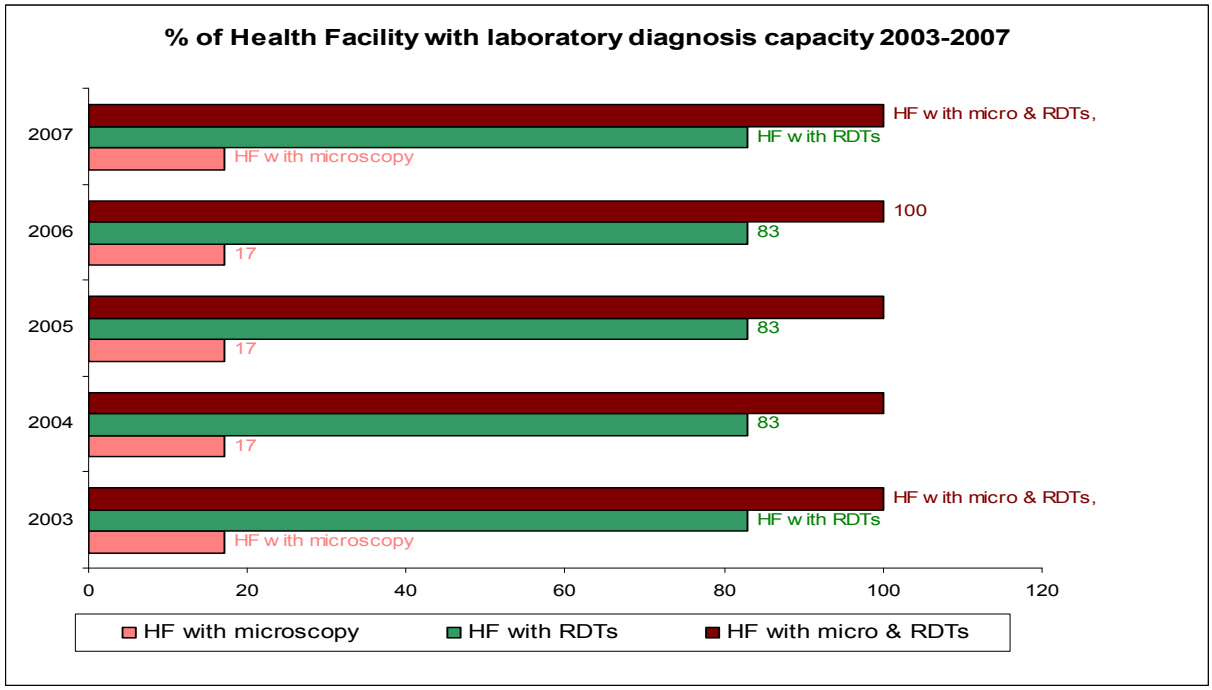
**Figure 3.7: Trend in number of health staffs trained on microscopy and RDTs diagnosis, 2003-2007**




Source: MoH/CNM (2003-2007)

Figure 3.8 reveals that since 2003, the laboratory malaria diagnosis was available at all public health facilities. 17% of those have microscopy at referral hospitals and formal district hospitals, and other 83% of health facilities have RDTs for malaria diagnosis.

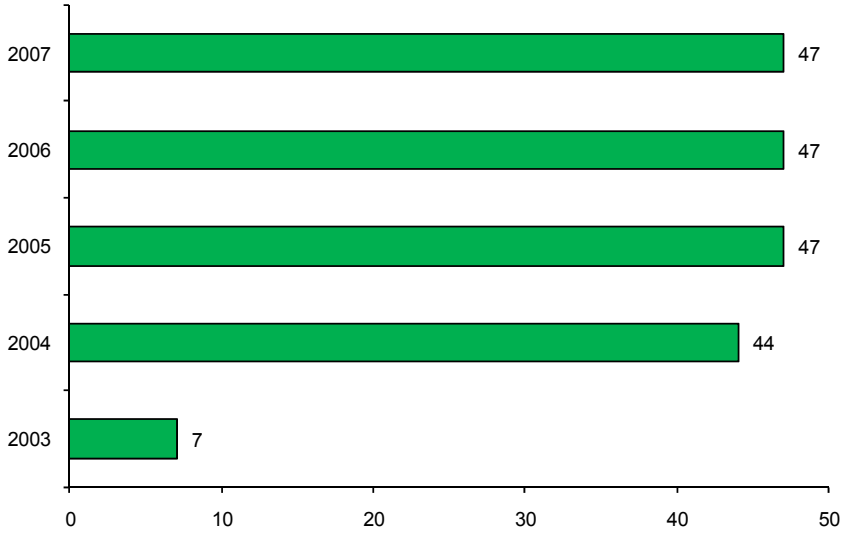
**Figure 3.8: Proportion of health facilities with laboratory diagnosis, microscopy and RDTs 2003-2007**




Source: MoH/CNM (2003-2007)

Free public sector delivery of diagnostic services is augmented through a network of village malaria workers (VMWs) operating in 35 of the most remote and malaria endemic communities in the country (mainly in the northeast) in 2003. The effort has been scaled up through 2007, with VMWs operating in 315 of 676 target villages. The VMW volunteers use rapid diagnostic tests and the same pre-packaged combination therapy used in the public sector. Figure 3.9 shows that since the VMW program has been launched and scaled-up, the percent of villages benefiting from RDTs increased from 7% in 2003 to 47% in 2007.

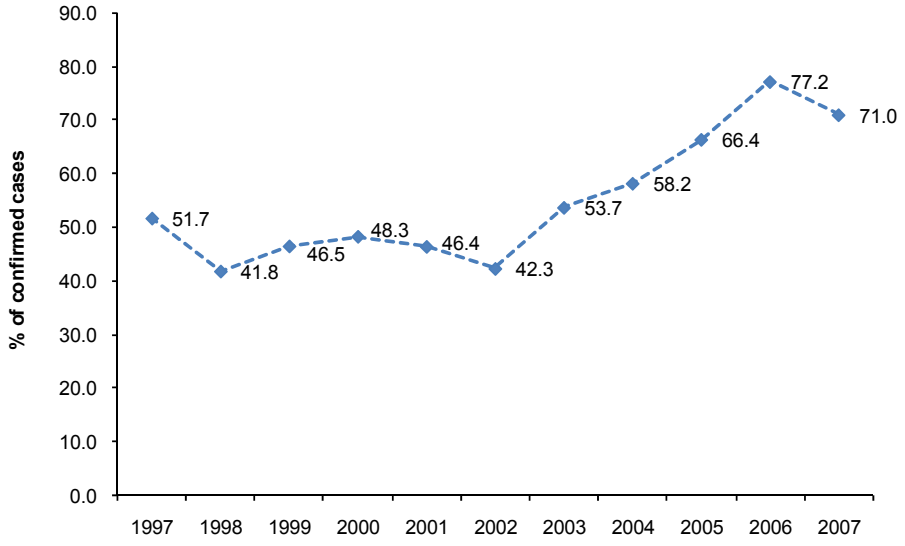
**Figure 3.9: Percent of hyper-endemic villages with laboratory diagnosis (RDTs), 2003-2007**




Source: MoH/CNM (2003-2007)

The proportion of confirmed cases among treated cases increased rapidly from 42% to 78% for the period 2002 to 2006, and decreased gradually to 71% in 2007. This indicates that the laboratory services and malaria diagnosis have improved considerably. It is noted, however, that since the source of this routine information is obtained from patient registers of varying quality, interpretations should be made with caution. (See Annex 1 Table A.3, related to the categories of Coverage, Outputs, Process, and Inputs modified according to relevance to the National Record Review and the Malaria Survey 2004 and 2007 data for the CNM).

**Figure 3.10: Proportion of malaria confirmed cases among treated cases in Cambodia, by data source, 1997–2007**

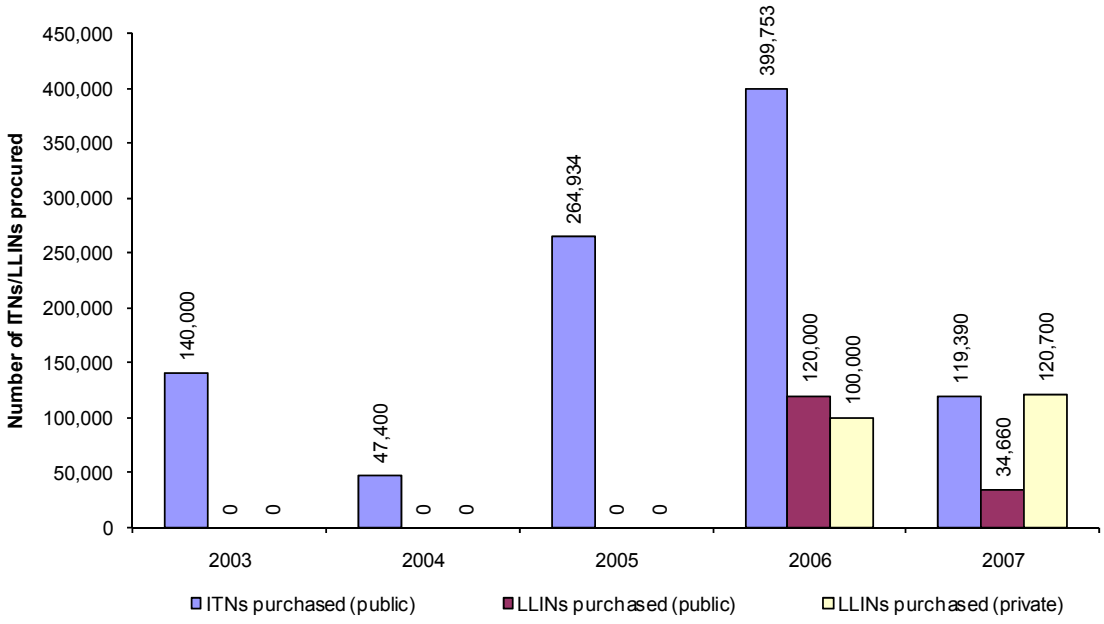



Source: MoH/CNM (1997-2007)

## QUALITY OF MALARIA SERVICES: INSECTICIDE-TREATED MOSQUITO NETS

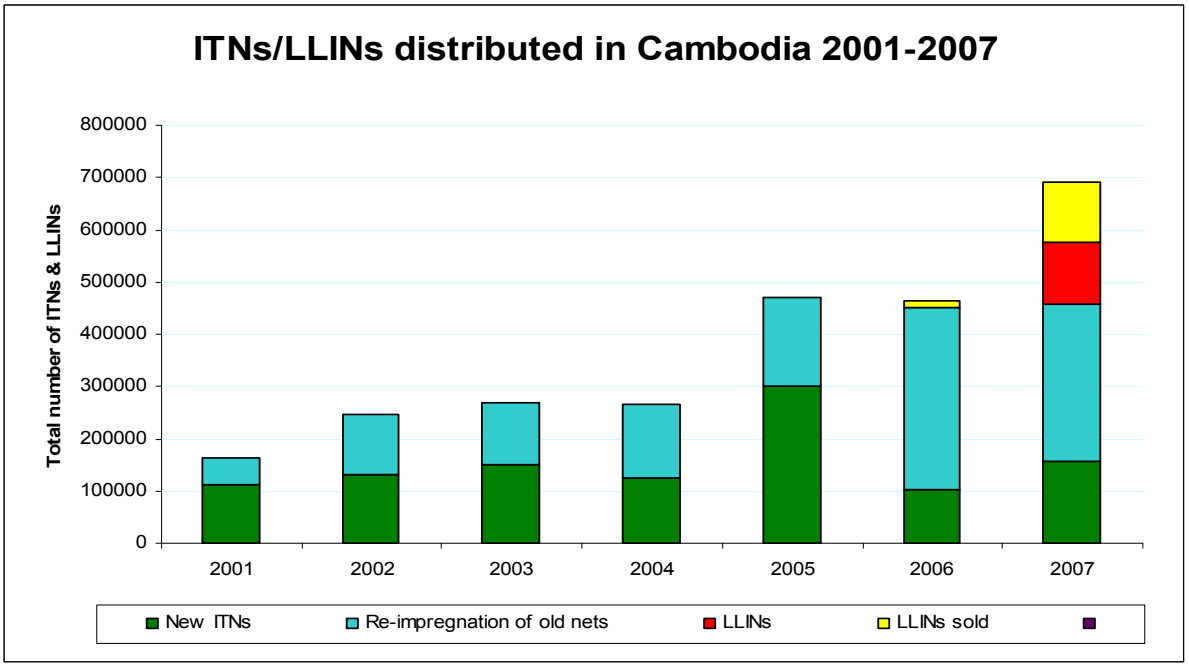
After having received funds from GFATM round 2, the CNM was able to supply nets across the country, with the number procured and distributed increasing throughout most of the decade (Figures 3.11 and 3.12). The number of ITNs procured in 2005, and the number in 2006, was about 2 times and 3 times more, respectively, compared to 2003. It should be further noted however, that although these data establish an increasing trend, better tracking details of these resources are needed; for example, in 2005 and 2006 it appears that significantly more nets were distributed than were available through procurements.

**Figure 3.11: Number of ITNs/LLINs procured in Cambodia, 2003-2007**




Source: MoH/CNM (2003-2007)

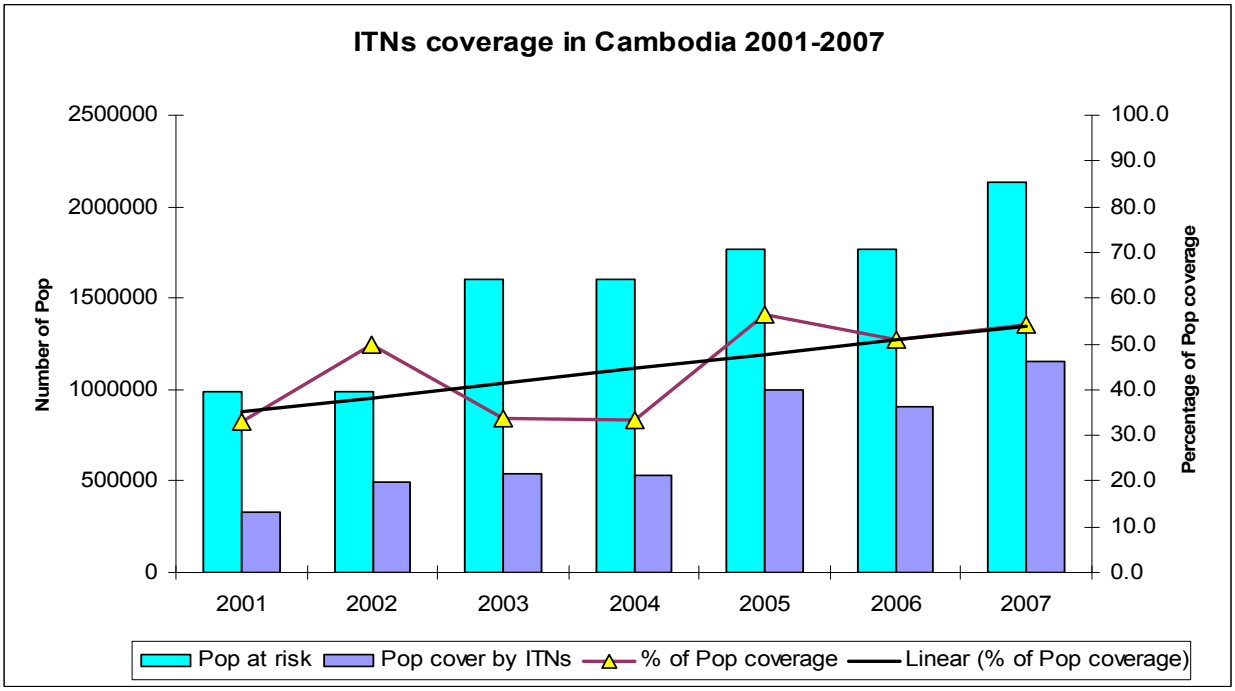
**Figure 3.12: Trends in the number of ITNs/LLINs distributed nationally, by type of net 2001 – 2007**




Source: MoH/CNM (2001-2007)

Figure 3.13 shows that from 2003 -2005, conventional ITNs coverage increased from about 30% to over 50%. Increased coverage is at least in part due to free distribution in villages within 500m of the forest, with the goal to cover at least 25% of the population at risk. Since 2005, ITN coverage expanded to cover all villages within 1 km from the forest, and long lasting insecticide treated nets (LLINs) were delivered to 400 of the most remote and hyper-endemic villages. After 2004, therefore, malaria prevention efforts have increased in order to cover all populations at risk, from 500m up to 1km from the forest. Finally, in most recent years, 35% of the population was covered by ITNs in 2006 and around 45% in 2007. (See Annex 1 Table A.3, related to the categories of Coverage, Outputs, Process, and Inputs modified to relevance to the 2004 and 2007 survey data and the National Record Review for the CNM).

**Figure 3.13: Trends in national ITN coverage in Cambodia, 2001 – 2007**




Source: MoH/CNM (2000-2007)

In Table 3.7, the proportion of households with at least one net, treated or untreated, is actually higher in the poorer quintiles, whereas the proportion with 2 nets is remarkably equitable across the quintiles (data not shown). This is a sign of an important success by the programme: targeting close-to-forest villages reaches the poorest people. A more detailed breakdown is needed to confirm the SES quintile distribution of untreated (market) nets, but this table indicates that use of treated (instead of untreated) nets is positively associated with poverty, presumably because of effective targeting. Since it is established that malaria parasitaemia is also strongly associated with poverty, this lends weight to the hypothesis that the observation of no association between net use and malaria is due to a balance between two opposing associations: a negative one due to the protection given by net-use, and the positive one due targeting.

**Table 3.7: Among households owning at least one mosquito net, percent with ever treated nets, ITNs, and sufficient ITNs, by risk zone and socioeconomic status, 2007**

| | Number of households | At least 1 net | | Sufficient ITNs % |
|---|---|---|---|---|
| | | Ever treated % | ITN % | |
| Total | 2,270 | 66.4 (58.0,73.9) | 42.6 (35.8,49.7) | 6.4 (4.5,8.9) |
| Domain | | | | |
| 1 | 1,166 | 73.4 (61.0,82.9) | 49.5 (37.9,61.2) | 11.1 (7.2,16.7) |
| 2 | 1,104 | 62.0 (50.5,72.3) | 38.3 (30.1,47.3) | 3.4 (2.1,5.5) |
| Risk zone | | | | |
| <250m | 770 | 66.6 (52.2,78.5) | 45.1 (32.7,58.2) | 5.3 (3.0,9.1) |
| 250m to <1km | 861 | 71.2 (58.0,81.5) | 44.5 (33.9,55.7) | 6.4 (3.5,11.6) |
| 1km to <2km | 639 | 59.6 (44.5,73.1) | 38.4 (27.6,50.5) | 7.0 (4.3,11.1) |
| Socio economic status | | | | |
| Q1 (poorest) | 499 | 73.8 (62.8,82.4) | 44.5 (34.5,54.9) | 6.1 (3.2,11.2) |
| Q2 | 471 | 69.1 (57.3,78.9) | 47.9 (37.9,58.0) | 7.7 (4.3,13.2) |
| Q3 | 450 | 64.6 (54.1,73.9) | 45.5 (36.7,54.6) | 5.3 (3.3,8.4) |
| Q4 | 470 | 61.5 (50.5,71.3) | 39.3 (30.8,48.6) | 5.7 (3.1,10.1) |
| Q5 (least poor) | 380 | 63.1 (49.3,75.1) | 35.9 (27.2,45.8) | 7.0 (3.4,13.8) |

All households have at least 1 mosquito net so 100% for all strata.

The overall picture shows little change between 2004 and 2007, but there is nevertheless an important contrasts between these two years: In 2004, the SES gradient in ITN use was the same as that in any-net use: not strong, but clearly showing worse coverage in the poorer groups. In 2007, the same SES differentials are again seen in any-net use (somewhat higher coverage in richer groups) but the gradient is reversed for ITNs: the poorest quintiles are more likely to use ITNs than the less poor. This is good news, and a clear mark of successful targeting, since the poorest are also the most at risk.

**Table 3.8: Use of nets by total population**

| | 2004 | | | | 2007 | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Any net % | Ever treated % | ITN % N | | Any net % | Ever treated % ITN | % |
| Total | 10,461 | 81.8 (74.9,87.1) | 51.2 (41.8,60.5) | 29.3 (20.4,40.0) | 11,342 | 79.6 (75.8,82.9) | 48.3 (41.3,55.3) | 25.3 (21.0,30.0) |
| Domain | | | | | | | | |
| 1 | 5,204 | 82.3 (74.1,88.3) | 46.3 (35.0,58.1) | 21.7 (12.6,34.9) | 5,629 | 81.4 (76.5,85.6) | 54.9 (44.3,65.1) | 33.9 (25.5,43.3) |
| 2 | 5,257 | 81.5 (70.8,88.8) | 54.4 (40.7,67.4) | 34.1 (21.4,49.6) | 5,713 | 78.4 (73.0,83.0) | 44.3 (35.2,53.9) | 20.1 (15.9,25.2) |
| Risk zone | | | | | | | | |
| <250m | 4,487 | 86.0 (78.5,91.2) | 53.8 (42.9,64.3) | 28.9 (16.7,45.1) | 3,809 | 77.8 (72.4,82.4) | 45.7 (35.2,56.5) | 26.0 (19.1,34.4) |
| 250m to <1km | 2,860 | 86.4 (78.8,91.6) | 62.7 (48.8,74.8) | 38.0 ( 24.5,53.6) | 4,196 | 78.8 (70.9,85.0) | 53.6 (41.9,64.8) | 27.3 (20.5,35.4) |
| 1km to <2km | 3,114 | 73.8 (57.4,85.5) | 36.3 (20.5,55.6) | 19.5 (6.9,44.4) | 3,337 | 81.7 (77.4,85.3) | 42.8 (31.4,55.0) | 22.0 (15.3,30.5) |
| Socio economic status | | | | | | | | |
| Q1 (poorest) | 2,048 | 76.6 (66.7,84.2) | 50.2 (39.8,60.6) | 21.5 (13.1,33.1) | 2,300 | 71.8 (63.0,79.2) | 54.3 (42.9,65.3) | 30.2 (22.3,39.3) |

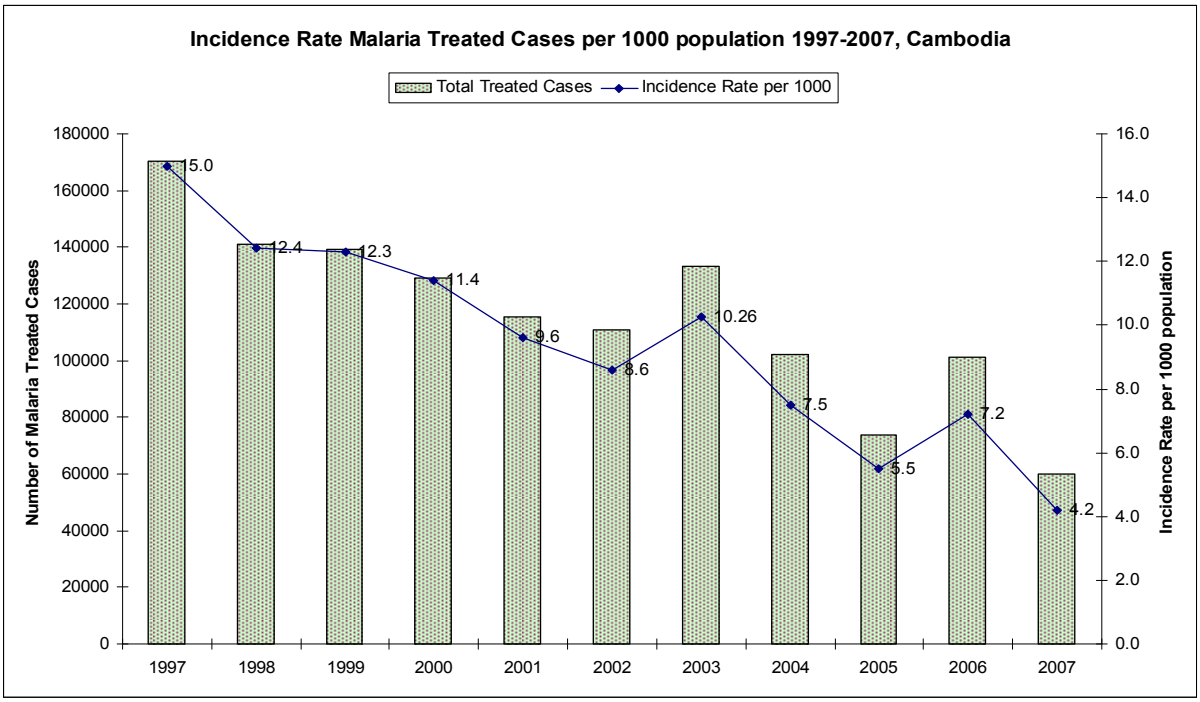
| | 2004 | | | | 2007 | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Any net % | Ever treated % | ITN % N | | Any net % | Ever treated % ITN | % |
| Q2 | 2,337 | 82.3 | 55.4 | 30.4 | 2,195 | 75.9 | 50.5 | 30.8 |
| | | (75.4,87.6) | (45.9,64.6) | (22.7,39.2) | | (69.6,81.2) | (41.1,58.9) | (23.9,38.7) |
| Q3 | 2,343 | 81.2 | 54.6 | 33.3 | 2,334 | 78.8 | 47.0 | 27.4 |
| | | (73.3,87.2) | (43.6,65.2) | (22.4, 46.) | | (73.6,83.2) | (38.2,55.9) | (20.8,35.1) |
| Q4 | 1,964 | 79.4 | 44.7 | 24.6 | 2,479 | 81.9 | 42.1 | 21.8 |
| | | (68.2,87.4) | (33.1,56.9) | (14.6,38.4) | | (78.5,84.9) | (34.3,50.4) | (17.5,26.9) |
| Q5 (least poor) | 1,769 | 89.8 | 50.2 | 35.9 | 2,034 | 87.9 | 49.1 | 17.3 |
| | | (80.4,95.0) | (33.1,67.2) | (21.4,53.6) | | (83.3,91.4) | (36.7,61.6) | (13.1,22.6) |

## 3.4. MALARIA INCIDENCE, PREVALENCE, MORBIDITY AND MORTALITY

### MALARIA INCIDENCE

The number of malaria treated cases in 2007 has declined dramatically when compared with the previous years back to 1997. There were 170,387 cases in 1997 and 59,848 cases in 2007, thus approximately an 84% drop in the 10 years. The incidence rate has decreased to only 4.2 per 1000 in 2007 from 15.0 per 1000 in 1997.

**Figure 3.14: Trends in the number of malaria treated cases and the national malaria incidence rate, 1997 – 2007**




Source: MoH/CNM (1997-2007)

## MALARIA PREVALENCE

The observed prevalence from the blood slide survey in 2004 was 4.4% and the observed prevalence from the blood slide survey in 2007 was 2.9%, but the differences are not significantly different (Table 3.9). They might or might not be real and a larger sample would be needed to settle the question.

**Table 3.9: Malaria prevalence and species**

| | 2004 | | | 2007 | | |
|---|---|---|---|---|---|---|
| | % | 95% CI | N (=5,696) | % | 95% CI | N (=6,273) |
| **Total** | 4.4 | 2.8, 6.8 | 255 | 2.9 | 1.8, 4.6 | 212 |
| *P.falciparium* | 2.9 | 1.7, 5.1 | 173 | 1.6 | 0.9, 2.7 | 125 |
| *P.vivax* | 1.3 | 0.8, 2.1 | 70 | 0.9 | 0.6, 1.6 | 69 |
| Mixed infection *Pf & Pv* | 0.1 | 0.04, 0.3 | 6 | 0.3 | 0.1, 0.9 | 17 |
| **Other** | 0.05 | 0.02, 0.1 | 6 | 0.01 | 0, 0.08 | 1 |
| Fever reported in last | | | N (=1,0461) | | | N (=1,1342) |
| 2 weeks | 12.9 | 11.6,14.3 | 1,316 | 10.8 | 9.8, 12.0 | 1,214 |

Source: MoH/CNM

There is a slight decline in the degree to which the risk of infections among species by age/sex in comparing in year 2004 and year 2007. The infection is especially high in adult men, 6.7% in 2004 decreasing to 3.2% in 2007 (Table 3.10). However, this change is it not significantly different between the two years.

**Table 3.10: Species by age/sex**

| Age/ Sex | N | Total % (N) | *P.falciparium* % (N) | *P.vivax* % (N) | Mixed infection *Pf & Pv* % (N) | Other % (N) |
|---|---|---|---|---|---|---|
| **2004** | | | | | | |
| <5yr | 830 | 4.2 (32) | 2.5 (22) | 1.7 (9) | 0.4 (1) | 0 - |
| 5 to <15 yr | 1,297 | 4.9 (73) | 3.0 (39) | 1.5 (29) | 0.3 (4) | 0.5 (1) |
| Male 15+ yr | 1,521 | 6.7 (93) | 4.8 (68) | 1.9 (23) | 0.01 (1) | 0.2 (1) |
| Female 15+ yr | 2,048 | 2.4 (57) | 1.7 (44) | 0.6 (9) | 0 | 0.1 (4) |
| **2007** | | | | | | |
| <5yr | 940 | 3.1 (39) | 2.0 (24) | 0.7 (10) | 0.4 (5) | 0 |
| 5 to <15 yr | 1,361 | 3.2 (64) | 1.7 (35) | 1.0 (20) | 0.4 (9) | 0 |
| Male 15+ yr | 1,781 | 3.2 (63) | 2.0 (39) | 1.1(21) | 0.1 (2) | 0.04 (1) |
| Female 15+ yr | 2,191 | 1.5 (46) | 0.8 (27) | 0.7 (18) | 0.03 (1) | 0 |

Source: MoH/CNM

## MALARIA MORBIDITY

The prevalence of severe anemia in children <5 years decreased from 1.3% in 2000 to 0.4% in 2005.

**Table 3.11: National trends in malaria morbidity**

| | 2000 | 2005 |
|---|---|---|
| Prevalence of severe anemia in <5 | 344 (1.3%) | 679 (0.4%) |

Source: National Demographic Health Survey 2000, 2005

## MALARIA MORTALITY

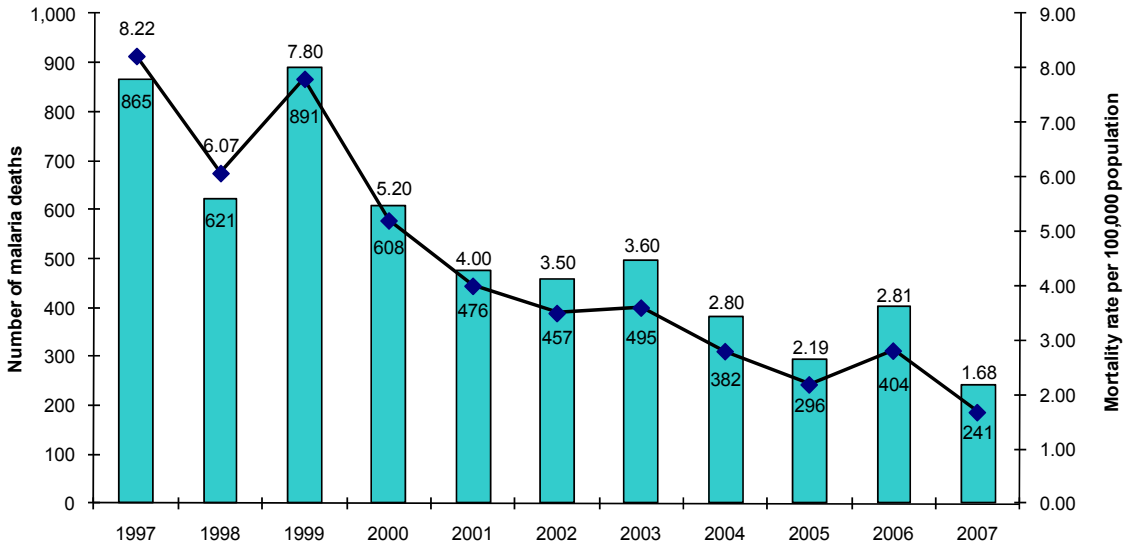
Malaria mortality rates (estimations) have decreased slightly from 3.7% in 2003 to 1.7% in 2007. This due to the number of malaria deaths which have diminished 51.3% between 2003 and 2007--241 deaths in 2007 as compared with 495 deaths in year 2003. For national trends of all-cause under-five mortality, the rate was 0.39 in 2003 and slightly increased to 0.44 in year 2007.

**Table 3.12: National trends in malaria mortality**

| 2003 | | 2004 | 2005 | 2006 | 2007 | Comment |
|---|---|---|---|---|---|---|
| Malaria attributable mortality rates, % (estimation) | 3.7 | 2.8 | 2.1 | 2.8 | 1.7 | Population denominators derived from First Revision Population Projections for Cambodia 1998-2020, National Institute of Statistics, Ministry of Planning |
| In low endemic or epidemic areas, malaria-attributed deaths reported in all age groups. | na | na | na | na | na | |
| In highly endemic areas, all-cause <5 mortality per 1000 children <5 years. | 0.39 | 0.37 | 0.44 | 0.45 | 0.44 | |

The number of malaria deaths decreased 72% from 1997 to 2007, that is, from 865 deaths in 1997 to 241 deaths in 1997 (Table 3.15). Malaria mortality rate has been dropped from 8.2 (1997) to 1.68 (2007) per 100,000.

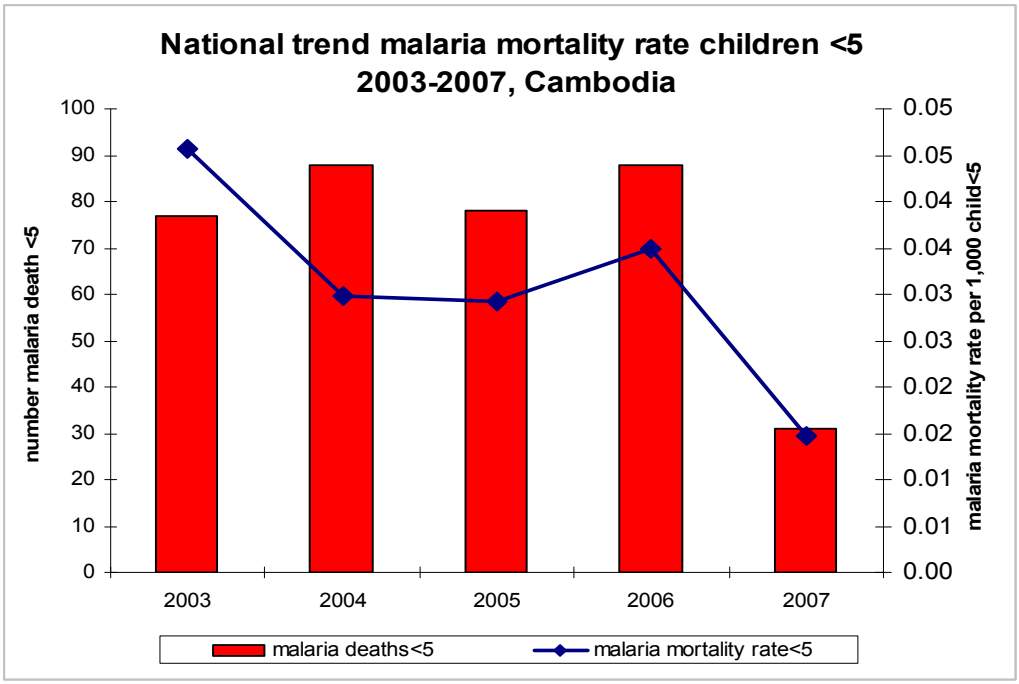
**Figure 3.15: Trends in national malaria mortality in Cambodia, by data sources 1997 – 2007**




Source: MoH/CNM (1997-2007)

The number of malaria deaths in children under 5 years has dropped from 88 deaths in 2006 to 30 deaths in 2007. The malaria mortality rate has decreased slightly from 0.04 to 0.02 per 100,000, in 2007 and 2006, respectively (Table 3.16).

**Figure 3.16: National trends in malaria mortality per 1000 children <5, 2003 – 2007**




Source: MoH/CNM (2003-2007)

## 3.5 HAS INCREASED MALARIA FUNDING LED TO A REDUCTION IN THE BURDEN OF DISEASE?

There is lack of detailed data of overall funding for malaria control prior to 2001; there is, however, a significant increase in funding from 2004 and onwards. The data presented here shows that prior to 2004 there was a gradual decline in malaria mortality and morbidity of 7.5% and 4.3% per year, respectively, and that this decline was accelerated after 2004 to 8.4% and 9.7%, respectively. The increase in funding resulted in a significant improvement in malaria prevention and treatment. This includes an increase in the coverage of ITNs, an increase in the population at risk that has access to early diagnosis and treatment through community-based village malaria workers, and an increase in the proportion of suspected malaria patients receiving a confirmed diagnosis.

An association between increased funding and a reduction in malaria morbidity and mortality is difficult to measure because the true burden of disease is unknown. This is mainly because the private sector is largely excluded, and so information on morbidity and mortality only pertains to patients in public facilities and to those who visit national hospitals that receive state subsidies. Since utilization of public health services constitutes only about a fourth of total utilization, the routine HIS data cannot be depended upon to accurately reflect the true burden of malaria. As the health system is gradually strengthened, and more recently a user fee exemption has been implemented, a greater proportion of patients are being seen in public health facilities. These changes must be taken into account in interpreting trends in morbidity and mortality; that is, as more patients with symptoms visit facilities, including those with less severe symptoms, these changes may appear to be a reduction in morbidity and mortality.

In conclusion, the increase in malaria funding has been associated with a decrease in malaria morbidity and mortality-- albeit difficult to quantify accurately-- and sustained funding to enable further scale-up of activities can be expected to result in a further reduction in the burden of disease.

# ANNEX 3.1

**Table A.1: Quality of malaria services: Case management—diagnostics**

| 2003 | | 2004 | 2005 | 2006 | 2007 | Comments |
|---|---|---|---|---|---|---|
| **Coverage** | | | | | | |
| % of Health Facilities (HF) with laboratory diagnosis capacity | 17% with micro.<br>83 % with RDTs | 17% with micro.<br>83 % with RDTs | 17% with micro.<br>83 % with RDTs | 17% with micro.<br>83 % with RDTs | 17% with micro.<br>83 % with RDTs | HF with micro.: RH,FDH and NH, HF with RDTs : all HCs, HPs |
| % of malaria hyper-endemic areas with laboratory diagnosis capacity (RDTs) | 7% | 44% | 47% | 47% | 47% | 315/676 endemic villages was selected to offer Dx and Tx in community |
| Total cases suspect (undergo clinical or lab diagnosis) | 133,064 | 102,316 | 73,726 | 101,003 | 59,848 | |
| # tested with microscopy and #(%) positive | 106,589<br>42,382<br>(39.76%) | 99,932<br>36,998<br>(37%) | 87,552<br>26,549<br>(30.32%) | 94,391<br>33,006<br>(34.96%) | 88,739<br>22,086<br>(24.89%) | |
| # tested with RDT and #(%) positive | 54,075<br>29,062<br>(53.74%) | 52,627<br>22,505<br>(42.76%) | 57,524<br>22,372<br>(38.89%) | 101,844<br>45,008<br>(44.19%) | 46,985<br>20,435<br>(43.49%) | |
| total clinical positive and % (not lab confirmed) | 61,620<br>(46.31%) | 42,813<br>(41.84%) | 24,805<br>(33.64%) | 22,989<br>(22.76%) | 17,327<br>(28.95%) | |
| Other | | | | | | |
| **Outputs** | | | | | | |
| # of HF with functioning microscope | 182 | 182 | 182 | 182 | 182 | HF with micro.: RH,FDH and NH |
| # of slides taken and read | 114416 | 107137 | 95007 | 101610 | 93273 | |
| # of RDTs taken and read | 51729 | 52617 | 57524 | 102520 | 46926 | |
| Other | | | | | | |
| **Process** | | | | | | |
| # laboratory technicians trained in microscopy | 46 | 258 | 239 | 217 | 380 | Public sector |
| # Health staff trained in RDT use | 476 | 904 | 735 | 591 | 242 | Public sector |
| # Drug outlet trained in RDT use | N/A | 667 | 865 | 901 | 778 | Private sector |
| Malaria diagnosis guidelines distributed | Yes | Yes | Yes | Yes | Yes | Included in lesson of training |
| **Inputs** | | | | | | |
| Finances made available for diagnostic work (yes/no for given year) | Yes | Yes | Yes | Yes | Yes | |
| Diagnosis guidelines developed (yes in given year | Yes | Yes | Yes | Yes | Yes | Included in curriculum training |
| #Microscopes purchased (Public) | N/A | N/A | 28 | N/A | N/A | Funding source: GF |
| #RDTs purchased (Public) | 810 kits (25tests/kit) NB | 6,322 kits (25tests/kit) NB | 9,555 kits (25tests/kit) NB/GF | 1,250 kit (25tests/kit) NB | 6,690 kits (25tests/kit) NB/GF | RDT: Paracheck |
| #RDTs purchased (Private) | N/A | 396,900 tests | 162,000 tests | 162,000 tests | 162,000 tests | RDT: Paracheck |

**Table A.2: Quality of malaria services: Case management—treatment**

| 2003 | | 2004 | 2005 | 2006 | 2007 | Comments |
|---|---|---|---|---|---|---|
| **Coverage** | | | | | | |
| % receiving prompt effective treatment according to national policy (under-5s in Africa; general population elsewhere) | N/A | N/A | N/A | N/A | N/A | |
| # of target groups who know where to go for testing and treatment | | 2259 (91.8) | | | 2202 (93.3) | (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| % of people seeking treatment from trained providers within 24 hours of developing a fever | | 690 (51.2) | | | 646 (66.9) | (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| **Outputs** | | | | | | |
| # people (children) with uncomplicated malaria receiving anti-malarial treatment (per policy) | 128,052 | 98,593 | 71,169 | 96,612 | 57,199 | |
| # people (children) with severe malarial receiving anti-malarial treatment | 5,012 | 3,723 | 2,557 | 4,391 | 2,649 | |
| % of public health facilities which maintain stocks of antimalarials with no out of date stocks | N/A | 42% | N/A | N/A | 62% | (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| % of public health facilities which maintain stocks of RDTs with no out of date stocks | | 42% | | | 44% | (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| **Process** | | | | | | |
| # anti-malarial treatment guidelines distributed | | 3,500 books | | | | In 2007, CNM has revised national treatment guideline and will distribute 4000 books in 2008 |
| # health care workers trained in anti-malarial guidelines | 476 | 628 | 608 | 188 | 242 | Public sector |
| # antimalarial treatments delivered (per population for a ratio) | N/A | N/A | N/A | N/A | N/A | |
| **Inputs** | | | | | | |
| Finances available | 830,379 | 1,581,353 | 745,350 | 1,06,9913 | | |
| Antimalarial treatment guidelines developed | | Yes | | | Yes | National treatment guideline was revised according to malarial drug policy up graded |
| # antimalarial drugs purchased (A+M) | A+M2: 11,600<br>A+M3: 21,000<br>A+M4: 55,900 | A+M2: 15,300<br>A+M3: 8,400<br>A+M4: 54,400 | A+M2: 30,041<br>A+M3: 29,945<br>A+M4: 143,217 | A+M2: 21,019<br>A+M3: 7,792<br>A+M4: 6,600 | A+M2: 12,734<br>A+M3: 8,715<br>A+M4: 49,221 | Funding source: NB & GF |
| Artemether | N/A | 110002 | N/A | 30000 | 159000 | Funding source: NB |
| Quinine ampoules | N/A | N/A | 20,000 | 8,000 | 3,000 | Funding source: NB |
| Quinine tablets | 600,000 | N/A | 300,000 | 200,000 | N/A | Funding source: NB |
| Tetracycline | N/A | 100,000 | 300,000 | 20,000 | N/A | Funding source: NB |
| Artesunate suppo. 50mg | N/A | N/A | 31,572 | 56,000 | 86,343 | Funding source: NB & GF |
| Other | | | | | | |

**Table A.3: Quality of malaria services: Insecticide-treated mosquito nets**

| | 2003 | 2004 2005 | 2006 | | 2007 | Comments |
|---|---|---|---|---|---|---|
| **Coverage** | | | | | | |
| HH ITN possession | | N (%) | | | N (%) | |
| Sufficient nets | | 2259 (17.5) | | | 2270 (58.6) | National Malaria Baseline Survey (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| Sufficient ITNs | | 2259 (5.0) | | | 2270 (6.4) | (NMBS) conducted in 2004 and follow up every 3 years, 2007 |
| ITN use (generally and by target group of <5s and pregnant women) | N/A | N/A | N/A | N/A | N/A | |
| Other | | | | | | |
| **Outputs** | | | | | | |
| # ITNs distributed | 151,998 | 124,793 | 329,738 | 101,761 | 156,680 | Public sector |
| # LLINs distributed | N/A | N/A | N/A | N/A | 120,598 | Public sector |
| # nets (re-) treated | 117,492 | 142,351 | 153,894 | 346,033 | 299,901 | Public sector |
| Volume of insecticides used for re-treatment | 10,780 (1L/btle) | 10,686 (1L/btle) | 9,673 (250ml/btle) | 8,956 (250ml/btle) | 9,132 (250ml/btle) | From 2003-04 used K-Othrine (1l/bottle) From 2005-07 used Fendona, ICON (250ml & 300ml/btle) |
| # LLINs sold | N/A | N/A | N/A | 10,907 | 113,197 | Private sector |
| # Insecticides sold | N/A | N/A | N/A | 11,780 | 133,370 | Private sector |
| Other | | | | | | |
| **Process** | | | | | | |
| # trained in distribution/retreatment | N/A | N/A | N/A | 354 | 400 | |
| # distribution points established | 2,717 Villages risk | 2,717 Villages risk | 2,392 Villages risk | 2,392 Villages risk | 3,296 Villages risk | From 2003-06 distance from the forest 1km>, 2007 up to 2km> |
| # ITN guidelines distributed | N/A | N/A | N/A | N/A | N/A | Distributed in early year 2008 |
| Other | | | | | | |
| **Inputs** | | | | | | |
| Finances available | 617,545 | 2,808,450 | 1,839,856 | 1,225,594 | | |
| ITN guidelines developed | N/A | N/A | N/A | N/A | N/A | |
| # of ITNs purchased | 140,000 (NB) | 47,400 (NB) | 264,934 (NB+GF) | 399,753 (NB+GF) | 119,390 (WB) | Public |
| # of LLINs purchased | N/A | N/A | N/A | 120,000 | 34,660 | Public |
| # of LLINs purchased | N/A | N/A | N/A | 100,000 | 120,700 | Private |
| Volume of insecticide purchased for ITN re-treatment | N/A | N/A | 12,636 (bottles) | 4,460 (bottles) | N/A | Public |
| Volume of insecticide purchased for ITN re-treatment | N/A | N/A | N/A | 100,000 | 120,000 | Private |
| Other | | | | | | |

**Table A.4: National Health Surveys**

| Name Year | | Report | Data | Health Services | Malaria |
|---|---|---|---|---|---|
| **Population-based health surveys (national)** | | | | | |
| Census | 2007 | Data analysis | 2008? | ? | ? |
| DHS | 2007 | Available | Yes | Some | Children with severe anemia |
| DHS | 2000 | Available | Yes | Some | Children with severe anemia |
| Projections for Cambodia National Institute of Statistics, Ministry of Planning | 1998-2020 | Available | | | First Revision Population |
| **Facility-based assessments** | | | | | |
| National Malaria baseline Survey | 2007 | | | | |
| | 2004 | Formally June 2005 | Yes | Some | All key malaria indicators |
| Communities based treatment for uncomplicated malaria in risk malaria villages, CNM | 2004 | Available | Yes | Some | Village Malaria Workers |

# Part II. District Comprehensive Assessment

# FOREWORD

The District Comprehensive Assessment (DCA) includes primary data collection activities pertaining to the three diseases in order to contribute detailed sub-national information from selected districts to the Cambodia Health Impact Evaluation. The DCA activties were conducted by the Psychosocial Organization (PSO), in collaboration with the Health Impact Evaluation Consortium.[5] Findings from DCA activities conducted in seven districts are presented in this report, including those from the Facility Census and from the Tuberculosis Patient Follow-up Study. Other primary data collection ativities were conducted, including facility and hospital record reviews, and an assessment of community based organizations, but analyses of these data so far have not yielded conclusive findings and are therefore not part of this report.

PSO would like to acknowledge the contribution of a number of organizations and individuals, including the technical assistance provided by the Health Impact Evaluation Consortium, Fern Greenwell, Measurement and Health Information Systems in WHO, for all of her facilitation, and Julio Ortuzar, Executive Director of SEPRO, Chile for training provided on data entry in CSPro.

The Cambodia Health Impact Evaluation was conducted under the auspices of the Royal Cambodian Ministry of Health and coordinated by the Country Task Force (CITF) headed by Dr. Or Vandine, Dr. Mary Mohan, and Dr. Kiv Sokha.

In particular, the following persons are recognized for their contributions to the Evaluation:

- Dr. Mary Mohan, Secretary CITF, M&E Advisor Global Fund Program Malaria, TB and HIV/AIDS, Cambodia
- Dr. Bunnak Poch, Data analysis consultant
- Savuth Sath M. Ed. National Coordinator
- Som Chansovandara, Kampong Speu, Provincial coordinator
- Ngim Solida, Udor Meanchey, Provincial coordinator
- Tem Soksan, Prey Veng, Provincial coordinator
- Hor Hen, Rattanak Kiri, Provincial coordinator
- Ngoun Sokchea, Battambang, Provincial coordinator
- Sang Kimtach, Svay rieng, Provincial coordinator
- DCA data collectors

The results of this GF Study are aimed at informing the Royal Cambodian Ministry of Health and other decision-makers in their planning relevant to the three diseases, and furthermore, based on experiences of implementing this evaluation, to inform future evaluation efforts.

Kamol VAN
DCA Principal Investigator

[5] The five members of the Health Impact Evaluation Consorium include Macro International, Harvard University, the African Population and Health Research Center, John Hopkins University, and the World Health Organization. The Consortium is under contract with the Global Fund to Fight AIDS, Tuberculosis and Malaria to conduct the Five-Year Evaluation.

# INTRODUCTION: DISTRICT COMPREHENSIVE ASSESSMENT

The Global Fund Five-Year Health Impact Evaluation is an assessment of collective health investments and their effects on levels and trends of disease burden, specifically HIV/AIDS, tuberculosis, malaria. Eight of the 18 Evaluation countries were selected to conduct the District Comprehensive Assessment (DCA), which entails primary data collection in selected districts in order to assess scale-up at the sub-national level. Cambodia was one of these eight countries. The DCA activities in Cambodia were funded through a subcontract between Macro International and the implementing institution, Psychosocial Services Organization (PSO).

The DCA methodology in Cambodia consists of primary data collection from various sources, in seven selected operational districts. The objective of collecting primary data from multiple sources in seven districts is to permit a better understanding of differences in scale-up across sub-national areas. DCA data were collected from a Health facility census, a TB patient follow-up study, a Community-Based Organization (CBO) survey. In addition, routine administrative data was abstracted from clinic registers as part of a facility and hospital record review, including data related to HIV services (ARV, PMTCT, VCCT), TB services (case notification and DOTS treatment), and malaria diagnosis and treatment services.

There were important lessons learned throughout the DCA implementation, especially with regards to coordination and communication challenges. First, although the role of the in-country Health Impact Evaluation Task Force, with multi-disciplinary representation from Royal Cambodian Ministry of Health and WHO Cambodia, was to guide the implementation of the DCA activities as part of the wider Health Impact Evaluation study, they were not always sufficiently informed as to provide the necessary guidance. Second, because timelines were an issue especially for the DCA data collection, there was not sufficient consultation between the implementing institution and relevant partners to ensure that the standard questionnaire instruments were adapted to the country situation. This was particularly the case for the Facility Census questionnaire which would have benefited from more extensive adaptation:

Despite these challenges, a meticulous job was done to ensure quality data collection in the field and a careful analysis of the data. Regarding the latter, a technical assistance visit was made by the WHO in order to consult with experts from the national diseases programs and the Health Impact Evaluation Task Force regarding the proper analysis and interpretation of the Health Facility Census data.

# SAMPLE OF OPERATIONAL DISTRICTS

Cambodia has 24 provinces and 76 operational districts (OD). The DCA work was carried out in seven ODs. These seven ODs were selected from seven different provinces to assure more even geographical distribution across the country. A purposive selection of these districts was made according to criteria described below.

## SELECTION CRITERIA

### GEOGRAPHIC CRITERIA

About 85% of Cambodia's population lives in rural areas, and the selection of ODs reflects this urban/rural allocation.

Identifying urban or rural districts for the study deserves further note. There is no unique urban-rural classification to be used at the OD level, although ODs are 'mainly urban' or 'mainly rural'. In all provinces, with the exception of Krong Preah Sihanouk, Krong Kaep, Krong Pailin, and Phnom Penh municipality, districts containing provincial headquarter towns are considered as 'mainly urban', while all the remaining areas in the country are considered 'mainly rural' (Cambodian Census 1998). The Cambodian Population Database 2004, classifies certain communes in an urban district as rural if they do not contain either the provincial headquarter or district headquarter and if they have small population size, low population density, and no urban infrastructure.

### DISEASE BURDEN CRITERIA

Selection of districts having a high burden of at least one of the three diseases, HIV, tuberculosis and/or malaria was desired since this is where scale-up of services was expected to have the highest potential impact on the burden of disease. Districts were explicitly selected to represent high burden of each disease in at least two districts. That is, two districts were selected with high burden of malaria, two with high burden of tuberculosis and two with high burden of HIV.

### SCALE-UP OF INTERVENTIONS CRITERIA

Scale-up refers to the collective interventions mounted against diseases, including financial resources invested to combat disease, curative or preventive programs, and local or community based efforts to reduce disease burden. In order to eventually analyse and compare differences in disease outcomes by level of scale-up, half of districts selected are considered 'high scale-up', and the other half are 'lower scale-up'. This was a qualitative distinction made by disease experts at the time of OD selection. Note that this characteristic ultimately was not used in the analysis as the number of non-pharmacy facilities in each OD (15-37 per OD) proved to be too few to determine patterns, especially since the total number is broken down further by public/private and/or type of facility.

## METHOD OF OD SELECTION

A group of 2-3 experts from each focal disease group, i.e., CENAT, NCHAD and CNM, provided their expert knowledge to select six rural ODs from six different provinces. The seventh OD selected is an urban one where substantial data collection activities had already been started for the pilot phase. In addition, to ensure an adequate number and mix of facilities, information was made

available on the number of health posts, health centers, and referral hospitals in each province/district.

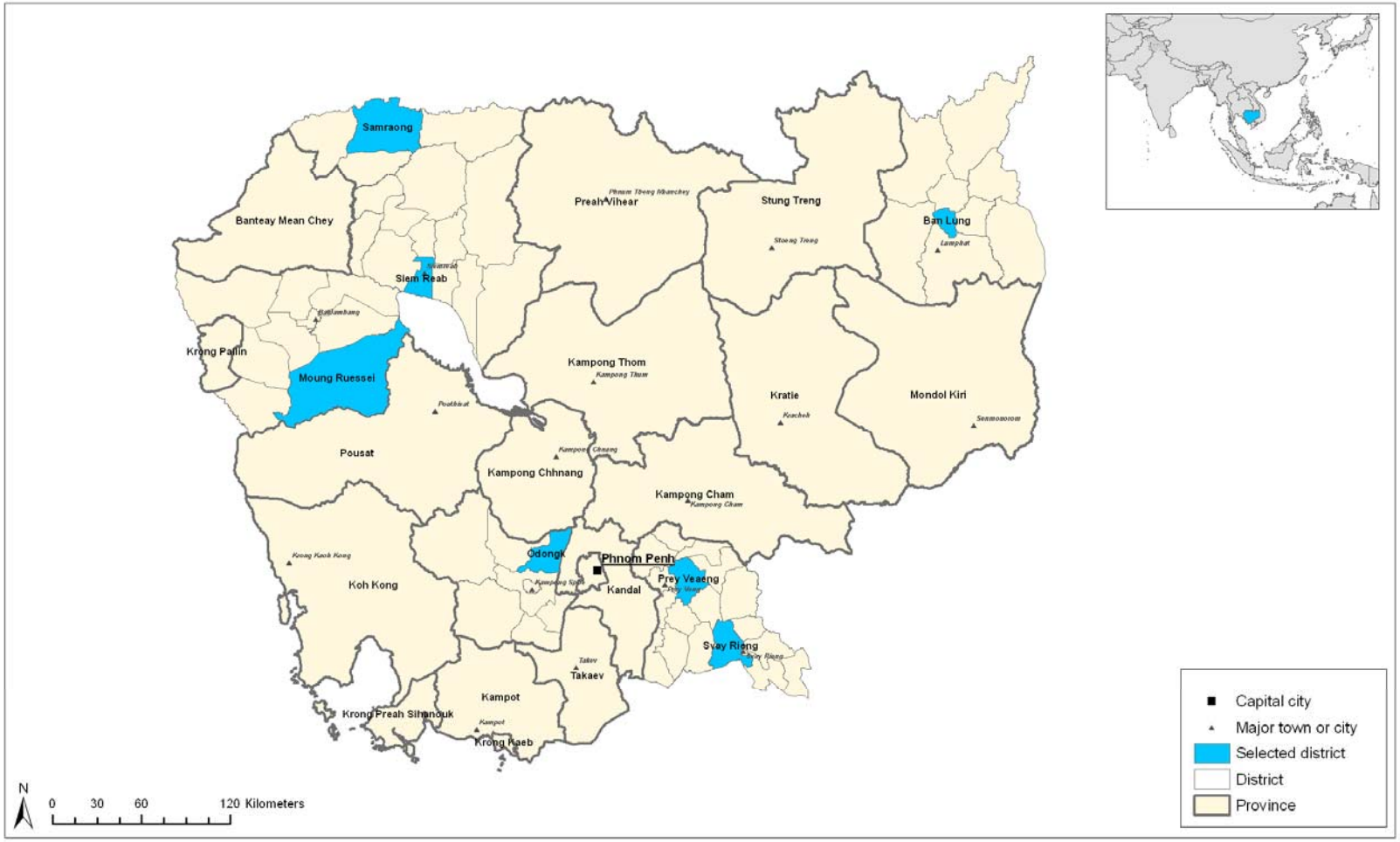
According to their disease expertise, each group of experts selected two ODs from two different provinces, according to the criteria described above. All DCA activities were carried out in all selected ODs, regardless of which disease experts made the selection. Disease experts commented also on disease burden in all selected districts. See results presented in Annex A, which also classifies the OD by level of scale-up (high, medium, low) by disease.

**SELECTED OPERATIONAL DISTRICTS**

Seven districts selected are classified as follows in terms of district scale up:

1. Moung Reussey OD in Moung Reussey District in Battambang
2. Ratanak Kiri OD in Ban Lung district in Ratanak Kiri
3. Svay Rieng OD in Svay Rieng district in Svay Rieng
4. Neak Loeung OD in Peam Ro district in Prey Veng
5. Udong OD in Udong district in Kampong Speu
6. Samroung OD in Samroung district in Oddar Meanchey
7. Siam Reab OD in Siam Reab district in Siam Reab.

## Cambodia: Districts selected for the Global Fund Evaluation, District Comprehensive Assessment




World Health Organization

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. 

Data Source: WHO/Global Fund
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

# District Comprehensive Assessment:

# Facility Census Report

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## 4.0 INTRODUCTION

Reliable data are necessary for monitoring and assessing health system performance and the scale-up of services, and their eventual impact on health care. It is thus beneficial to gather the relevant data directly from health facilities about the basic facility infrastructure, workforce, services offered, and available equipment and medicines.

The main objectives of the DCA Facility Census is to: (1) classify health facilities according to the type of facility and the administrative authority; (2) estimate hospital density and workforce density vis-à-vis the population at risk; 3) describe facility infrastructure; 4) estimate the density of particular services related to HIV, TB and malaria; and 5) to indicate the 'readiness' of facilities to offer particular services as regards their staff composition and training, availability of guidelines, and basic equipment, lab supplies and medicines. The results of the Facility Census provide a snapshop, at the sub-national level, of progress in scaling-up against the three diseases. This information may be helpful in making decisions about where or how to use future resources most efficiently.

A secondary objective of the DCA Facility Census was to instill or reinforce capacity in-country to conduct such research, including questionnaire design, data management, data analysis, and report writing.

### METHODOLOGY

#### SELECTION OF HEALTH FACILITIES AND RESPONDENTS

The selection of health facilities for data collection depends on types of facilities involved. Facilities were classified into two broad groups: the first group consists of facilities offering direct service delivery, including hospitals, health centers, private clinics and health posts; the second group consists of clinics, pharmacies, and drug stores. All health facilities from the first group, public facilities as well as private clinics, were included in the facility census. In each facility, the informant was either the chief or director of the facility.

About two-thirds of health facilities identified in the second group were included in the study. Their selection was based on a convenience sample, by which the first available 70%-75% of all clinics, pharmacies and drug stores were interviewed. In each facility, the informant was the owner of the facility.

#### DATA COLLECTION FIELD WORK

Data collection was carried out from October 2007 to March 2008 for Siem Reab district as a pilot exercise, and from 19th March to 19th May 2008 for the remaining six districts (in six provinces). The data were collected by means of face-to-face interview, via a standardized paper questionnaire.

#### DATA COLLECTION INSTRUMENTS

Standardized questionnaires for the facility survey were developed by the Health Impact Evaluation Consortium and were translated into Khmer language.

The Khmer version of the Facility Census questionnaire was tested in Siem Reap operational district hospital by the pilot test team to ensure that the interviewee understood the questions before the

DCA activities started. The questionnaire covers a variety of information including: facility characteristics, available services, equipment, infection control, work force, training guidelines, drugs and commodities, and laboratory. Unfortunately the final questionnaire did not benefit from country adaptation following the pilot exercise in Siem Reab, resulting in a lost opportunity to collect some pertinent information desired by the national disease programs.

#### DATA COLLECTORS

Seven groups of data collectors were established, with one team for each selected operational district. The teams consisted of one provincial coordinator and 8-12 interviewers depending on the number of health facilities in each district. Interviewers were recruited from a pool of university students and some professors with experience in conducting previous research by PSO.

To ensure the quality of field staff and data collection, the provincial coordinator and data collectors received training for five days at Royal University of Phnom Penh on the study objectives, methodology, questionnaires, and data recording. The training covered all necessary materials and the pilot test team provided a sample of completed questionnaires from Siem Reab.

#### DATA ENTRY

The collected data were entered into CSPro software by five data entry clerks who received a one-week training in CSPro data entry by experts from SERPRO (Chile) provided by Macro, at a CNAT meeting venue, in April, 2008. The data entry was carried out in an office at the Royal University of Phnom Penh. For data quality assurance, the data were entered twice by different clerks. Then, the two data sets were compared and corrected for all errors and inconsistencies found.

#### DATA ANALYSIS

All data were analyzed by means of descriptive techniques and took into account recommendations from disease experts at CNM, CENAT and NCHADS, as well as other experts on the Task Force.

## 4.1 RESULTS

### DISTRICT HEALTH FACILITY CHARACTERISTICS

#### DESCRIPTION OF FACILITIES

A total of 447 health facilities were visited in the seven selected operational districts, 437 having completed interviews.[6] Table 1.1 shows the breakdown of the type of facility by district.

In Cambodia, there is one referral hospital in each district in general, except large cities that are highly urbanized, like Phnom Penh and Siem Reab. These urban cities may have more than one referral hospital that have different specializations (children hospitals, for instance). The DCA Facility Census data show that there is only one referral hospital in each of the six districts, with the exception of Samroung district in Oddar Meanchey province, where there are two hospitals (Table 1.1). One is the national second level hospital located in the provincial town. The other has been

[6] Ten pharmacies/drug stores and 2 clinics did not have completed interviews and are thus excluded from further analyses.

recently upgraded from a local health center into a hospital because it was located in the area of former Khmer Rouge stronghold in Anlong Veng that is far from the provincial town and is populated by a significant number of people. This former health center has good infrastructure, is well-equipped and staff perform multiple functional services as in a hospital with in-patient beds and delivery service.

It is noted that Siem Reab district has several hospitals, including private and NGO-run hospitals. They were not included in the facility survey for unclear reasons. As Siem Reab was the pilot test site and only one hospital was selected for the pilot study, it is possible that other hospitals were neglected to be visited after the pilot study was complete.

Health centers play a significant role in providing health services to Cambodian people in both urban and rural areas; while health posts are more common in more remote areas, such as those in Ban Lung. There are 97 rural and urban health centers, most of which are located in rural areas. The five urban health centers are found to be in Svay Rieng (one health center), in Siem Reab (2 health centers), and in Samrong (2 health centers). Svay Rieng has the highest number (20) and Udong has the lowest number of health centers (9). There 18 health posts, among which 15 are located in Ratanak Kiri district (Table 4.1). Privately administered clinics also play a prominent role in providing health services-- a total of 84 clinics which count for about 40% of all non-pharmacy/drugstore facilities.

About 30% of non-pharmacy facilities in the selected districts are located in urban areas. They are comprised mainly of second and tertiary level hospitals, urban health centers and about half of all clinics. The primary facilities in rural areas include the rural health centers, health posts and about half of all clinics.

All pharmacies and drug stores are privately administered. There are a total of 134 pharmacies and 94 drug stores in the seven districts. Siem Reab district has the highest number of pharmacies (35 pharmacies), while Svay Rieng district has the lowest number of pharmacies (9 pharmacies) but the highest number of drug stores (54 drug stores).

**Table 4.1: Number of facilities by type of facility by operational district and province**

| | Operational District (province) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Moung Reussey | Rattanakiri | Svay Rieng | Neak Loeung | Udong | Samroung | Siem Reab | Total |
| Type of facility | | | | | | | | |
| Tertiary Care | | | | | | | | |
| Third level (tertiary) hospital | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| Secondary Care | | | | | | | | |
| Second level referral hospital | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 5 |
| First level hospital | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Urban health center | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 5 |
| Rural health center | 13 | 10 | 19 | 16 | 9 | 11 | 14 | 92 |
| Primary Care | | | | | | | | |
| Clinic | 15 | 6 | 12 | 20 | 5 | 15 | 11 | 84 |
| Health post | 0 | 15 | 0 | 0 | 0 | 2 | 1 | 18 |
| **Sub-total: number of non-pharmacy health facilities** | **30** | **32** | **33** | **37** | **15** | **33** | **29** | **207** |
| Others | | | | | | | | |
| Second (higher) level pharmacy | 13 | 5 | 2 | 9 | 2 | 26 | 32 | 87 |
| First (lower) level pharmacy | 7 | 11 | 7 | 5 | 11 | 3 | 3 | 47 |
| Drug store | 16 | 7 | 53 | 17 | 1 | 0 | 0 | 94 |
| Total number of facilities | 65 | 55 | 95 | 68 | 29 | 61 | 64 | 437 |

Source: DCA Facility Census 2008

## HOSPITAL DENSITY

Since an operational district is defined on the basis of population size, it is not expected that hospital-related proportions will vary tremendously between ODs. However, to the extent that the OD populations are growing or diminishing over time, these indicators will vary more widely. Table 4.2 shows that, overall, in selected operational districts there is less than one hospital (first, secondary or tertiary level) per 100,000 people, except for Samroung with 1.3 hospitals per 100,000 people. The number of in-patient beds varies between 1 and 10 beds per 10,000 people with an average of 7 beds. The number of maternity beds varies between 1 and 3 per 10,000 people, and the number of delivery beds between 1 and 2 beds per 10,000 people-- with the density being much higher when just the number of pregnant women is taken into account (not shown). It should be noted that facilities omitted from the census in Seam Reab operational district results in an underestimate in density for all of the density indicators.

**Table 4.2: Hospital density**

**Hospitals and hospital beds (in-patient, maternity, delivery) per 10,000 population**

| Operational District | OD population in 2008 | Hospitals per 100,000 population | Hospital in-patient beds per 10,000 population | Hospital maternity beds per 10,000 population | Hospital delivery beds per 10,000 population |
|---|---|---|---|---|---|
| Moung Reussey | 175,951 | 0.57 | 7.73 | 1.42 | 1.76 |
| Rotanak Kiri | 183,497 | 0.54 | 5.83 | 0.82 | 1.63 |
| Svay Rieng | 309,473 | 0.32 | 2.16 | 1.13 | 1.03 |
| Neak Loeung | 288,595 | 0.35 | 1.94 | 1.91 | 0.83 |
| Udong | 137,299 | 0.73 | 1.17 | 1.68 | 0.87 |
| Samroung | 154,762 | 1.29 | 9.82 | 2.71 | 2.00 |
| Seam Reab | 131,835 | 0.76 | 4.55 | 2.28 | 2.35 |
| Total | 1,381,412 | 0.09 | 0.89 | 2.51 | 2.13 |

Source: DCA Facility Census 2008

## HEALTH WORKFORCE DENSITY

With regard to health workforce density, the Facility Census in seven operational districts shows that there are, overall, about 2-3 medical doctors, 1-2 assistant medical officers, 4-6 certified nurses, 2-3 nursing aids, 2-3 registered midwives, 1 laboratory technician, and less than one laboratory assistant per 10,000 population (Table 4.3).

Furthermore, Table 4.3 shows that the highest workforce density is found to be in all provincial town districts and lowest workforce density is likely to be in rural districts. For example, Ban Lung (the provincial town of Ratanak Kiri province) and Seam Reab have respectively 5 and 2.3 medical doctors per 10,000 population, compared to less than one medical doctor per 10,000 people in Moung Reussey, Svay Rieng and Udong which have the most rural areas among all seven districts. Ratanak Kiri and Samroung have notably more certified nurses per 10,000 people than other ODs, Samroung also scores higher than average for certified nurses and lab technicians.

**Table 4.3: Health workforce density**

**Types of fulltime workforce per 10,000 population by district**

| Operational district | Population | Medical doctors/ physician | Clinical officers/ assistant medical officer | Certified/ registered nurses | Nursing assistant/ nursing aides | Certified/ registered midwives | Laboratory technician/ technologist | Lab assistants | Health workers *(1)* |
|---|---|---|---|---|---|---|---|---|---|
| Moung Reussey | 175,951 | 0.85 | 0.68 | 4.26 | 0.00 | 3.18 | 0.34 | 0.00 | 3.18 |
| Rotanak Kiri | 131,835 | 5.31 | 1.06 | 5.08 | 1.97 | 3.34 | 0.91 | 0.38 | 3.34 |
| Svay Rieng | 309,473 | 0.68 | 0.48 | 3.72 | 3.04 | 2.07 | 0.29 | 0.19 | 2.07 |
| Neak Loeung | 183,497 | 2.02 | 0.93 | 3.81 | 1.25 | 2.67 | 0.27 | 0.05 | 2.67 |
| Udong | 137,299 | 0.80 | 1.46 | 1.75 | 1.60 | 1.24 | 0.36 | 0.00 | 1.24 |
| Samroung | 154,762 | 1.81 | 2.07 | 4.72 | 3.23 | 3.23 | 0.78 | 0.52 | 3.23 |
| Seam Reab | 288,595 | 2.29 | 0.35 | 3.78 | 1.70 | 2.36 | 0.35 | 0.17 | 2.36 |
| Total | 1,381,412 | 1.80 | 0.87 | 3.86 | 1.91 | 2.52 | 0.43 | 0.18 | 2.52 |

Source: DCA Facility Census 2008

*(1)* Includes doctors/physicians, clinical officers, nurses, and midwives

## INFRASTRUCTURE

Health facilities were assessed in terms of their basic elements of infrastructure. The basic elements are not a requirement for providing quality services, but basic infrastructure is nevertheless an indicator of investment in health. That is, as overall living conditions improve, so should basic amenities in health facilities be present. Basic elements of infrastructure include having an uninterrupted power supply (via a grid, functional generator with fuel, battery) improved running water source within 500 meters, communication capacity, emergency transport, and overnight beds for 24 hour observation. Table 4.4 shows that all virtually all facilities have communication potential, and overall more than half of facilities have power, water and observation beds. Facilities in Rattanakiri and Oudong were least likely to have power (41% and 53%, respectively); fewer than 60% of facilities in Neak Loeung, Mong Russei and surprisingly, Siem Reab, had access to improved water source. Emergency transport, such as an ambulance, was rarely available however facilities are known to arrange transport through other public sources which is more cost effective than maintaining their own vehicle. Overall, about 25% of facilities had access to internet (not shown).

**Table 4.4: Among non-pharmacy facilities, the percent with basic infrastructure elements, by district**

| Operational district | Power | Water | Communication | Emergency transport | Overnight observation beds | Facilities (non-pharmacy) |
|---|---|---|---|---|---|---|
| Mong Russei | 0.62 | 0.59 | 1.00 | 0.03 | 0.79 | 29 |
| Oudong | 0.53 | 0.80 | 1.00 | 0.07 | 0.40 | 15 |
| Neak Loeung | 0.81 | 0.54 | 1.00 | 0.03 | 0.49 | 37 |
| Rattanakiri | 0.41 | 0.72 | 1.00 | 0.09 | 0.55 | 32 |
| Siem Reab | 0.83 | 0.59 | 1.00 | 0.28 | 0.59 | 29 |
| Svay Rieng | 0.61 | 0.76 | 0.97 | 0.07 | 0.33 | 33 |
| Samrong | 0.84 | 0.78 | 1.00 | 0.09 | 0.69 | 32 |
| All districts | 0.68 | 0.67 | 1.00 | 0.09 | 0.55 | 207 |

Source: DCA Facility Census 2008

Examining the same infrastructure elements by type of facility, it is not surprising that all hospitals have all of the basic elements of infrastructure (Table 4.4a). Private clinics also report having these basic infrastructure elements. Rural health centers and health posts are most likely to lack continuous power, an accessible improved water source, and overnight beds for observation.

**Table 4.4a: Among non-pharmacy facilities, the percent with basic elements of infrastructure**

| Type of facility | Power | Water | Communication | Emergency transport | Overnight observation beds | Facilities (non-pharmacy) |
|---|---|---|---|---|---|---|
| Hospital 3rd level | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 2 |
| Referral hospital 2nd level | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 5 |
| Hospital 1st level | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1 |
| Urban health center | 1.00 | 1.00 | 1.00 | 0.00 | 0.60 | 5 |
| Rural health center | 0.49 | 0.51 | 1.00 | 0.02 | 0.46 | 92 |
| Clinic | 0.98 | 0.85 | 0.99 | 0.11 | 0.68 | 84 |
| Health post | 0.00 | 0.44 | 1.00 | 0.06 | 0.24 | 18 |
| All facilities | 0.68 | 0.67 | 1.00 | 0.09 | 0.55 | 207 |

Source: DCA Facility Census 2008

In terms of elements of higher infrastructure in hospitals, virtually all hospitals in the study benefit from having radiology equipment, basic operating room equipment, anesthesia machine, oxygen and infusion (Table 4.5). The referral hospital in Ban Lung district lacked the most elements (radio, anesthesia machine and infusion), the other referral hospitals lacked at most one or two items (data not shown.

**Table 4.5: Among hospitals, the percent with elements of higher level health infrastructure**

| Type of facility | Radiology | Operating room and basic OR equip. | Anesthesia machine | Oxygen system/ cylinders | Intravenous infusion kits | Hospitals |
|---|---|---|---|---|---|---|
| Hospital 3rd level | 1.00 | 1.00 | 0.50 | 1.00 | 1.00 | 2 |
| Referral hospital 2nd level | 0.80 | 1.00 | 0.40 | 0.80 | 0.80 | 5 |
| Hospital 1st level | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1 |
| All facilities | 0.75 | 1.00 | 0.38 | 0.88 | 0.88 | 8 |

Source: DCA-Facility Census 2008

## HIV/AIDS

### HIV SERVICES

Among the 207 non-pharmacy health facilities interviewed (see Table 1.1), 87 reported providing any HIV service including HIV testing and counseling, PMTCT and OI/ART services (Table 4.6). Oudong and Rattanakiri reported the fewest facilities offering these services (4 and 6 facilities, respectively) and Svay Rieng reported the most (20 facilities) (data not shown). Thirty-one percent of facilities with HIV services are located in urban areas, a distribution which reflects the mostly-rural

characteristics of the sampled 7 districts. Almost three-quarters of the facilities are publicly administered, and the remaining quarter is administered through private clinics.

**Table 4.6: Among facilities providing any HIV service, the percent urban and the percent administered by the government (public)**

| Type of facility | Percent urban | Percent public | Facilities w/ HIV services |
|---|---|---|---|
| Hospital 3rd level | 1.00 | 1.00 | 2 |
| Referral hospital 2nd level | 0.80 | 1.00 | 5 |
| Hospital 1st level | 0.00 | 1.00 | 1 |
| Urban health center | 1.00 | 1.00 | 4 |
| Rural health center | 0.00 | 1.00 | 47 |
| Clinic (private) | 0.62 | 0.04 | 26 |
| Health post | 0.00 | 1.00 | 2 |
| All facilities | 0.29 | 0.71 | 87 |

Source: DCA Facility census, Cambodia 2008

Private clinics are not regulated by the government and therefore will be analyzed separately in this report from the public ones. Since provision of 'any HIV service including counseling and/or clinical services' is self-reported by the visited facility, special attention is given in the analysis to the 'qualifying components' including services, training and guidelines, and available supplies that facilities report to have. It is expected that there is a smaller proportion of private clinics than public facilities that have each of these components, and thus indicating that they don't provide the breadth of services/training/equipment that the government facilities have. In some cases a facility is assumed to have misreported providing a particular service if it has none of the relevant components. For each service (VCT, PMTCT and ART) the presence of relevant elements will be checked.

Table 4.7 presents the number of facilities among those reporting to have any HIV services that report having specific services, including HIV testing and counseling (HTC), antiretroviral therapy (ART), and prevention of mother to child transmission (PMTCT).

**Table 4.7: Among all facilities reporting to offer specific HIV services, the number of official HTC, ART and PMTCT sites**

| Type of facility | All HTC *(1)* | Official HTC | All ART | Official ART | All PMTCT*(2)* | Official PMTCT | All facilities w/ HIV services |
|---|---|---|---|---|---|---|---|
| Hospital 3rd level | 2 | 2 | 2 | 2 | 1 | 1 | 2 |
| Referral hospital 2nd level | 5 | 5 | 3 | 3 | 4 | 4 | 5 |
| Hospital 1st level | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| Urban health center | 3 | 2 | 1 | 0 | 4 | 2 | 4 |
| Rural health center | 21 | 6 | 4 | 0 | 36 | 10 | 47 |
| Clinic | 9 | 0 | 4 | 0 | 20 | 0 | 26 |
| Health post | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| All facilities | 41 | 16 | 14 | 5 | 67 | 17 | 87 |

Source: DCA Facility Census, Cambodia 2008

*(1)* A facility is considered to provide HTC if it reports providing both testing & counseling services

*(2)* A facility is considered to provide PMTCT services if it reports providing at least counseling to pregnant women

Sixteen of the 41 facilities that report to provide both HIV testing and HIV counseling are official government sites. Five of the 14 facilities reporting to provide ART are official government sites, and 17 of the 67 facilities reporting PMTCT services are official government sites. Clinics do not count among any of the official sites if they are not regulated by the government.

## HIV TESTING AND COUNSELING SERVICES

The importance of properly trained staff within a recent time period and the availability of written guidelines are indicators of quality of service delivery. Among the 87 facilities providing any HIV service, a total of 41 reported providing HIV testing and counseling services (HTC). Sixteen of these are official government HTC sites. Table 4.8 presents the proportion of these sites that have at least one trained staff in HIV testing and counseling within the past two years, and guidelines available at the time of the interview. The availability of HIV tests is a necessary supply to have available for HTC clients.

**Table 4.8: Among HIV testing and counseling sites, the percentage with at least one trained staff and guidelines, by official sites & others reporting to provide HTC**

| | Training & guidelines | | Equipment & supplies | | | Facilities |
|---|---|---|---|---|---|---|
| Type of facility | Trained staff: HTC | Guidelines: HTC | HIV rapid test | Elisa reader/ scanner | Any HIV testing supplies/ equip. | w/ HTC services |
| | Official HTC sites | | | | | |
| Hospital 3rd level | 0.50 | 1.00 | 50.0 | 50.0 | 50.0 | 2 |
| Referral hospital 2nd level | 1.00 | 1.00 | 60.0 | 20.0 | 80.0 | 5 |
| Hospital 1st level | 1.00 | . | 100.0 | 100.0 | 100.0 | 1 |
| Urban health center | 1.00 | 0.50 | 50.0 | 50.0 | 50.0 | 2 |
| Rural health center | 1.00 | 1.00 | 66.7 | 16.7 | 83.3 | 6 |
| Total official HTC facilities | 0.94 | 0.93 | 62.5 | 31.3 | 75.0 | 16 |
| | Other facilities reporting HTC | | | | | |
| Urban health center | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 1 |
| Rural health center | 0.60 | 0.47 | 13.3 | 6.7 | 13.3 | 15 |
| Clinic | 0.22 | 0.44 | 88.9 | 55.6 | 88.9 | 9 |
| Total other HTC facilities | 0.44 | 0.44 | 40.0 | 24.0 | 40.0 | 25 |

Source: DCA Facility Census 2008

Almost all official sites report having trained staff in HTC and available guidelines whereas less than half of the non-official sites have them. In particular, few of the nine clinics reported to have this service element. The most common HIV test available is the rapid test. Two-thirds of official HTC sites have these available as compared to less than a quarter of non-official sites. A third of official sites report having ELISA testing capability, but these are not HIV testing methods widely promoted in government sites, and nor are they common in private sites. Overall, 75% of official sites had testing supplies available at the time of interview and only 40% of the non-official sites. Most of the nine private clinics, however, did have rapid tests available.

It is noted that there is one urban health center (Somrong HC) that reports providing HTC services but has none of these measures of quality of services. This non-official site may have answered they provide HTC because it is part of the linked-response project and draws blood to be sent to the nearest VCCT. Such sites do not have HIV rapid testing on site and are not expected to have received complete VCCT training nor have VCCT guidelines on site. Rather, they are likely to have received a three days orientation workshop or group pre-test information for pregnant women; the blood drawn at the health center will be sent to the nearest VCCT site for HIV testing.

## PMTCT SERVICES

The minimum package of PMTCT services includes HIV counseling services for pregnant women. There are 17 official PMTCT sites in the seven selected districts and the levels of training and guideline availability are high-- 94% of sites had at least one staff member trained in PMTCT within the past two years and also had guidelines available (Table 4.9). This is contrasted with a much smaller proportion of staff trained and guidelines present in non-official sites (about one quarter).

**Table 4.9: Among PMTCT sites, the percentage with at least one trained staff and guidelines, by official sites and others reporting to provide PMTCT**

| | Trained staff & guidelines | | Basic drugs | | |
|---|---|---|---|---|---|
| Type of facility | Percent with staff trained in PMTCT | Percent with PMTCT guidelines | Percent with AZT | Percent with NVP | Facilities with PMTCT services |
| | Official PMTCT sites | | | | |
| Hospital 3rd level | 1.00 | 1.00 | 1.00 | 1.00 | 1 |
| Referral hospital 2nd level | 1.00 | 1.00 | 1.00 | 1.00 | 4 |
| Urban health center | 1.00 | 1.00 | . | . | 2 |
| Rural health center | 0.90 | 0.90 | . | . | 10 |
| Total official PMTCT sites | 0.94 | 0.94 | 1.00 | 1.00 | 17 |
| | Other facilities reporting PMTCT | | | | |
| Hospital 1st level | 0.00 | 0.00 | . | . | 1 |
| Urban health center | 0.00 | 0.00 | . | . | 2 |
| Rural health center | 0.35 | 0.38 | . | . | 26 |
| Clinic | 0.15 | 0.15 | 1.00 | 1.00 | 20 |
| Health post | 0.00 | 0.00 | . | . | 1 |
| Total other PMTCT sites | 0.24 | 0.26 | 1.00 | 1.00 | 50 |

Source: DCA Facility Census 2008

Some PMTCT sites also provide testing, including 88% of official sites and 40% of other sites (data not shown). During the interview, PMTCT sites that reported providing any ART services were asked about basic drugs available; among those sites 100% had AZT and Nevirapine available. Note that sites that did not report providing any ART were not asked about drugs and therefore show missing cases (this filter in the standard questionnaire has since been fixed).

Among other, non-official sites, it appears that the hospital, urban and rural health centers, and the health post do not offer formal PMTCT services. That is, they report counseling pregnant women, and in some cases testing pregnant women for HIV, but they do not have the specially trained staff, guidelines or drugs. This is a potentially detrimental situation if these facilities are counseling pregnant women but are not properly trained or otherwise equipped to do so. Likewise, several private clinics report at least some proportion having relevant training, guidelines, and HIV testing, but they are all dispensing AZT and NVP drugs in an unregulated fashion.

## ART SERVICES

Few health facilities in the study areas offer ART services, and only a few of them are officially designated ART sites. Among 14 facilities reporting to offer ART services only five are official ones. Because staff working at these ART sites are likely to manage a variety of complex, clinical situations related to patient care they are therefore likely to be trained on a variety of related topics. Facilities offering ART were asked how many staff they had who were trained in the three following areas: opportunistic infections, management of TB/HIV co-infection, and post-exposure prophylaxis (PEP). The availability of guidelines is ascertained for each of these areas and presented in Table 4.10.

**Table 4.10: Among facilities reporting to have ART, the percentage with at least one trained staff and guidelines, by official sites & others reporting to provide ART**

| Type of facility | Trained staff: OI | Guidelines: OI | Trained staff: TB/HIV | Guidelines: TB/HIV | Trained staff: PEP | Guidelines: PEP | Facilities w/ ART services |
|---|---|---|---|---|---|---|---|
| | Official ART sites | | | | | | |
| Hospital 3rd level | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 2 |
| Referral hospital 2nd level | 1.00 | 1.00 | 1.00 | 1.00 | 0.67 | 0.67 | 3 |
| Total official ART sites | 0.80 | 0.80 | 0.80 | 0.80 | 0.60 | 0.60 | 5 |
| | Other facilities reporting ART | | | | | | |
| Urban health center | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1 |
| Rural health center | 1.00 | 1.00 | 0.25 | 0.25 | 0.75 | 0.75 | 4 |
| Clinic | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 |
| Total other ART sites | 0.56 | 0.56 | 0.22 | 0.22 | 0.44 | 0.44 | 9 |

Source: DCA Facility Census 2008

The proportion of sites having at least one trained staff and available guidelines is higher in official sites than other sites, across each of the three training topics (note, Svay Rieng RH is the one official 3rd level referral hospital lacking trained staff and guidelines). Government urban and rural health centers are not officially-designated ART sites, nonetheless, several of these five health centers report having trained staff. None of them had ARV drugs at the time of visit. On the other hand, private clinics have no trained staff or available guidelines in any of the areas assessed, but in terms of availability of drugs they all have AZT which indicates they have at least some store of ARV drugs (Table 4.11).

Table 4.11 ascertains the availability of the most popular ART regimens in ART sites. The five official sites all have first line regimen, alternate first line regimen, and AZT available at the time of visit. Second line treatment, however, is only available at one referral hospital. The clinics that have first line regimens are Ly Huor Suor (Neak Loeng) and Examine and Treatment PC (Svay Rieng); these same two clinics also report having alternate first line treatment.

**Table 4.11: Among HIV testing and counseling sites, the percentage with standard and alternate first line ART regimens, second line regimen, and AZT, by official sites & others reporting to provide ART**

| Type of facility | First line regimen *(1)* | Alternate first line regimen *(2)* | AZT | Second line treatment*(3)* | Facilities w/ ART services |
|---|---|---|---|---|---|
| | Official ART sites | | | | |
| Hospital 3rd level | 1.00 | 1.00 | 1.00 | 0.00 | 2 |
| Referral hospital 2nd level | 1.00 | 1.00 | 1.00 | 0.33 | 3 |
| Total official ART sites | 1.00 | 1.00 | 1.00 | 0.25 | 5 |
| | Other facilities reporting ART | | | | |
| Urban health center | 0.00 | 0.00 | . | . | 1 |
| Rural health center | 0.00 | 0.00 | . | . | 4 |
| Clinic | 0.50 | 0.50 | 1.00 | 0.00 | 4 |
| Total other ART sites | 0.22 | 0.22 | 1.00 | 0.00 | 9 |

Source: DCA Facility Census 2008

*(1)* Standard first line regimen AZT+3TC+NVP or d4T+3TC+NVP

*(2)* Alternate first line regimen d4T+3TC+EFZ

*(3)* Second line treatment including LPV/RTV

## INTEGRATION OF HIV SERVICES

The following three tables show the extent to which HIV-related services are harmonized to provide one-stop care and treatment for an infected person in the selected districts. Clients seeking testing and counseling in about half of HTC sites in these districts may also access ART treatment in the same site; and about a quarter of HTC sites also provide at least PMTCT counseling (and possibility testing and treatment services for pregnant women) (Table 4.12).

**Table 4.12: Among official HIV testing and counseling sites, the percentage with other official HIV services**

| Type of facility | Percentage with ART | Percentage with PMTCT: HIV counseling pregnancy women | Official HTC sites |
|---|---|---|---|
| Hospital 3rd level | 0.50 | 1.00 | 2 |
| Referral hospital 2nd level | 0.80 | 0.60 | 5 |
| Hospital 1st level | 0.00 | 0.00 | 1 |
| Urban health center | 1.00 | 0.00 | 2 |
| Rural health center | 0.33 | 0.00 | 6 |
| All districts | 0.53 | 0.27 | 15 |

For official PMTCT sites there is a similar break-down in integration of services as with HTC. All hospitals and urban health centers providing PMTCT also provide HTC--overall about half of PMTCT sites provide HTC. If a pregnant woman is tested HIV positive then most likely she will seek treatment elsewhere-- overall about a quarter of PMTCT sites also provide ART (Table 4.13).

**Table 4.13: Among official PMTCT sites, the percentage with other official HIV services**

| Type of facility | Percentage with HTC | Percentage with ART | Official PMTCT sites |
|---|---|---|---|
| Hospital 3rd level | 1.00 | 1.00 | 1 |
| Referral hospital 2nd level | 1.00 | 0.75 | 4 |
| Urban health center | 1.00 | 0.00 | 2 |
| Rural health center | 0.20 | 0.00 | 10 |
| All districts | 0.53 | 0.24 | 17 |

The official ART sites are fewer in number but are most likely to have other services integrated. All of the referral hospitals offering ART also offer the other services, and one of the two tertiary hospitals (Table 4.14).

**Table 4.14: Among official ART sites, the percentage with other official HIV services**

| Type of facility | Percentage with PMTCT | Percentage with HTC: HIV counseling pregnancy women | Official ART sites |
|---|---|---|---|
| Hospital 3rd level | 0.50 | 0.50 | 2 |
| Referral hospital 2nd level | 1.00 | 1.00 | 3 |
| All districts | 0.80 | 0.80 | 5 |

Because of the relatively low HIV prevalence (0.9% in 2006) official ART services are offered at Rreferral hospital level only.

## CONNECTION BETWEEN HIV SERVICES AND COMMUNITY PREVENTION SERVICES

There are many local and international NGOs or CBOs in Cambodia providing home-based care to people living with HIV/AIDS, as well providing counseling and awareness of HIV/AIDS to Cambodian people. Many of these NGOs work closely with state-run health facilities on several issues ranging from referring suspected patients for testing to PMTCT and ART.

Table 4.15 shows that 44% of 207 health facilities (excluding pharmacies and drug stores) in the study area have working relationships with an NGO or CBO. The percentage is lowest in three districts: Moung Reussey and Oddar Meanchey with 33.3% and Ratanak Kiri with 34%. In contrast, the percentage is relatively high in Siem Reab (62.1%) and in Svay Rieng (57.6%).

**Table 4.15: Connection between HIV services and community prevention services**

**Percentage of all facilities and those offering HIV services with a working relationship with any NGO or CBO for HIV prevention activities, by district, Cambodia 2008**

| Operational district | Percentage of all facilities with HIV-NGO relationship | Total number of facilities with HIV-NGO relationship | Number of health facilities |
|---|---|---|---|
| Moung Reussey | 33.3 | 10.0 | 30 |
| Ratanak Kiri | 34.4 | 11.0 | 32 |
| Svay Rieng | 57.6 | 19.0 | 33 |
| Neak Loeung | 45.9 | 17.0 | 37 |
| Kampong Speu | 40.0 | 6.0 | 15 |
| Samroung | 33.3 | 11.0 | 33 |
| Siem Reap | 62.1 | 18.0 | 29 |
| Total | 44.0 | 92.0 | 207 |

The number of inhabitants in a given area and its distance from the capital city may partially explain the differences in the percentages of health facilities having working relationship with NGOs or CBOs. ODs that are highly populated like Svay Rieng, or more highly developed like Siem Reab, are more likely places where NGOs are established. On the other hand, Moung Reussey in Battambang, Ban Lung in Ratanak Kiri, and Samroung in Oddar Meanchey are very far away from the Capital city Phnom Penh and thus may be less attractive areas for NGOs to be established.

## TUBERCULOSIS

### TB SERVICES

Cambodia is ranked by the WHO as one of the top 22 countries with the highest burden of tuberculosis. It has benefited from full DOTS coverage in public treatment facilities since over a decade ago. Among the 207 non-pharmacy health facilities interviewed (see Table 4.16), 125 of them are public facilities. Official tuberculosis (TB) services are offered in 93% of these public facilities, or a total of 116 TB service points. In addition, twenty-four private facilities reported offering TB services but are excluded from further analysis upon advice of National TB program managers. The public TB sites in this analysis represent 83% of all facilities offering TB treatment, including public and private.

**Table 4.16: Among public facilities, the number and percent with any TB services, by type of facility**

| Type of public facility | Percent of public facilities w/ TB services | Number of public facilities w/ TB services | Total number of public health facilities |
|---|---|---|---|
| Hospital 3rd level | 1.00 | 2 | 2 |
| Referral hospital 2nd level | 1.00 | 5 | 5 |
| Hospital 1st level | 1.00 | 1 | 1 |
| Urban health center | 0.80 | 4 | 5 |
| Rural health center | 1.00 | 92 | 92 |
| Clinic * | 1.00 | 2 | 2 |
| Health post | 0.56 | 10 | 18 |
| All facilities | 0.93 | 116 | 125 |

* 'Clinics' are usually classified as private facilities except the following 2 clinics are classified as public:

BA CHOANG, Prey Veng (Neak Loeung); and TA VEANG HC, Rotanak Kiri (Rattanakiri)

To further describe the TB sites in the seven selected districts, Table 4.17 presents sites by district and by location. The number of TB sites range from 10 to 21 per district, which is positively correlated with the population, as expected. That is, the largest number of sites, which are in Svay Rieng, Rattanakiri and Neak Loeng, are also in operational districts with the highest populations. Overall, 11% of sites in these districts are in urban areas, with more urbanized districts such as Siem Reab having the highest proportion located in urban areas (18%). Mont Russei has no urban TB site which reflects the rural nature of this operational district in Battambong province.

**Table 4.17: Among public facilities with any TB service, the percent that are urban, by district**

| Operational district | Percentage urban facilities | Public health facilities with TB |
|---|---|---|
| Mong Russei | 0.0% | 14 |
| Oudong | 10.0% | 10 |
| Neak Loeung | 11.1% | 18 |
| Rattanakiri | 10.5% | 19 |
| Siem Reab | 17.6% | 17 |
| Svay Rieng | 9.5% | 21 |
| Samrong | 17.6% | 17 |
| All facilities | 11.2% | 116 |

Source: DCA Facility Census, Cambodia 2008

## DESCRIPTION OF TB SERVICE SITES

DOTS, smear microscopy, and patient follow-up constitute three main TB services in this study. On-site sputum smear examinations are carried out in 68% of sites; other sites have procedures by which sputum are collected, packaged and sent to an examination site, and the results are then sent back and communicated to the patient at the original site.

Among the 116 facilities, almost all of them offer DOTS treatment, which is not surprising since Cambodia has had 100% DOTS coverage since 2001. Rattanakiri has an inexplicably low percentage

of DOTS treatment, 42%, as well as a low overall treatment of 58%. Programme managers may want to inquire further to understand whether this reflects the real situation or else possible misreporting. MDR-TB diagnosis is very low, as expected, since this service is on the verge of being rolled out in the forthcoming year.

**Table 4.18: Among public facilities with any TB service, the percentage with specific services, by district**

| Operational district | Diagnosis: SS microscopy | Diagnosis: MDR-TB | Any treatment | DOTS treatment | Public facilities with TB services |
|---|---|---|---|---|---|
| Mong Russei | 0.57 | 0.00 | 1.00 | 0.93 | 14 |
| Oudong | 0.50 | 0.00 | 1.00 | 1.00 | 10 |
| Neak Loeung | 0.94 | 0.11 | 1.00 | 1.00 | 18 |
| Rattanakiri | 0.74 | 0.05 | 0.58 | 0.42 | 19 |
| Siem Reab | 0.24 | 0.00 | 0.94 | 1.00 | 17 |
| Svay Rieng | 0.91 | 0.05 | 1.00 | 0.95 | 21 |
| Samrong | 0.71 | 0.06 | 0.88 | 0.81 | 17 |
| All public TB sites | 0.68 | 0.04 | 0.90 | 0.86 | 116 |

Source: DCA Facility Census, Cambodia 2008

## Staff Trained in TB Services

Staff training in TB diagnosis-treatment and TB management, and available guidelines, are indicators of quality of service delivery. Most of the facilities offering TB services have at least one staff member who received training in diagnosis and treatment of TB the past two years-- over 90% overall, with Rattanakiri again being the operational district with the lowest proportion of TB sites trained staff. The percentage of facilities trained in each OD on MDR-TB and TB/HIV are about half or less; most sites have not yet undergone concentrated training on these services because they are only recently being rolled out. It is possible that staff have learned about these topics in the more general TB Diagnosis and treatment training sessions.

**Table 4.19: Among public facilities with any TB service, the percent with at least one trained staff, by district**

| | TB Diagnosis & treatment | | MDR-TB | | TB/HIV | | Public facilities with TB services |
|---|---|---|---|---|---|---|---|
| Operational district | At least one trained staff | Guidelines available | At least one trained staff | Guidelines available | At least one trained staff | Guidelines available | |
| Mong Russei | 0.93 | 0.93 | 0.21 | 0.21 | 0.57 | 0.57 | 14 |
| Oudong | 0.90 | 0.90 | 0.50 | 0.50 | 0.30 | 0.30 | 10 |
| Neak Loeung | 0.89 | 0.00 | 0.06 | 0.00 | 0.28 | 0.00 | 18 |
| Rattanakiri | 0.79 | 0.74 | 0.32 | 0.26 | 0.26 | 0.21 | 19 |
| Siem Reab | 0.94 | 1.00 | 0.35 | 0.12 | 0.77 | 0.94 | 17 |
| Svay Rieng | 1.00 | 1.00 | 0.91 | 0.91 | 0.86 | 0.84 | 21 |
| Samrong | 0.94 | 0.88 | 0.71 | 0.69 | 0.53 | 0.56 | 17 |
| All public TB sites | 0.91 | 0.77 | 0.45 | 0.40 | 0.53 | 0.50 | 116 |

Source: DCA Facility Census, Cambodia 2008

Guidelines for each of the three topics are available in fewer sites than where trained staff is found. It is notable that in Svay Rieng the proportion of trained staff is almost 100% across the three focus areas, including a high proportion of available guidelines. Neak Loeng, on the other hand, appears to not have any guidelines available. These data were double-checked and they are not missing; since Neak Loeng is the only OD where 0 sites have any guidelines, it is probably worth checking on the next supervisory visit.

### Availability of Drugs

Availability of first line drugs is another necessary component to adequate service delivery. First line drugs include Ethambutol, Isoniazid, Pyrazinamide and Rifampcin. During the interview the respondent at the facility was asked if each drug was available on the on the day of the visit.

**Table 4.20: Among public facilities with any TB service, the percent with specific drugs, by operational district**

| Operational district | % Ethambutol 100or 400mg | % Isoniazid 100or 300mg | % Pyraz 400mg | % Rifampcin 150or 300mg | % Isoniazid+ Rifampcin | % All drugs (Eth+Ison+ Pyra+Rif) | Public facilities w 7 TB services |
|---|---|---|---|---|---|---|---|
| Mong Russei | 1.00 | 0.36 | 1.00 | 0.36 | 0.86 | 0.93 | 14 |
| Oudong | 1.00 | 0.10 | 0.90 | 0.30 | 0.80 | 0.70 | 10 |
| Neak Loeung | 0.83 | 0.29 | 0.83 | 0.56 | 0.67 | 0.67 | 18 |
| Rattanakiri | 0.42 | 0.37 | 0.42 | 0.37 | 0.26 | 0.42 | 19 |
| Siem Reab | 1.00 | 0.00 | 0.94 | 0.00 | 0.94 | 0.94 | 17 |
| Svay Rieng | 1.00 | 0.14 | 0.91 | 0.29 | 0.91 | 0.81 | 21 |
| Samrong | 1.00 | 0.18 | 0.94 | 0.13 | 0.94 | 0.94 | 17 |
| All public TB sites | 0.88 | 0.21 | 0.84 | 0.29 | 0.76 | 0.77 | 116 |

Source: DCA Facility Census, Cambodia 2008

Although the overall percentage is high for the availability of Ethambutol and Pyrazinamide, it is much lower for Isoniazid and Rifampcin (Table 4.2.3). The discrepancy is probably due to the fact that a large portion of facilities use the combination drug, which shows a much higher availability.

It is notable, again, that the proportions of Rattanakiri sites are significantly lower than the other ODs and pulls down the overall average. This OD has been low on all indicators assessed and further enquiry is necessary to better understand the situation.

## MALARIA

### MALARIA SERVICES

The seven selected operational districts are classified according to their level of malaria endemicity: highly endemic ODs include Ratanak Kiri and Samrong; low endemic ODs include Mong Russei, Oudong and Siem Reab; and non-endemic areas include Neak Loeng and Svay Rieng ODs. The non-endemic areas are likely to have malaria services because of mobile populations who may contract the disease as well as possibly having malaria epidemics in some areas. There are 144 health facilities in these ODs that report offering malaria services at the time of the survey (Table 4.21).

The two major services aspects, malaria diagnosis and malaria treatment, are offered in over 90% of facilities and both services are usually integrated in the same site.

**Table 4.21: Among facilities with any malaria service, percentage with diagnostic & treatment services**

| Operational district | Percent with malaria diagnosis | Percent with malaria treatment | Percent with both | Facilities with malaria services |
|---|---|---|---|---|
| **High malaria endemic** | **96.4** | **100.0** | **96.4** | **55** |
| ..Rotanak Kiri | 96.3 | 100.0 | 96.3 | 27 |
| ..Samrong | 96.4 | 100.0 | 96.4 | 28 |
| **Low malaria endemic** | **86.9** | **98.4** | **85.2** | **61** |
| ..Mong Russei | 100.0 | 95.5 | 95.5 | 22 |
| ..Oudong | 91.7 | 100.0 | 91.7 | 12 |
| ..Siem Reab | 74.1 | 100.0 | 74.1 | 27 |
| **Non endemic** | **92.9** | **89.3** | **82.1** | **28** |
| ..Neak Loeung | 92.3 | 92.3 | 84.6 | 13 |
| ..Svay Rieng | 93.3 | 86.7 | 80.0 | 15 |
| All facilities with malaria services | 91.7 | 97.2 | 88.9 | 144 |

Source: DCA Facility Census, Cambodia 2008

Among the 144 facilities offering malaria services, about 60% are publicly administered (n=87) and the remainder are private clinics (n=57) (Table 4.22). About 90% of both the publicly and privately administered facilities offered both diagnosis and treatment services. Table 5.1.2 also shows a breakdown of the public sites by the type of facility. Most public malaria services are offered through rural health centers and health posts; this reflects the largely rural nature of the selected ODs as well as an apparent equitable dispersion of services among rural populations which are generally at higher risk of contracting malaria. For the 57 private clinics, about half are located in rural areas (27) and half in urban areas (30) (data not shown).

**Table 4.22: Among public facilities with any malaria service, percentage with diagnostic & treatment services, by type of facility**

| Type of public facility | % Malaria diagnosis | % Malaria treatment | % Both diagnosis & treatment | Public facilities with malaria services |
|---|---|---|---|---|
| | Public facilities | | | |
| Hospital 3rd level | 100.0 | 100.0 | 100.0 | 2 |
| Referral hospital 2nd level | 80.0 | 100.0 | 80.0 | 5 |
| Hospital 1st level | 100.0 | 100.0 | 100.0 | 1 |
| Urban health center | 75.0 | 100.0 | 75.0 | 4 |
| Rural health center | 90.2 | 96.7 | 86.9 | 61 |
| Clinic* | 100.0 | 100.0 | 100.0 | 1 |
| Health post | 100.0 | 100.0 | 100.0 | 13 |
| Public facilities with malaria services | 90.7 | 97.7 | 88.4 | 87 |
| | Private facilities | | | |
| Private clinics with malaria services | 93.0 | 96.5 | 89.5 | 57 |

Source: DCA Facility Census, Cambodia 2008

* TA VEANG health center is classified as a public clinic

## MALARIA TRAINED STAFF AND GUIDELINES

Table 4.23 presents the proportion of facilities benefiting from at least one staff member trained in the last two years in malaria diagnosis and treatment, and the availability of guidelines for diagnosis and treatment. Seventy-one percent of facilities in highly malarious areas have at least one trained staff, compared to about half of facilities in low and non-endemic areas. Oudong and Svay Rieng ODs both have a large percentage of trained staff even though they are not located in the highest endemic areas (92% and 80%, respectively).

**Table 4.23: Among all facilities with any malaria service, percentage with at least one trained staff and guidelines in malaria diagnosis and treatment**

| Operational district | Percent with trained staff | Percent with guidelines | Percent with both | Facilities with malaria services |
|---|---|---|---|---|
| **High malaria endemic** | **70.9** | **62.3** | **62.3** | **55** |
| .. Rotanak Kiri | 74.1 | 61.5 | 61.5 | 27 |
| .. Samrong | 67.9 | 63 | 63 | 28 |
| **Low malaria endemic** | **50.8** | **73.8** | **49.2** | **61** |
| .. Mong Russei | 45.5 | 45.5 | 45.5 | 22 |
| .. Oudong | 91.7 | 83.3 | 83.3 | 12 |
| .. Siem Reab | 37 | 92.6 | 37 | 27 |
| **Non endemic** | **53.6** | **44.4** | **44.4** | **28** |
| .. Neak Loeung | 23.1 | 0 | 0 | 13 |
| .. Svay Rieng | 80 | 80 | 80 | 15 |
| All facilities with malaria services | 59 | 63.8 | 53.2 | 144 |

Source: DCA Facility Census, Cambodia 2008

Overall public clinics are three-times more likely to have at least one recently trained staff compared to private clinics (79% vs. 28%, respectively) (Table 4.24). Public clinics are also twice as likely to have guidelines available for malaria diagnosis and treatment. Among public facilities, hospitals and health posts benefit from trained staff more than urban and rural health centers.

**Table 4.24: Among public and private facilities with any malaria service, the percentage with at least one trained staff and guidelines in malaria diagnosis and treatment**

| Type of facility | Percent with trained staff | Percent with guidelines | Percent with both | Facilities with malaria services |
|---|---|---|---|---|
| | | Public facilities | | |
| Hospital 3rd level | 50.0 | 100.0 | 50.0 | 2 |
| Referral hospital 2nd level | 100.0 | 75.0 | 75.0 | 5 |
| Hospital 1st level | 100.0 | . | . | 1 |
| Urban health center | 50.0 | 50.0 | 50.0 | 4 |
| Rural health center | 77.0 | 80.3 | 70.5 | 61 |
| Clinic | 100.0 | 100.0 | 100.0 | 1 |
| Health post | 92.3 | 83.3 | 83.3 | 13 |
| Public facilities with malaria services | 79.3 | 79.8 | 71.4 | 87 |
| | | Private facilities | | |
| Private clinics with malaria services | 28.1 | 40.4 | 26.3 | 57 |

## MALARIA DIAGNOSTIC AND TREATMENT SUPPLIES

Rapid diagnostic tests (RDT) are the most common means of diagnostic testing: half of facilities use RDT versus one-third that use microscopes. Siem Reab and Svay Rieng ODs are exceptional in that facilities in these ODs are more likely to have a microscope than RDT. Only 20% of facilities have both means of diagnosing malaria (Table 4.25).

**Table 4.25: Among facilities with any malaria service, the percentage with microscopy and rapid testing**

| Operational district | Percent with microscope | Percent with RDT | Percent with both | Facilities with malaria services |
|---|---|---|---|---|
| **High malaria endemic** | **40.7** | **74.5** | **31.5** | **55** |
| .. Rotanak Kiri | 38.5 | 66.7 | 23.1 | 27 |
| .. Samrong | 42.9 | 82.1 | 39.3 | 28 |
| **Low malaria endemic** | **26.2** | **36.1** | **8.2** | **61** |
| .. Mong Russei | 9.1 | 59.1 | 4.5 | 22 |
| .. Oudong | 41.7 | 41.7 | 8.3 | 12 |
| .. Siem Reab | 33.3 | 14.8 | 11.1 | 27 |
| **Non endemic** | **35.7** | **35.7** | **21.4** | **28** |
| .. Neak Loeung | 38.5 | 53.8 | 30.8 | 13 |
| .. Svay Rieng | 33.3 | 20.0 | 13.3 | 15 |
| All facilities with malaria services | 33.6 | 50.7 | 19.6 | 144 |

Source: DCA Facility Census, Cambodia 2008

Similar patterns are manifested for other supplies such as slides with covers (49% of facilities in high endemic areas vs 25% in low endemic areas), GIEMSA stain supplies (24% of facilities in high endemic areas vs 20% in low endemic areas), and field stain supplies (15% of facilities in high endemic areas vs 10% in low endemic areas) (data not shown).

Public facilities are more likely to have a microscope and or RDT. Urban health centers-- of which there are only 4 -- have least access to diagnostic equipment (Table 4.26). This likely reflects the lesser burden of malaria in urban sites compared to rural areas.

**Table 4.26: Among facilities with any malaria service, percent with at least one trained staff and guidelines in malaria management**

| Type of facility | Percent with microscope | Percent with RDT | Percent with both | Facilities with malaria services |
|---|---|---|---|---|
| | | Public facilities | | |
| Hospital 3rd level | 100.0 | 50.0 | 50.0 | 2 |
| Referral hospital 2nd level | 100.0 | 40.0 | 40.0 | 5 |
| Hospital 1st level | 100.0 | 100.0 | 100.0 | 1 |
| Urban health center | 25.0 | 50.0 | 0.0 | 4 |
| Rural health center | 36.1 | 54.1 | 21.3 | 61 |
| Clinic | 100.0 | 100.0 | 100.0 | 1 |
| Health post | 0.0 | 53.8 | 0.0 | 13 |
| All public facilities | 37.2 | 54.0 | 20.9 | 87 |
| | | Private facilities | | |
| Private clinic | 28.1 | 45.6 | 17.5 | 57 |

Source: DCA Facility Census, Cambodia 2008

On the other hand, private clinics in the selected districts appear to be better equipped with other supplies including slides with covers, GIEMSA stain and field stain.

**Table 4.27: Among facilities with any malaria service, the percentage with specific lab tests, by administrative authority**

| Administrative authority | Percent with slides with covers | Percent with GIEMSA stain | Percent with field stain | Facilities with malaria services |
|---|---|---|---|---|
| | | Public facilities | | |
| Hospital 3rd level | 100.0 | 50.0 | 0.0 | 2 |
| Referral hospital 2nd level | 100.0 | 80.0 | 40.0 | 5 |
| Hospital 1st level | 100.0 | 100.0 | . | 1 |
| Urban health center | 25.0 | 0.0 | 0.0 | 4 |
| Rural health center | 32.8 | 14.8 | 6.6 | 61 |
| Clinic | 100.0 | 100.0 | 0.0 | 1 |
| Health post | 15.4 | 0.0 | 0.0 | 13 |
| All districts | 36.8 | 18.4 | 7.0 | 87 |
| | | Private facilities | | |
| Private clinic | 35.1 | 26.3 | 21.1 | 57 |

Source: DCA Facility Census, Cambodia 2008

It is unfortunate that the questionnaire instrument was not adapted to capture the specific first line drug used in Cambodia-- since the name of drugs in the questionnaire were not recognizable or pertinent to the Cambodia situation, most responses were for 'other malaria drug' available at the time of the interview. Although this may represent an underestimate of first line drug availability, it is informative that over 80% of public facilities with malaria services had malaria drugs available at the time of the visit, versus 68% of private clinics (Table 4.28).

**Table 4.28: Among public facilities with any malaria service, percent with malaria drugs, by type of facility**

| Type of facility | Percent with 'other' malaria drugs | Facilities with malaria services |
|---|---|---|
| | Public facilities | |
| Hospital 3rd level | 100.0 | 2 |
| Referral hospital 2nd level | 80.0 | 5 |
| Hospital 1st level | 100.0 | 1 |
| Urban health center | 100.0 | 4 |
| Rural health center | 78.3 | 61 |
| Clinic | 100.0 | 1 |
| Health post | 84.6 | 13 |
| All public facilities | 81.4 | 87 |
| | Private facilities | |
| Private clinic | 68.4 | 57 |

## 4.2 CONCLUSIONS

This study was one primary data collection activity in the context of the District Comprehensive Assessment. Its value lies in the empirical, up-to-date information gathered directly from health facilities in selected districts, providing a rich snapshot of the current situation regarding service infrastructure, the array of services offered, and the availability of staff, guidelines and medicines. Such information at the district level should serve program managers and national decision makers to better assess and guide where and how best to use resources to continue scaling up services and improving service delivery potential.

It is furthermore acknowledged that there were valuable lessons learned in the course of this activity. First, closer coordination between disease experts and the team conducting the survey and evaluation is needed. This coordination is most necessary during the early planning stages including questionnaire design and interviewer training, and again in later phases of analysis and interpretation of the findings. On the other hand, during the fieldwork phase it was beneficial that the autonomous survey team ensured objective data collection and dedicated oversight of timeliness and data quality.

The experience in the seven districts could be expanded to other districts for eventual coverage of the whole country. Such a 'rolling facility assessment' could provide a full facility database every 3-5 years, and provide trend information when the same districts are ultimately revisited. Building on the capacity gained from the initial experience in seven districts, a subsequent effort in another sample of districts would likely be a worthy investment and an opportunity to make improvements.

# District Comprehensive Assessment:

# TB Patient Follow-up Report

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## 5.0 INTRODUCTION

The TB follow-up survey has two main objectives:

1 To confirm the reported treatment outcomes for patients who have already completed treatment (within the last 0-3 months);
2 To characterize medium-term health outcomes (e.g., persistent cure, relapse or mortality) 12 to 24 months after treatment completion.

Specifically, the survey aims to answer the following questions:

1 What is the correspondence between outcomes measured 0-3 months after treatment completion, and recorded outcomes at the end of treatment?
2 What proportion of patients who are declared cured or completed treatment in the last 12-24 months are smear positive and/or culture positive and/or have symptoms?
3 What is the survival of patients who are declared cured or completed treatment, at 12-24 months after treatment completion?

## 5.1 METHODOLOGY

The methodology used in this study was adapted from the original protocol developed by Vree et al (2007) in Vietnam.[7]

### STUDY LOCATIONS

TB follow-up data were collected from all seven operational districts (OD) selected for the District Comprehensive Assessment (DCA). These operational districts, and the corresponding administrative districts and provinces are:

| | Operational District | District | Province |
|---|---|---|---|
| 1 | Moung Reussey | Moung Reussey | Battambang |
| 2 | Ratanak Kiri | Ban Lung | Ratanak Kiri |
| 3 | Svay Rieng | Svay Rieng | Svay Rieng |
| 4 | Neak Loeung | Peam Ro | Prey Veng |
| 5 | Udong | Udong | Kampong Speu |
| 6 | Samroung | Samroung | Oddar Meanchey |
| 7 | Siam Reab | Siam Reab | Siam Reab |

### SELECTION OF TB FOLLOW-UP RESPONDENTS

For the TB follow-up study, TB patients aged 18 years and older who received complete TB treatment from a referral hospital or health center in their district were the population of the study. Given the recommendation from Health Impact Evaluation Consortium[8], a sample of 53 TB

[7] M. Vree, N. T. Huong, B. D. Duong, D. N. Sy, L. N. Van, N. V. Hung, N. V. Co, M. W. Borgdorff, F. G. Cobelens. 2007. Survival and relapse rate of tuberculosis patients who successfully completed treatment in Vietnam. *INT J TUBERC LUNG DIS* 11(4):392–397.
[8] See Study Protocol, Version December 11, 2007 or its latest version.

patients was targeted for the TB follow-up study in each district and their selection was performed separately for patients who had finished treatment for 0-3 months and for 12-24 months prior to the survey date (13 patients and 39 patients in each group, respectively).

Convenience sampling was proposed to select TB patients in both groups as follows: First, the list of enrolled patients and their lab results was obtained from the referral hospital and used as the sampling frame for selection. Then, the first 13 enrolled patients who met the 0-3 months time-since-treatment-completion criterion were selected for the first group. Similarly, the first 39 enrolled patients who met the 12-24 months time-since-treatment-completion criterion were selected for the inclusion in the second group.

The actual selection of respondents deserves attention here (Table 5.1). In each district, the interviewers with the local health staff at the health center selected a total of 52 TB patients for follow-up (Column A, Table 1). Given that all 52 patients in all districts were 'successfully interviewed' (Column B, Table 1), it is suspected that the selection method employed may not have followed the proposed method. Rather, it appears that instead of pre-selecting patients to follow-up, that data collectors sought patients who were available to interview, and stopped when the target number of 52 respondents was reached. Also recorded was the number of TB patients for which interviews were not conducted for one of three reasons: The first reason was the loss of the respondents due to death (11 patients died); the second was the refusal or unmet respondents (109 patients), meaning that these patients either refused to come to the health center for the interview or were not met during the visit; and the third was the error in the timing criteria of declaring cured patients (29 patients).

**Table 5.1: Sample and sample size of TB follow-up respondents**

**TB patients who completed TB treatment 0-3 or 12-24 months prior to the survey**

| | | | N of TB patients not interviewed by reasons | | | |
|---|---|---|---|---|---|---|
| | N of enrolment for follow-up | N of patients successfully interviewed | N of TB patients died | N of unmet | N of errors[1] | N not interviewed |
| Ban Lung | 74 | 52 | 0 | 16 | 0 | 6 |
| Svay Rieng | 105 | 52 | 3 | 22 | 0 | 28 |
| Samroung | 61 | 52 | 1 | 8 | 0 | 0 |
| Moung Reussey | 78 | 52 | 3 | 20 | 1 | 2 |
| Peam Ro | 68 | 52 | 0 | 9 | 6 | 1 |
| Siem Reab | n/a | 52 | 4 | 18 | 0 | n/a |
| Udong | 90 | 52 | 0 | 16 | 22 | 0 |
| Total | n/a | 364 | 11 | 109 | 29 | 37 |

[1] Errors due to incorrect date of declared cure after treatment

## DATA COLLECTION METHODS

Data collection was carried out from October 2007 to March 2008 for Siem Reab district and from 19th March to 19th May 2008 for the remaining 6 districts. Retrospective patient data was collected from TB records (patient enrolment and lab registers), and current information was collected from a follow-up survey with the patient, and his/her sputum test results.

Data abstraction from the TB records was very confusing because in some patient registers the recording has not been done consistently. In some TB registers, the information was not recorded by exact dates, or even by month or quarter. Data collectors therefore had to check and compile the data carefully during the head count from the registers. In addition, some patient information in the registers was missing because it was simply never recorded. The issues mentioned above were found almost in every health center in the selected districts. The TB patients eligible for selection should have included re-treated patients. However, the sample frame of eligible patients contained no re-treated patients. This could be due to two reasons. One is that all patients selected had completed treatment and none had relapsed. Or two, the data collectors did not include re-treated patients. There were, therefore, no retreated patients in the final sample.

Survey data were collected by means of a face-to-face interview. In some districts where access to the interviewers' home was difficult, such as in Moung Reussey, Samroung, and ban Lung, the TB patients selected for the follow-up study were asked by the local health staff to come to the nearest health center for interview and sputum sample. In other cases, the interview took place at the respondents' home.

In addition to the household survey, two new sputum samples of these TB respondents were collected by health center staff. Some health centers are very far from the laboratory so sputum smears were sent to the referral laboratory for microscopy exam. After the microscopy exam, the lab technician recorded the result on the questionnaire or on their standardized recording form at the lab.

## 5.2 RESULTS

The cohort of TB patients for this TB patient follow-up study includes all TB patients whose TB treatment records were found in the record books in all health centers in the selected seven districts. The sample consisted of two TB patient groups: one for those who completed treatment 0-3 months prior to the survey date and the other for those who completed treatment 12-24 months before the time of the survey.

The follow-up data were based on a total of 366 patients[9], whose smear test results were positive at the time of enrollment and declared cured at the completion of treatment[10]. Among them, 107 patients had completed the treatment less than a year prior to the survey, 255 had completed the treatment from 12 to 30 months after the survey, and four were missing on the treatment completion date. The smear test results at the survey time are available for all of these 366 respondents, with approximately 52 TB patients per district.

[9] Due to undocumented sampling while doing the data collection by the data collection teams, the total number of TB patients in the pool was problematic. In addition, the fieldwork note indicated that there were only 364 patients were interviewed, while the data contained 366 cases.

[10] Data were collected from 372 TB patients. But, four of them had negative TB test result at the beginning of treatment, one case was reported not cured, and case was reported incomplete. They were excluded from the analysis because of inconsistency with the selection criterion.

## CHARACTERISTICS OF TB PATIENTS AT THE FOLLOW-UP

Table 5.2 summarizes the respondents' socio-demographic characteristics for each district. Variations between districts can be observed on several socioeconomic indicators, such as education, household size, ethic composition, economic status, and distance to the nearest health center.

Overall, the proportion of female TB follow-up patients was slightly higher than that of male (53% versus 47%), with the discrepancy being the highest in Svay Rieng (61% were female). The majority of these TB patients were from large families, with more than 70% living in households with at least 5-members and 43% living in households with least 7-members.

About 22% of all TB patients were under 35 years old, 36% were between 35 and 49 years old, and 42% were 50 years old or older. Small variations in age patients across all districts was observed among the follow-up patients, with the highest percentage of young patients being in Ban Lung, the rural provincial town of Ratanak Kiri, and the highest percentage of old patients being in Svay Rieng, the provincial town of Svay Rieng province.

**Table 5.2: Characteristics of TB patients and their households**

| | Moung Reussey | Ban Lung | Svay Rieng | Peam Ro Udo | Udong | Sam-roung | Siem Reab | Total |
|---|---|---|---|---|---|---|---|---|
| **N of TB patients** | 54 | 49 | 51 | 52 | 56 | 52 | 52 | 366 |
| **Sex** | | | | | | | | |
| Male | 44.4% | 49.0% | 39.2% | 57.7% | 48.2% | 42.3% | 51.9% | 47.5% |
| Female | 55.6% | 51.0% | 60.8% | 42.3% | 51.8% | 57.7% | 48.1% | 52.5% |
| **Age** | | | | | | | | |
| 18-34 years old | 24.1% | 28.6% | 15.7% | 17.3% | 21.4% | 23.1% | 26.9% | 22.4% |
| 35-49 years old | 33.3% | 34.7% | 35.3% | 34.6% | 35.7% | 36.5% | 38.5% | 35.5% |
| 50 years old or above | 42.6% | 36.7% | 49.0% | 48.1% | 42.9% | 40.4% | 34.6% | 42.1% |
| **Marital Status** | | | | | | | | |
| Single | 5.6% | 0.0% | 5.9% | 5.8% | 8.9% | 3.8% | 7.7% | 5.5% |
| Married | 77.8% | 93.9% | 66.7% | 82.7% | 64.3% | 80.8% | 73.1% | 76.8% |
| Divorced/Sep/Wid | 16.7% | 6.1% | 27.5% | 11.5% | 26.8% | 15.4% | 19.2% | 17.8% |
| **Education** | | | | | | | | |
| Never attending school | 44.4% | 73.5% | 37.3% | 9.6% | 19.6% | 53.8% | 50.0% | 40.7% |
| Primary | 42.6% | 22.4% | 33.3% | 61.5% | 57.1% | 40.4% | 36.5% | 42.3% |
| Secondary | 13.0% | 4.1% | 27.5% | 25.0% | 19.6% | 1.9% | 13.5% | 15.0% |
| Higher | 0.0% | 0.0% | 2.0% | 3.8% | 3.6% | 3.8% | 0.0% | 1.9% |
| **Household Size** | | | | | | | | |
| 1-4 people | 25.9% | 12.2% | 13.7% | 25.0% | 32.1% | 48.1% | 30.8% | 27.0% |
| 5-6 people | 37.0% | 18.4% | 35.3% | 25.0% | 41.1% | 26.9% | 26.9% | 30.3% |
| 7 or more people | 37.0% | 69.4% | 51.0% | 50.0% | 26.8% | 25.0% | 42.3% | 42.6% |
| Household SES | | | | | | | | |
| Poor | 38.9% | 73.5% | 9.8% | 42.3% | 30.4% | 67.3% | 7.7% | 38.3% |
| Medium | 51.9% | 20.4% | 54.9% | 44.2% | 50.0% | 26.9% | 48.1% | 42.6% |
| Rich | 9.3% | 6.1% | 35.3% | 13.5% | 19.6% | 5.8% | 44.2% | 19.1% |
| **Distance to nearest HC** | | | | | | | | |
| Less than 30 minutes | 29.6% | 16.3% | 30.0% | 19.2% | 32.1% | 25.0% | 65.4% | 31.2% |
| 30-60 minutes | 29.6% | 28.6% | 50.0% | 32.7% | 17.9% | 25.0% | 26.9% | 29.9% |
| More than 60 minutes | 40.7% | 55.1% | 20.0% | 48.1% | 50.0% | 50.0% | 7.7% | 38.9% |
| **Ethnicity** | | | | | | | | |
| Cambodia | 90.7% | 20.4% | 100.0% | 90.4% | 100.0% | 100.0% | 100.0% | 86.6% |
| Chinese | 0.0% | 0.0% | 0.0% | 3.8% | 0.0% | 0.0% | 0.0% | 0.5% |
| Vietnamese | 0.0% | 0.0% | 0.0% | 5.8% | 0.0% | 0.0% | 0.0% | 0.8% |
| Muslim | 9.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.4% |
| Hill Tribe | 0.0% | 71.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 9.6% |
| Other | 0.0% | 8.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.1% |

Data in Table 5.2 also show that the majority of TB patients never attended school. The percentage varies from 10% in Peam Ro to 76% in Ban Lung. The percentage of TB patients having at least secondary education was highest in three districts: 29% in Peam Ro, 29% in Svay Rieng, and 23% in Udong.

Regarding ethnicity, the majority of TB patients were Cambodian, with the exception of patients in Ban Lung, where an overwhelming number of TB patients were hill tribe people (72%).

In some districts that were more urban, TB patients tended to live closer to a health center, while in the other more rural districts they were scattered further from a health center. For example, 65% of those in Siem Reab lived within 30 minutes walking distance to the nearest health center and only 8% lived farther than 60 minutes walking distance. In contrast, slightly more than 50% of Ban Lung patients lived far away from the nearest health center (more than 60 minutes of walking distance), and less than 20% lived within 30 minutes walking distance to the nearest health center.

It is not unexpected that the follow-up data show a higher proportion of TB patients who were well off in a more urban areas than in a more rural areas. Based on the family economic status shown in Table 5.1 (as measured by the count of 12 household assets, See Questions d19 and d23 in the TB Follow-Up Questionnaires), the highest proportion of poor TB patients was found in Ban Lung (74%), followed by Samroung (67%), Peam Ro (42%), Moung Reussey (39%), Udong (32%), Svay Rieng (10%), and Siem Reab (only 8%).

## TB TREATMENT HISTORY

### PRE-TREATMENT TEST RESULTS

Examining the TB test records of these respondents reveals that 3% had 1-9 AFB/100 fields, 45% had 10-99 AFB/100 fields, 25% had 1-10 AFB/field, and 27% had greater that 10 AFB per field. Svay Rieng is the only district where few TB patients had greater than 1 AFB per field.

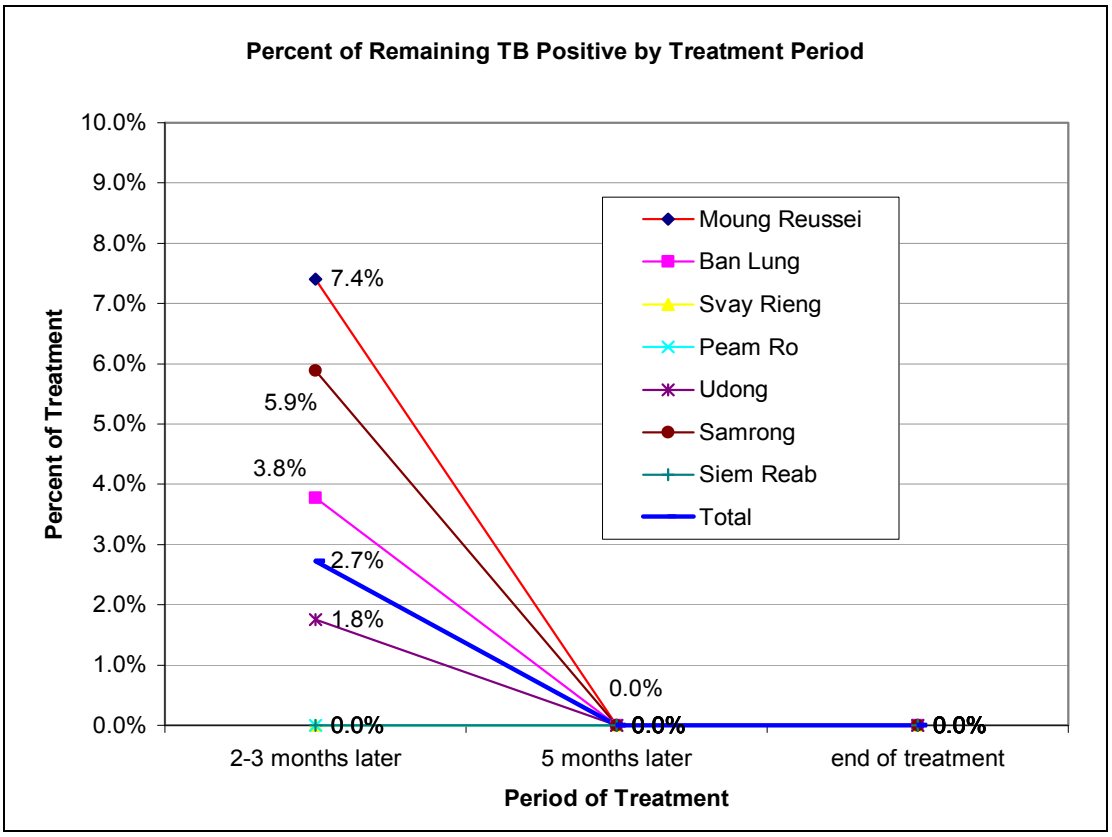
**Table 5.3: Number of TB follow-up patients by TB test results at pre-treatment**

| | 1-9 AFB/ 100 fields | 10-99 AFB/ 100 field | 1-10 AFB/ field | >10 AFB/ field N | total |
|---|---|---|---|---|---|
| Moung Reussey | 1 | 17 | 13 | 23 | 54 |
| Ban Lung | 0 | 15 | 17 | 17 | 49 |
| Svay Rieng | 2 | 38 | 3 | 8 | 51 |
| Peam Ro | 0 | 21 | 16 | 15 | 52 |
| Udong | 3 | 24 | 16 | 13 | 56 |
| Samroung | 1 | 23 | 12 | 15 | 51 |
| Siem Reab | 2 | 26 | 15 | 9 | 52 |
| N total | 9 | 164 | 92 | 100 | 365 |
| % of total | 2.5% | 44.9% | 25.2% | 27.4% | 100.0% |

### TREATMENT OUTCOME

Once TB positive was confirmed, these patients were enrolled in the treatment program at their respective health center or referral hospital. After 2-3 months of the treatment, only 3% of them remained TB positive (Figure 5.1). This figure appears to be highest in Moung Reussey (7.4%), ban Lung (6.0%), and in Samroung (5.9%); and lowest in Siem Reab and Peam Ro (All patients were claimed to be cured after 2-3 months of treatment). After 5 months of treatment, only 2 TB patients remained TB positive, one was in ban Lung and the other was in Udong. The patient in Udong was reported to have incomplete treatment at the end of the treatment program.

**Figure 5.1: Percent of patients remaining sputum smear positive, by treatment period (N=365)**




## RELAPSE OR MORTALITY

There were no retreatment records for TB follow-up patients[11]. This means that none of the 366 TB patients selected for follow-up had died or relapsed since the treatment completion (0-24 months prior to survey).

While this finding shows only favorable outcomes, and hence may reflect successful efforts of the TB treatment programs in these seven districts[12], conclusions should be made with care because the sample selection for the study might be biased.

## SMEAR TEST RESULTS AT THE FOLLOW-UP

The smear test for these TB follow-up respondents was conducted twice by health staff at the time of the interview. The results show only two positive results (only 0.55 percent of 366 patients). These were among patients who completed treatment 12-24 months ago. One case was diagnosed with positive 10-99 AFB/100 field (a 74-year old woman who was admitted for TB treatment in February 2007 and was declared cured six months later). The other was diagnosed with 1-

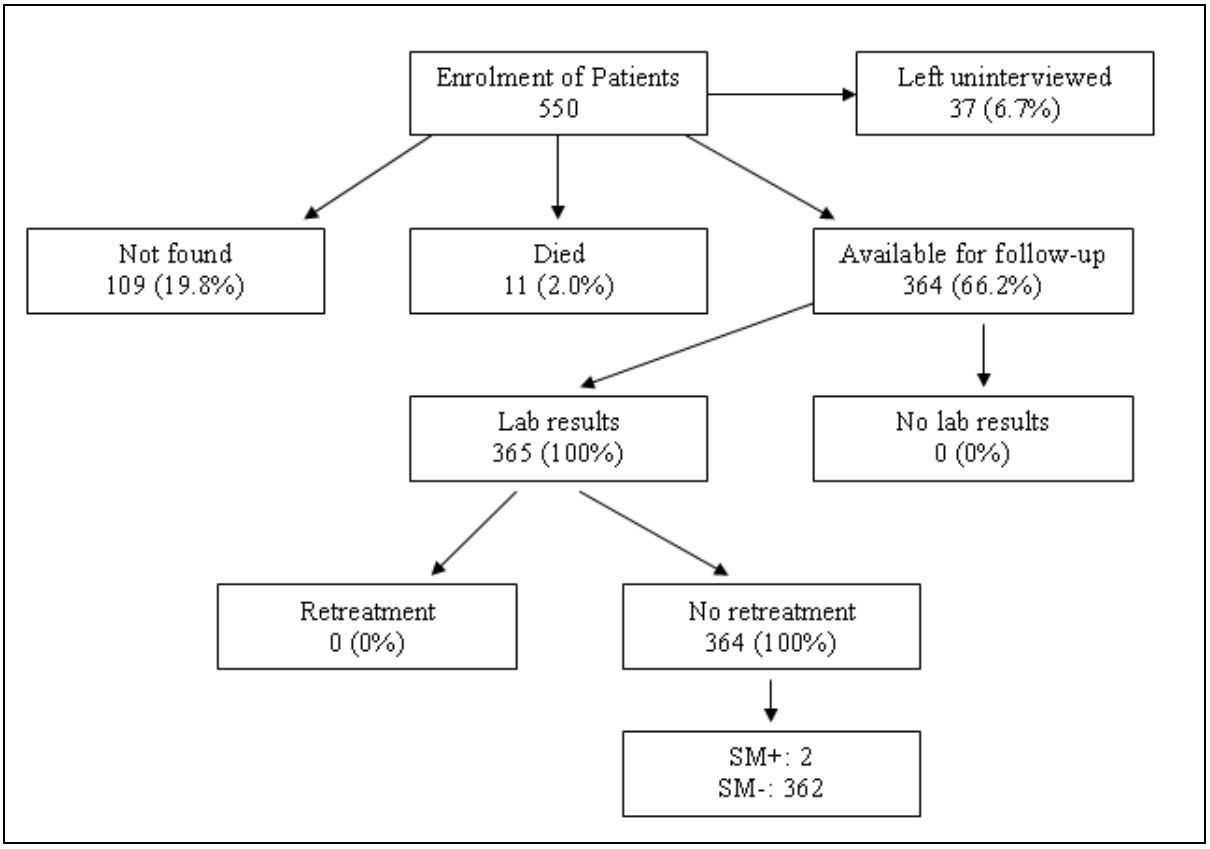
[11] Respondent selectivity might be an issue here because health staff that provided the TB patient lists (sample frames) may have dropped cases with unfavorable outcome from the list. Therefore, the representativeness of the sample is highly questionable.

[12] A field note from data collection in Siem Reab district indicated that 4 of the targeted 52 TB patients died. This suggests the existence of negative TB treatment outcomes, but without documents found.

10 AFB/field (a 55-year old man living enrolled in the treatment program in May 2006 and reported cured in November 2006). Both patients were illiterate.

The sputum smear test results described above suggest that there is a strong correspondence between the outcomes measured 12-30 months after treatment completion and the recorded outcomes at the end of the treatment. Thus, this study confirms the favorable treatment outcomes reported by health facilities offering TB treatment services[13]. Figure 5.2 summarizes the results of patient selection, follow-up, and retesting of sputum smears.

**Figure 5.2: Summary of the follow-up**




## PERSISTENCY OF TB SYMPTOMS IN TB FOLLOW-UP PATIENTS

### ADDITIONAL TB EXAMINATIONS AND TREATMENT SOUGHT

The TB follow-up study collects data on TB symptoms from all interviewed patients. Specifically, patients were asked if they had had any further examinations or treatment for tuberculosis since they had completed treatment. Table 5.4 summarizes the results. Apparently, 35 out of 366 respondents had sought additional TB exams or treatment, and the majority of them sought additional exams or treatment within the week prior to the follow-up survey. The proportion of the respondents seeking additional exams or treatment was especially high in Ban Lung (37%), in Peam Ro (12%), and in

[13] Such a conclusion would benefit from verification using another sample of patients, since data from this sample may not be representative sample of TB patients, due to potential biases in selection discussed earlier.

Samroung (10%), while the proportion is the lowest in Udong and Siem Reab (less than two percent in each district).

**Table 5.4: Number and percent of all respondents seeking additional TB exams or treatment after the completion of the initial treatment**

| | Total | | % of seeking additional treatment by time | | |
|---|---|---|---|---|---|
| | N | % of all respondents | 1 week ago | 2-3 weeks ago | 4 or more weeks ago |
| Moung Reussey | 2 | 3.7% | 50.0% | 0.0% | 50.0% |
| Ban Lung | 18 | 36.7% | 55.6% | 33.3% | 11.1% |
| Svay Rieng | 2 | 4.0% | 50.0% | 0.0% | 50.0% |
| Peam Ro | 6 | 11.5% | 33.3% | 50.0% | 16.7% |
| Udong | 1 | 1.8% | 100.0% | 0.0% | 0.0% |
| Samrong | 5 | 9.6% | 80.0% | 20.0% | 0.0% |
| Siem Reab | 1 | 1.9% | 100.0% | 0.0% | 0.0% |
| Total | 35 | 9.6% | 57.1% | 28.6% | 14.3% |

The pattern of seeking additional examinations or treatment is similar among those who completed treatment 12-24 months ago (Table 5.5). This is due to the fact that a large proportion of the respondents seeking additional examinations and treatment was from those who completed the treatment 12-24 months ago (71% of 35 respondents).

**Table 5.5: Number and percent of respondents completing TB treatment 12-24 months ago seeking additional TB exams or treatment after the completion of the initial treatment**

| | Total | | % of seeking additional treatment by time | | |
|---|---|---|---|---|---|
| | N | % of all respondents | 1 week ago | 2-3 weeks ago | 4 or more weeks ago |
| Moung Reussey | 2 | 4.9% | 50.0% | 0.0% | 50.0% |
| Ban Lung | 11 | 22.4% | 54.5% | 36.4% | 9.1% |
| Svay Rieng | 2 | 4.0% | 50.0% | 0.0% | 50.0% |
| Peam Ro | 5 | 9.6% | 40.0% | 40.0% | 20.0% |
| Udong | 1 | 1.8% | 100.0% | 0.0% | 0.0% |
| Samrong | 3 | 5.8% | 66.7% | 33.3% | 0.0% |
| Siem Reab | 1 | 1.9% | 100.0% | 0.0% | 0.0% |
| Total | 25 | 9.8% | 56.0% | 28.0% | 16.0% |

## POST-TREATMENT SYMPTOMS OF TB IN TB PATIENTS COMPLETING TREATMENT IN 12-30 MONTHS

All TB patient respondents who completed TB treatment in the last 12-24 months and who were available for the follow-up (a total of 255 respondents) were asked if they had ever experienced any TB symptoms since completing initial treatment; if they did, a subsequent question about the timing of the experience was asked. Figure 5.3 summarizes these results for each district.

**Figure 5.3: Percent distribution of those completing treatment 12-24 months ago by number of symptoms**

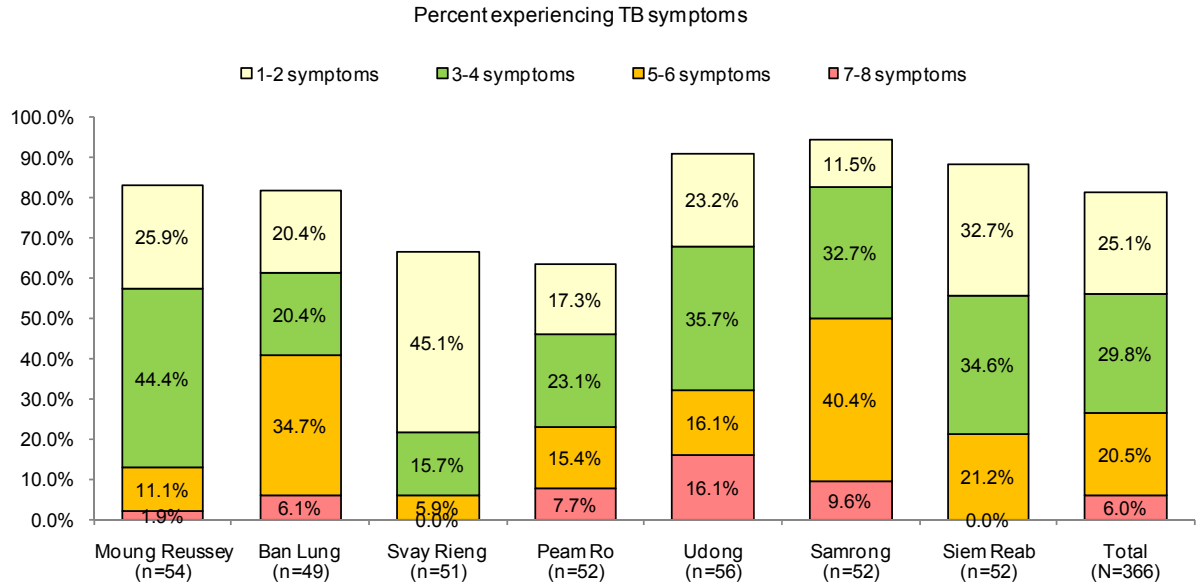



Figure 5.3 shows the distribution of respondents by the number of TB symptoms experienced. On the one hand, Peam Ro and Svay Rieng appear to be the only districts in which nearly 50% of the TB patient respondents did not report any TB symptoms 12-24 months after the treatment completion.

On the other hand, it is clear that many of these respondents had such an experience. Specifically, 27% of all 255 respondents reported having experienced at least five symptoms. This figure varies largely by district. For example, the percent of patients experiencing at least five TB symptoms was the highest in Samroung (50%), followed by Ban Lung (41%), Udong (32%), Peam Ro (23%), Siem Reab (21%), Moung Reussey (13%), and Svay Rieng (6%). Furthermore, there are patients in these districts who reported experiencing 7-8 TB symptoms since completing treatment. This suggests that some patients may not have been completely cured as reported, or else experienced a relapse.

The above finding indicates an inconsistency with the results of new sputum smears that were tested in the course of this study. Such unexplained inconsistencies merit further research to determine whether it is a data quality issue (i.e. completed treatments were not cures), or the lab results did not detect a relapse in TB, or the reports of TB symptoms are indicative of another maladie other than TB.

### SPECIFIC TB SYMPTOMS EXPERIENCED BY TB PATIENTS

Figure 5.4 shows which symptoms the respondents experienced the most. As seen, cough, fatigue, chest pain, night sweats, and having sputum are commonly experienced by the majority of these respondent, regardless of which district. Coughing up blood is also reported by the respondents in all districts, except Siem Reab and Moung Reussey, although the proportion experiencing the coughing up of blood is very small (a total of 13 out of 255 patients).

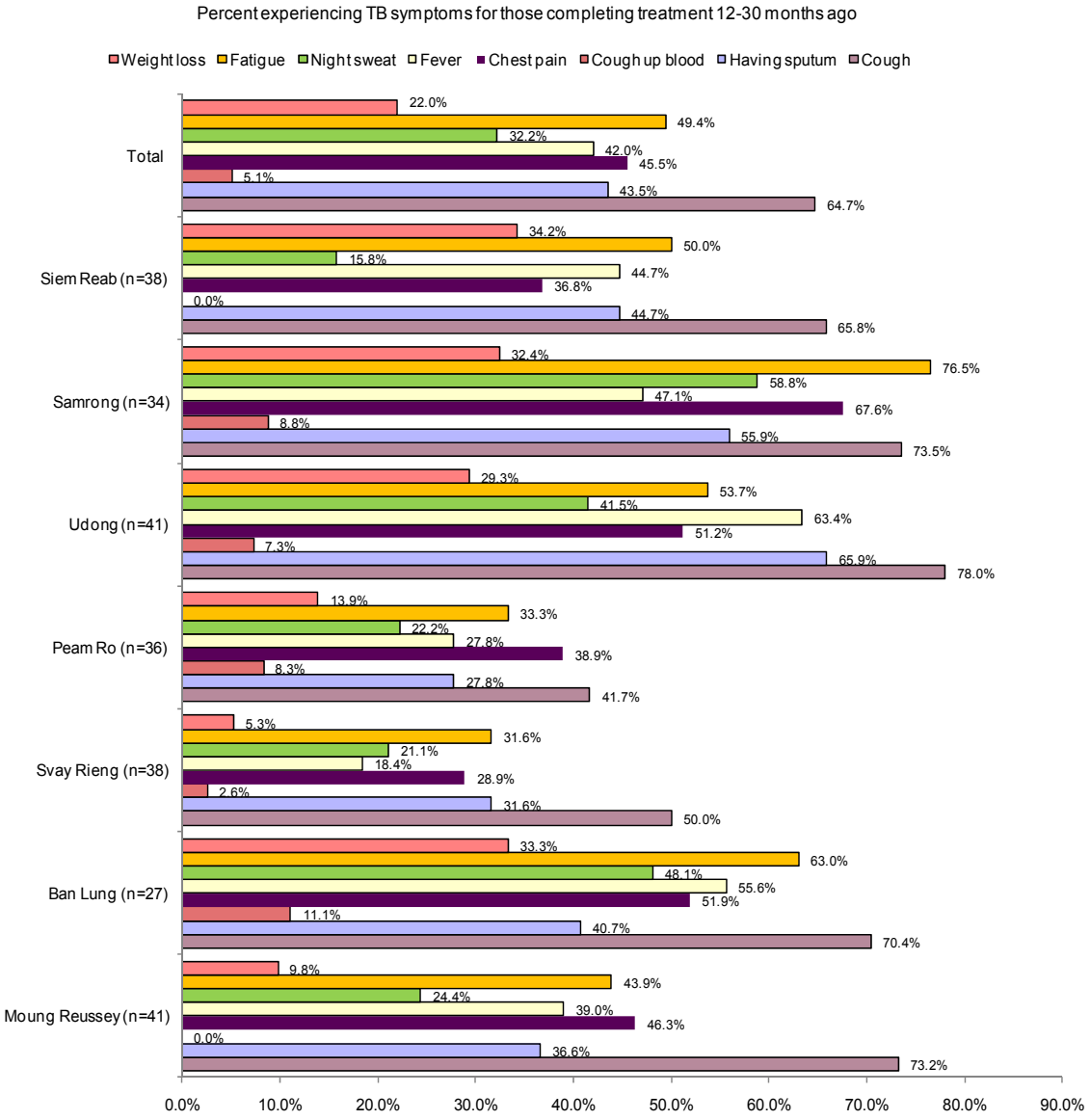
It is noteworthy that the above data were based on the respondents' self-reporting. These symptoms either indicate a relapse of TB, or a treatment that failed to cure, symptoms that were not TB symptoms.

### TIMING OF TB SYMPTOMS

The duration before experiencing a given TB symptom after the treatment completion was computed using the information on timing of treatment completion and timing of TB symptom experience. All respondents claimed having a given TB symptom within one month prior to the survey[14]. This lack of variation renders this information not useful.

[14] The timing variable is likely to be misunderstood by the wording in the filter question that asks for a given symptom that occurred in the last month prior to the survey (See Question 25 in TB follow-up questionnaire). This means that both data collectors and respondents may have misunderstood the timing of the starting of the TB symptom with the existence of current symptom experienced by the respondent.

**Figure 5.4: Percent of patients experiencing specific TB symptoms among those completing treatment 12-24 months ago**




## 5.3 CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the findings from the TB follow-up study conducted in seven districts. The respondents were TB patients who completed TB treatment 0-3 months or 12-24 months prior to the survey. Data collected for 366 TB patients were both retrospective data abstracting from TB patient records, provided by the districts' health centers and referral hospitals, and current information collected using a structured questionnaire.

The results based on the existing treatment records indicate that all TB patients enrolled in the treatment programs, except one case, were reported to be cured when the treatment completed. In addition, there were neither patients with unfavorable outcomes nor patients on retreatment.

The lab results from the sputum smear samples taken at the time of the survey confirmed the success of the TB treatment programs in these districts. Out of 366 cases, only 2 cases were detected positive (less than one percent). These were the patients who completed the treatment 12-24 months prior to the survey.

There were no retreatment records for the sample of TB patients, meaning that none were enrolled in the treatment program since declared cured. There were also no non-response cases due to death or migration for the sample, suggesting the absence of unfavorable outcomes in the TB treatment program.

However, the analysis of TB symptoms reported experienced by the TB respondents might suggest otherwise. For example, a substantial number of the respondents had experienced TB symptoms during the month prior to the survey. About a quarter of them complained of having at least 5-8 symptoms, with the highest proportion being in rural and poor areas, such as Samroung, Ban Lung, Peam Ro, and Udong. These areas also have some respondents complaining about coughing up blood.

Although the experience of TB symptoms does not necessarily mean a respondent has TB, the finding does suggest that some of these TB patients may not have been completely cured or may be experiencing a relapse. The result presented in Table 3 that showed about 10% of these respondents seeking additional examinations or treatment of TB primarily in health centers may further confirm this argument. This inconsistency in findings, the lack of unfavorable outcomes vis-à-vis the symptoms reported, call for further research.

Finally, given that the sampling technique was not fully transparent attempts to generalize findings from these data should be made with caution.

## RECOMMENDATIONS

Based on the above conclusions, the following recommendations are made:

1. Patients' treatment outcomes should routinely validated, especially in rural operational districts, regardless of whether or not it is a provincial town, given that a substantial number of respondents reported to have experience with TB symptoms.
2. Microscopy tests of patients' sputum smears should be conducted by technicians in an independent laboratory in order to have objective confirmatory results.
3. Case detection and referrals of patients experiencing TB symptoms should be strengthened.
4. Health staff training should be further supported.

# APPENDIX A. SELECTED OPERATIONAL DISTRICTS FOR THE DCA

| Geographic criteria | | | High burden disease/ Low-high scale-up | | | Comments |
|---|---|---|---|---|---|---|
| Province | Operational district | (Mostly) Urban / Rural | TB | Malaria | HIV | *Note: TB is present in all districts, malaria and HIV burden varies as noted.* |
| Battambang | Mong Russei | Rural | | | High | First scale-up site for ARV treatment, on main road to provincial capital. High malaria burden. |
| Kampong Speu | Oudong | Rural | Low | | | Some malaria burden, medium HIV burden but no ARV treatment centre. |
| Prey Veng | Neak Loeung | Rural | | | Medium | This district is on the ferry route and a very busy district for ARV treatment. (Malaria?) |
| Ratanik Kiri | Rattanakiri | Rural | | High | | Low HIV burden. |
| Svay Rieng | Svay Rieng | Rural | High | | | Medium HIV burden, ARV treatment exists. (Malaria?) |
| Oddar Meanchey | Samrong | Rural | | Low | | HIV treatment is recently available. |
| Siem Reap | Siem Reap | Urban | | | | Treatment and prevention activities for all diseases, malaria burden low. Pilot test in January initiated work for facility census and facility/hospital record reviews. |