Control of Neglected Tropical Diseases in Cambodia

An Integrated National Plan of Action focused on diseases controlled and eliminated by preventive chemotherapy

2011 - 2015

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Kingdom of Cambodia
Nation – Religion – King

Ministry of Health

Acknowledgements

I have a great pleasure to make public the *Control of Neglected Tropical Diseases in Cambodia; an Integrated National Plan of Action focused on diseases controlled and eliminated by preventive chemotherapy 2011 – 2015.*

Many of the NTDs are significant public health problems in Cambodia and the current plan of action concentrate on these diseases, elimination or control of which are high priorities for the Ministry of Health, Kingdom of Cambodia. We appreciate bilateral and multilateral partnerships to achieve these targets.

This national plan of action for the integrated control of Neglected Tropical Diseases (NTD) was developed in December 2010 by the National Centre for Parasitology, Entomology and Malaria Control (CNM) of the Ministry of Health, Kingdom of Cambodia with the assistance of World Health Organization (WHO). I wish to gratefully acknowledge the contributions made by the staff of WHO.

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Minister of Health

List of Abbreviations

CNM	National Centre for Parasitology, Entomology & Malaria Control
DEC	Diethylcarbamazine
FBT	Foodborne Trematodiasis
Hb	Hemoglobin
IU	Implementation Unit
LF	Lymphatic Filariasis
MDA	Mass Drug Administration
MF	Microfilaraemia
MOH	Ministry of Health
NGO	Non-Governmental Organization
NPEH	National Programme for Eye Health
NTD	Neglected Tropical Disease
PC	Preventive Chemotherapy
pre-SAC	Preschool Children
SAC	School-Aged Children
SCH	Schistosomiasis
STH	Soil-Transmitted Helminthiasis
Swiss TPH	Swiss Tropical Institute of Public Health
TT	Trachomatous Trichiasis
UNICEF	United Nations Children's Emergency Funds
WCBA	Women of Child Bearing Age
WHA	World Health Assembly
WHO	World Health Organization

1. Introduction

The Neglected Tropical Diseases (NTDs) are the most common infections in the world's poorest or marginalized populations. The large majority of the NTD burden results from helminth infection, such as Lymphatic Filariasis (LF), Soil Transmitted Helminthiasis (STH), schistosomiasis (SCH) and Foodborne Trematodiasis (FBT).[1] In addition, trachoma is the leading cause of infectious blindness in the world.[2] The World Health Assembly (WHA) resolution 54.19 urged all member states that at least 75% of all school-aged children who are at risk of morbidity from STH should be regularly reached and treated.[3] The WHA resolution 50.29 and 51.11 also called for elimination of LF and blinding as a global public health problem, respectively. For helminthes NTDs and trachoma, low-cost, safe and effective drugs are currently available to alleviate that burden and provide better quality of life for people in poor settings. The World Health Organization (WHO) therefore recommends preventive chemotherapy (PC) as a health intervention against helminthiasis and trachoma, aiming at reduction of morbidity through regular administration of anthelminthics and drugs to at-risk population. The greatest challenge is to extend regular drug administration coverage to reach all individuals at risk of helminth and trachoma infection.[1]

NTDs are intensely transmitted in Cambodia.[4] The NTDs in Cambodia that can be controlled or eliminated by preventive chemotherapy are as follows:

- **Soil Transmitted Helminthiasis (STH)** that include ascariasis, trichuriasis and hookworm infection
- **Schistosomiasis (SCH)**
- **Lymphatic Filariasis (LF)**
- **Foodborne Trematodiasis (FBT)** that include opisthorchiasis, clonorchiasis, paragonimiasis, fascioliasis, taeniasis and cysticercosis
- **Trachoma**
- **Strongyloidiasis**

Another important NTD in Cambodia is strongyloidiasis

Consequences of these infections include the followings:

- Increased rate of malnutrition, especially among children and women
- Reduced school performance in children
- Reduced productivity in adulthood
- Chronic ill health and liver disease
- Cholangio carcinoma (due to opisthorchiasis)
- Esophageal varices (due to schistosomiasis)
- Blindness (due to trachoma)
- Disseminated infection and death among immune suppressed (due to strongyloidiasis)

The groups at risk of each disease are:

- **STH:** pre-school children, schoolchildren and women of child bearing age (WCBA).
- **SCH:** People living along Mekong river in high risk focal ecological areas
- **LF:** the entire population in 6 endemic districts (this group has now received 5 rounds of mass drug treatment and may no longer be at high risk)
- **FBT:** children and adults eating raw food

- **Trachoma:** the entire population in endemic provinces/districts, in particular young children
- **Strongyloidiasis**: the entire population in endemic provinces/districts, in particular young children; mapping is yet to be completed
- **For most NTDs:** Those who live in poverty, usually with poor sanitary, eating and hygienic practices. Ethnic minorities and some occupational groups (e.g fishermen for SCH and women farmers working in field for hookworm)

The main strategy to control helminthic NTDs is preventive chemotherapy, which is regular treatment of the population at-risk with anthelminthics and drugs - alone or in combination - according to the diseases targeted.

The LF elimination programme in Cambodia has already completed five rounds of mass drug administration by 2009. The stop-MDA surveys to confirm that transmission no longer takes place in endemic districts have been completed in November 2010. The survey showed that the MDA can be stopped in all IUs. Cambodia now needs to transit to post-MDA surveillance.

The trachoma elimination programme in Cambodia has also confirmed a medium level of endemicity but with pockets of high endemicity (as high as 20% in some places) in children under 10 years old. Only intermittent and limited focal control activities have been conducted due to resource constraints. The present challenge is to operate the backlog of TT surgery (~ 84,000 TT cases) in order to achieve elimination of blinding trachoma by the year 2015.

Upon successful elimination of LF and effective control of schistosomiasis, Cambodia will be able to serve as a model country in the region.

2. Endemic Situation of NTDs in Cambodia

2.1. Soil Transmitted Helminthiasis (STH)

Current endemic situation

Cambodia is highly endemic throughout the country for Soil Transmitted Helminthiasis (STH) due to humid climatic conditions favorable for transmission, lack of proper sanitation and presence of certain unhygienic practices such as the use of human excreta as fertilizer in agriculture. The baseline prevalence by 2002 for roundworm ranged from 40 - 63%, whipworm 15-60% and hookworm 20-83%, mix worm infections is 60-70%.[5,6]

The total population at risk of STH morbidity in Cambodia is estimated at arround 8.4 million individuals. They are comprised of three distinct risk groups that are most prone to associated health impacts such as anaemia, malnutrition and vitamin A malabsorption; preschool children (pre-SAC), school-age children (SAC) and women of child-bearing age (WCBA) in all parts of the country

Figure 1 shows the STH-endemic provinces by integrated interventions in Cambodia, where children and women need to be periodically treated.

Figure 1: Geographical distribution of STH intervention in Cambodia:

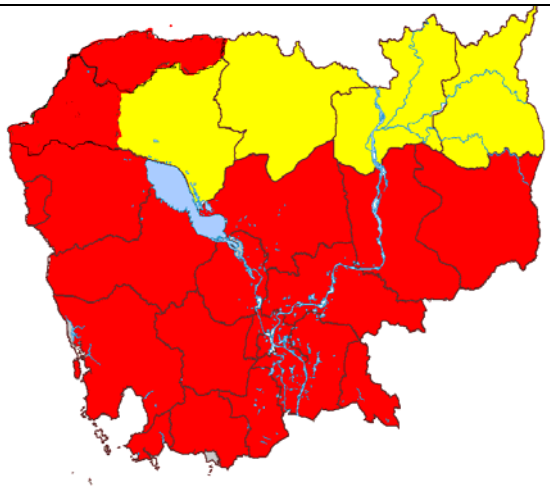


Figure 1 MDA for the control of STH:

- In red provinces where all school children are treated twice/year and pregnant and lactating women are regularly dewormed
- In yellow provinces where in addition the entire population is treated with albendazole + DEC for the control of LF.

Current situation of control activities

The main STH **control strategy** is regular distribution of Albendazole (or Mebendazole) to the three groups at risk. MoH/CNM has been collaborating in planning, piloting and scaling up of activities for the control of NTD with WHO, various other developmental partners and INGOs over 7 years. The collaborative efforts have facilitated Cambodia to conduct one of the largest deworming programmes in the region at very low cost.[6] Table 1 presents the extent of recent mass deworming coverage of different risk groups in Cambodia from 2007 to 2009.

Table 1: Extent of recent mass deworming coverage of different risk groups in Cambodia, 2006 – 2009 (Source: CNM – MoH, Cambodia**)**

Population group	2007	2008	2009	Remarks
Preschool children				
Population at risk	1,324,650	1,386,592	1,124,668	For operational reasons, total preschool population is considered eligible for deworming
Population targeted	1,324,650	1,339,571	1,124,668	
Population treated & program coverage (%)	1,226,530 (90%)	1,146,205 (85.6%)	966,960 (86%)	
National coverage of population at risk	90%	82.7%	86%	
Geographic coverage (of endemic provinces)	24/24 (100%)	23/24 (96%)	24/24 (100%)	
School aged children				
Population at risk	2,574,197	2,481,699	2,811,671	
Population targeted	2,574,197	2,481,699	2,811,671	
Population treated & program coverage (%)	2,377,493 (92.4%)	2,429,114 (97.9%)	2,520,114 (90%)	
National coverage of population at risk	92.4%	97.9%	90%	
Geographic coverage (of endemic provinces)	24/24 (100%)	24/24 (100%)	24/24 (100%)	
Women of Child Bearing age				
Population at risk	3,685,000	3,800,000	3,900,000	
Population targeted	Antenatal & lactating women (360,000)	Antenatal & lactating women (375,000)	Antenatal & lactating women (414,000)	The estimated number of AN and lactating women is 2.8% of the total population
Population treated & program coverage (%)	226,333 (62.8%)	290,461 (77.4%)	314,640 (76%)	
National coverage of population at risk	6.14%	7.6%	8.6%	
Geographic coverage (of endemic provinces)	24/24 (100%)	24/24 (100%)	24/24 (100%)	

***** All provinces in Cambodia has STH endemicity >50% and require 2 deworming rounds per year but no second round has been planned for those areas as yet.

As shown in the above table the WCBA are the high risk group that is least covered in Cambodia.

Control strategy

The main strategy to control STH is preventive chemotherapy, consisting of regular treatment of the population at-risk with anthelminthics and drugs - alone or in combination - according to the diseases targeted. Drugs are made available to target population, free of charge, through large-scale drug distribution interventions. Several drug donation programmes are in place. For instance J & J donates about 5 million mebendazole, GSK donated albendazole

800,000 and KAHP donated 150,000 tablets of praziquantel and 200,000 albendazole annually. This reduced the burden of control activities of the national program. Cambodia has demonstrated its ability to integrate drug distribution with the existing structures (e.g. school system, vitamin A distribution activities, women union) and personnel (teachers, village health workers) further reducing cost of logistics. Treatment activities are also often combined with health education messages. However, the national programme activities are largely dependent on availability of external financial resources while government commitments are mainly in kind with financial commitments to purchase deworming drugs for preschoolers and pregnant/lactating women. For deworming of Pre-SAC an outreach strategy has been successfully used and this structure can be expanded to reach WCBA. These outreach activities are also supplemented with Village Health Volunteer and Village Malaria Worker through their routine activities to enhance the coverage by treating those who missed in the outreach campaign.

The main challenge in Cambodia is (1) to maintain the high level of coverage with albendazole or mebendazole in SAC, Pre-SAC in all areas that had high prevalence of STH and (2) to allow progressive scaling up of the coverage in WCBA, to cover all at risk at least once per year integrating with existing campaigns. The specific activities will include:

- TOT and training for district personnel in the provinces where mass drug administration (MDA) is newly implemented for a new target group for the first time;
- Refresher training on STH including training of teachers, who are drug distributors, on newly developed school health which includes an extensive sector on helminthiasis
- Distribution, monitoring and evaluation costs for the school deworming programme;
- Drug procurement and distribution costs to cover pre-SAC during vitamin A campaign;
- Drug procurement and distribution cost to expand from coverage of pregnant and lactating women to coverage of all WCBA;
- Conducting health education campaigns to impart hygienic behavior
- Maintaining linkages and holding forums to share/disseminate information
- Conducting parasitological evaluation surveys, 1 survey for each risk group, every 3 years after intervention.

Table 2: Number of the provinces where MDA for STH control is planned

Target Group	2011	2012	2013	2014	2015
SAC	24	24	24	24	24
pre-SAC	24	24	24	24	24
WCBA	2	12	24	24	24

Table 3. Number of provinces where M & E of STH control is planned*

Target Group	Indicator	2011	2012	2013	2014	2015
Pre-SAC	STH prevalence/Intensity		6**			6

SAC	school attendance, STH prevalence/Intensity KAP	6			6	
WBCA	anaemia, STH prevalence/Intensity KAP	1				6

* M&E activities will be carried out in sentinel sites of each planned province.
** Two provinces each from three ecological areas (costal, plain and hilly) to represent these areas

2.2. Schistosomiasis

Schistosomiasis endemicity in Cambodia is focalised in Stung Treng and Kratie provinces in the Mekong River Basin where ecological conditions for transmission continue to exist (see Fig 2). In Cambodia the disease is caused by *Schistosoma mekongi* and the intermediate host is *Neotricula aperta*, a river snail that lives in the fissures of partially submerged rocks. Animal hosts mainly dogs appear to be an important reservoir host in the maintenance of transmission.[9] The human population at risk is estimated at >80,000 people. The baseline endemicity level, before the control measures were implemented, has been over 70% among the school-aged children population and 49% in the general population with over 12,000 severe cases and 25 deaths estimated to occur annually. [7,8,9]

Figure 2: Map of Cambodia showing endemic areas of schistosomiasis (in red colour)

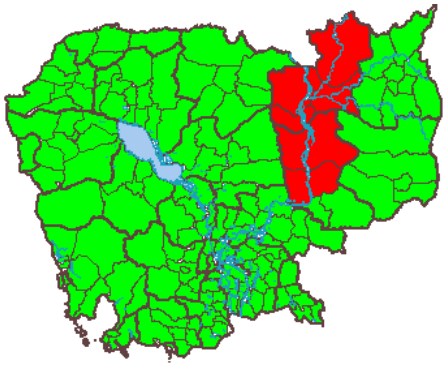


Fig. 3: Patients with severe complications was common in the past

Control measures including universal treatment with praziquantel have been implemented since 1996. The main strategies include:

a) Epidemiological surveillance including sentinel monitoring and spot check surveys
b) Mass drug administration
c) Passive case detection and treatment
d) Health education

Since the implementation of these control measures and with achievement of coverage levels consistently over 80% over the years the prevalence has been progressively reduced to less than 1% of cases per year by 2006.[9] However, the ongoing prospective study conducted by CNM in collaboration with Dokkyo Medical University Japan, that uses both ELISA and stool examination technique indicated that by 2008 a re-infection rate of 30%. However, the intensity has been very low. These results would give a clue that if the regular mass treatment is withdrawn, the prevalence level will return to baseline level within few years as it happened in Laos.

Activities during 2009/2010:

Mass drug administration has been conducted in the two provinces; Kratie and Stung Treng with support from HSSP2. The coverage achieved has been 92% over the total population of 81,000 living in high risk areas.

Plans for 2011 and beyond

Detailed plan for continuation of MDA and health education has been prepared but funding sources have not been confirmed yet. Sasakawa funding has ceased from 2008, and ADB-CDC1 from 2009.

Impact of schistosomiasis interventions:

Severe clinical cases of schistosomiasis have not been reported over last decade despite increased surveillance. Severe cases were common in the past. The parasitological surveys indicate decreasing trends with regular multiple rounds of treatment. Only 4 positives have been reported in 2007. However, in 2008, infection in snails and in higher number of humans has been found. The role of animal hosts in the maintenance of transmission, even if complete clearance of human infection is achieved, remains unknown. Further, a few cases have also been reported in Ratanakiri (6 positives) and in Kampong Cham (2 positives) in 2008.

2.3. Lymphatic Filariasis

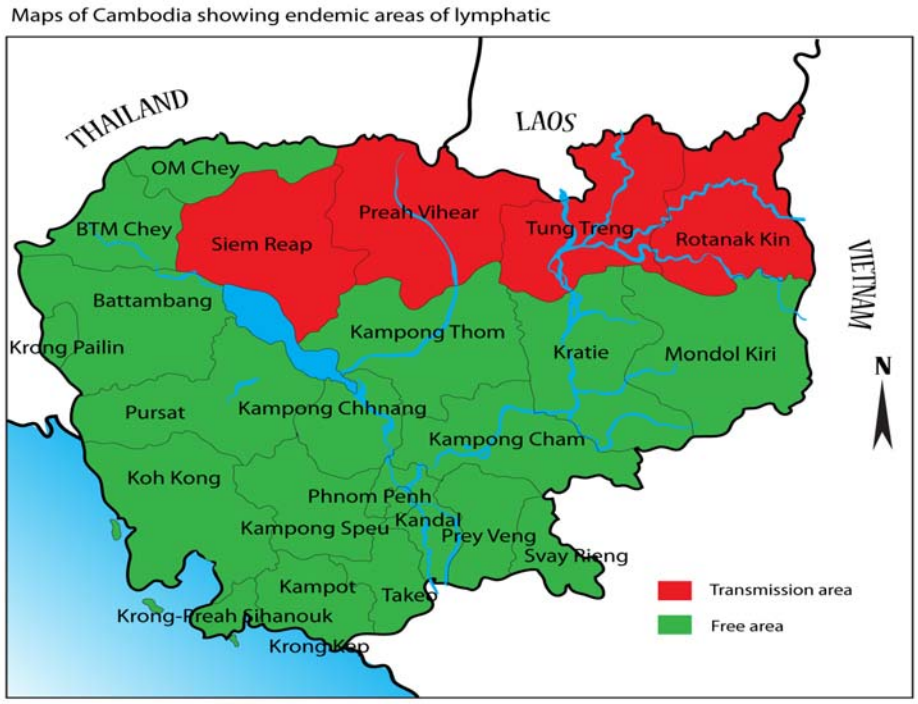
Current endemic situation and activities for elimination

Lymphatic Filariasis (LF) caused by *Wucheraria bancrofti* is endemic in 4 provinces. Cambodia is committed to eliminate it on par with the Global Programme to Eliminate Lymphatic Filariasis. [5,10] Mapping of endemic areas with ICT testing as well microfilaria blood film examinations were completed in 2004. As many as 18 districts in four provinces, namely, Rattanakiri, Stung Treng, Preah Vihear and Siem Reap were identified as the areas with on-going transmission. Figure 4 shows the endemic areas of filariasis. The population at risk in the endemic districts is around 475,000. With a well written national strategic plan for the elimination of LF the national programme was got underway in 2005. Five rounds of MDA have been completed by 2009. Stop-MDA surveys conducted in 2010 showed that transmission of LF has

been reduced below critical levels to enable stopping of MDA. The national LF elimination programme is now transiting into post intervention surveillance phase.

Fig. 4: Mass drug administration against LF

Figure 5 Map of Cambodia showing endemic areas of Lymphatic filariasis



Coverage and monitoring

The coverage assessment surveys verified the estimated figure to range between 79 – 90% in different IUs. Overall, it has been a satisfactory level of preventive chemotherapy coverage of the population at risk since 2005. Further, MF surveys carried out in sentinel sites indicate 100% reduction rate of microfilareamia in all IUs after two rounds of MDA. [11]

Stop MDA Survey in 2010

Stop MDA surveys were conducted in all IUs in 2010 using ICT survey sampling 900 in each IU. It showed that transmission of LF has been reduced (0.1 – 0.6%) below critical levels in each IU. Thus further MDA will not be required.

Disability alleviation

Currently, the case load of affected persons, as detected by the programme is not high with about 50 cases of lymphoedema and hydrocele. All these patients are above the age of 50 years and no new clinical cases among young people have been detected for several years. The majority of these patients are under care of general health care system. At the beginning of the program the doctors in the endemic areas have been trained in the disability alleviation of LF cases.

Plans for 2011 and beyond

Cambodia could now passage to post intervention surveillance. The Post-MDA Surveillance 1 should be conducted in 2012 and Post-MDA Surveillance II in 2015. These should be conducted according to the new guidelines from WHO. Preparation of the verification dossier could be targeted for 2015/2016. Research should be conducted to identify any pockets of systematically excluded populations from MDA e.g. prison inmates, forest workers. Xenomonitoring should also be conducted in order complement the post-MDA surveillance.

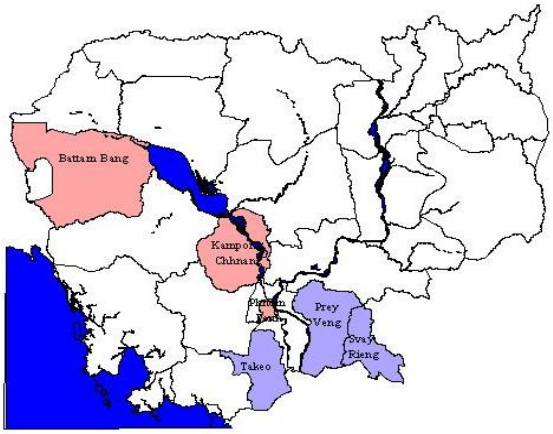
2.4 Trachoma

Current endemic situation and activities for elimination

Trachoma control programme in Cambodia has been started in 1995. Cambodia has a national strategic plan for the prevention of blindness 2008 – 2015 and elimination of trachoma is a main component of this plan. The National Programme for Eye Health (NPEH) was founded in 1995, (based in the National Eye Hospital, Phnom Penh). [12] The NPEH has taken the leadership in conducting all control activities taking SAFE as the key strategy including setting up guidelines for personal and environmental hygiene improvement, active trachoma treatment with antiseptics drugs and antibiotics, and Trachomatous Trichiasis (TT) surgery in communities. [13]

In Cambodia only tetracycline has been used in the antibiotic treatment. Due to non availability of funds and other reasons azythromycin or MDA has not been used. Rapid assessment surveys have been conducted in 2000 and 2004. The figure 6 shows the areas surveyed and endemicity levels. The overall prevalence of active trachoma under 10 year olds has ranged between 1 – 15% in 2004. Ultimate Intervention Goals (UIGs) required by WHO for elimination of blinding trachoma may not be reached if interventions are not scaled up adequately. The number of TT patients is estimated to be more than 84,000 cases. Therefore, the challenges in trachoma control in Cambodia includes surgical operation to clear the backlog of TT **to achieve elimination of blinding trachoma by the year 2015**.

Figure 6: Map of Cambodia showing indentified endemic areas for trachoma by 2010. (countrywide mapping yet to be completed)



In pink: Battam Bang, Kampong Chhnang, Phnom Penh provinces

TF/TI >2%
TT - 1 – 4%

In blue: Takeo, Svay Rieng, Prey Veng provinces

TF/TI - 6.2%
TT – 2 - 11%

Strategy for elimination of blinding trachoma in Cambodia by 2015

The goal is to reduce TT prevalence to be below 1% at the community level. The WHO-recommended SAFE strategy (Surgery for trichiasis, Antibiotics to treat C. trachomatis infection, Facial cleanliness and Environmental improvements to reduce transmission of C. trachomatis from one person to another) will be continued in the coming years. Mapping of the endemicity levels in all provinces that have not been mapped, is a priority. The components A and S will be the core activities in the endemic provinces. The components F and E will be maintained and integrated into other programmes such as school health, water supply and sanitation improvement. The component A will be applied for TT patients after surgery.

The cost of one TT surgery case is estimated at around 50 USD. All endemic provinces will be able to implement a plan of action, assess the exact number of TT cases, conduct training for community health workers to carry out the screening, and provide surgery at referral hospitals at provincial or district level. TT surgeons can be ophthalmologists or eye doctors at provincial or district level. Results should be recorded and reported regularly for monitoring and evaluation purpose. The key activities to reach high level of coverage in priority provinces would consist of:

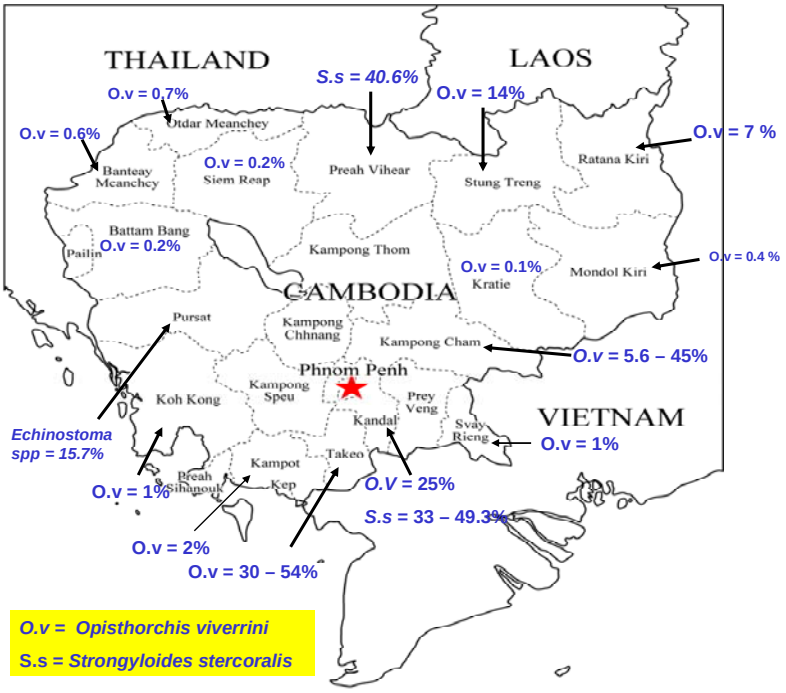
- TT screening in all the endemic provinces
- Conducting F & E (of SAFE strategy)
- TT surgeries in all the endemic provinces
- Workshop, programme management, supervision, monitoring and evaluation
- Rapid assessment
- elimination declaration by 2015
- establish a trachoma surveillance system integrated with primary health care programme

2. 5 Foodborne Trematodiasis

Current endemic situation

In Cambodia the main foodborne parasitic diseases are opisthorchiasis and echinostomiasis. Figure 7 shows the endemicity levels in different provinces detected from mapping during 2007 - 2010 on opisthorchiasis, echinostomiasis and strongyloidiasis.

Figure 7: Endemicity levels of opisthorchiasis, strongyloidiasis and echinostomiasis in Cambodia



2.4.1 Opisthorchiasis

Opisthorchiasis mainly due to *Opisthorchis viverrini* has bee reported in different parts of the country. They are mainly reported from southern and northern districts of the country especially in the border areas with prevalence levels ranging from 1 – 54%.

A questionnaire survey followed by stool examinations conducted by MoH in 18 provinces in order to map the endemicity of opisthorchiasis and echinostomiasis in 2007 concluded that five provinces, namely, Kompong Cham, Prey Veng, Koh Kong, Kompong Chhnang and Pursat are endemic for both diseases. (See fig 7)

Passive case detection and treatment has been in place in a few places but mass treatment strategies have not been implemented due to many reasons. It is important to complete endemicity mapping and continue the surveillance of this disease. Control strategies need to be implemented early. [14]

2.4.2 Echinostomiasis

Echinostomiasis is also one of the widespread FBTs in Cambodia but its clinical spectrum in Cambodia is less understood. However, this infection is not known to cause serious clinical outcomes in other parts of the world. Due to presence of habits of eating undercooked snails, the intermediate host of echinostoma, the disease is prevalent in many parts of the country

especially in the northern and southern parts. Several species of echinostoma genus have been implicated and to date the reported prevalence rates have ranged from 0.3 – 16.5 %.[5] The infection rate of echinostoma irrespective whether it has a clinical burden or not, serves as a marker of risky eating habits.

Current situation of control activities

In Cambodia, trematode infections are parasitic foodborne diseases related to people's eating habit. The habit of eating raw food is still common in many localities.

As for opisthorchiasis, WHO Cambodia and CNM selected some endemic areas, where liver fluke infection rate is higher than 20% for mass treatment. In 2009 and 2010 a total of 16 villages were selected for treatment with praziquantel targeting 9600 people.

Control strategy

FBT control strategies include:

i) Mapping of baseline endemicity level and assessment of community prevalence of behavior habit of eating raw fish

ii) Mass drug administration in IUs with high endemicity (Annually in areas >20% prevalence and once in two in areas with prevalence leveles between 5 – 20%)

iii) Treatment of suspected/diagnosed cases

iv) Stocking of all the health institutions in the endemic districts with treatment-drugs (praziquantel)

v) Health education on hygienic eating practices and agricultural production processes.

Praziquantel is the drug of choice for opisthorchiasis. Treatment campaigns will include health education too. Cambodia received a donation of praziquantel for control of FBT from Korean Association of Health Promotion for treatment in 16 villages of the pilot project area. This donation might not continue beyond 2011. The key control activities to reach high level of coverage in priority provinces in Cambodia would consist of:

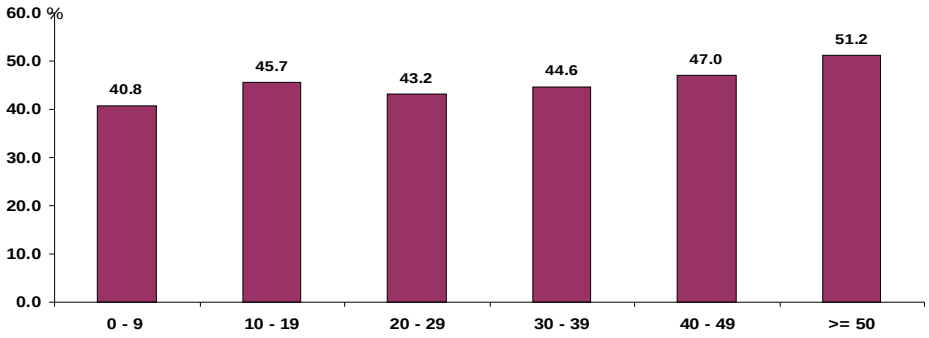
- On-the-job-training for MoH personnel
- Drug procurement (praziquantel) for the endemic provinces
- Drug distribution cost
- Health education
- Collaboration with animal health and food safety sectors
- Monitoring and evaluation
- Operational research

2.6 Strongyloidiasis

Strongyloidiasis caused by *Strongyloidus stercoralis* was found to be a significant health problem from the epidemiological surveys conducted recently.[5] This parasitic infection is soil-transmitted but also as has other transmission modes including auto infection. It causes significant morbidity including mortality particularly among the immune suppressed people. Current treatment strategies particularly the treatment with ivermectin appear to be effective as has been noted among the few people treated in Cambodia.

Swiss Tropical Institute of Public Health (Swiss TPH) supported the baseline assessment surveys in 2009/2010. Infection rates have ranged from 40 – 60% in the districts of two provinces surveyed so far. Swiss TPH will support surveys in one more province in 2011. Figure 8 shows the age distribution of the strongyloidiasis by age in province that completed endemicity assessment. It shows the disease is highly endemic in the assessed province affecting all age groups.

Fig 8: Distribution of *Strongyloides stercoralis* prevalence by age group in Preah Vihear province, Cambodia (2010)



There is a need to assess endemicity levels in all the remaining provinces (21) in Cambodia and commence control activities early.

3. National Plan of the Integrated NTD Control

3.1 Goal and Objectives

The goal of the programme is (i) to achieve elimination of LF and Trachoma, and (ii) to reduce morbidity due to STH, FBT, strongyloidiasis in Cambodia through an integrated control strategy by using preventive chemotherapy combined with health education.

The specific objectives of the programme for individual diseases are as follows:

1) Covering all the pre-school children and school children at risk for STH;
2) Increasing significantly the number of WCBA receiving preventive chemotherapy for STH;
3) Covering entire population at risk of SCH and carrying out intense surveillance
4) Carrying out post-MDA surveillance for elimination of LF
5) Carrying out baseline assessment, preventive chemotherapy and surgery (SAFE strategy) for elimination of trachoma by 2015
6) Covering all individuals at risk of FBT (opisthorchiasis)
7) Carrying out baseline assessment, chemotherapy and health education for controlling strongyloidiasis

3.2. Operational Strategies

The principal strategy for the control of helminthic NTDs remains the large-scale distribution of anthelminthic drugs to population groups at-risk, at regular intervals. This strategy alone significantly reduces morbidity attributable to NTD, but allows re-infections. Notwithstanding, there is evidence that regular mass treatment when conducted for several years leads to a certain amount of reduction in the community prevalence. This has been demonstrated for LF and STH in areas where regular mass treatment has been conducted for several years with high coverage. Health education is an integral part of all interventions. However, much more needs to be done to improve IEC and effect desirable behavioural changes. Where feasible and when resources permit sanitation improvement will be attempted. Close collaboration with animal health sections will also be maintained, focussing on surveillance and control of FBT. Attention also needs to be focussed on surveillance and improving quality, collation and reporting of data.

3.2.1. Government Ownership

The National Centre for Parasitology Entomology and Malaria Control, (CNM), which is the institution of the Ministry of Health (MoH), is responsible for the control/elimination of STH, SCH, LF, FBT, strongyloidiasis and other parasitic diseases. The National Eye Hospital, which is also the institution of the MoH, in collaboration with CNM is responsible for elimination of trachoma.

The following steps will be taken to ensure the ownership and leadership by Governmental authorities at national and provincial level:

- **Stake holders' meetings** will be organized in Phnom Penh bi-annually, where relevant officials from the Ministry of Health, the Ministry of Education Youth and Sport, the programme director and programme managers in CNM, provincial project managers and

staff of Women' Union will gather together, review their programme ongoing and revise the strategic plan for control and elimination of NTDs in Cambodia, with technical support from WHO and other relevant partners like ADB, Swiss TPH and NGOs working in this field.

- All control activities will be conducted directly by government personnel (mainly from the MoH/CNM/NPEH but also from the MOEYS in case of school based programmes). In areas where ethnic minorities are present, attempts will be made to include MoH/ MOEYS staff from the minority.

- To reinforce the ownership by provincial personnel, each province will be provided with the budget for the drug distribution activities. In addition to the distribution activities each province will be given complete discretion on the selection of the most appropriate social mobilization activities. The social mobilization activities implemented in each province will vary: school visits of health staff before and during the distribution day, production of banners and posters, community meetings organization, translation into minority languages of the information, distribution of information messages with megaphones or local radio. In all cases these supporting activities will be considered as a local decision and therefore conducted with more dedication than if imposed by higher levels.

The above measures are already in place for the areas presently covered and resulted in effective leadership and strong ownership at all levels of the Governmental hierarchy. We consider that it will be relatively easy to apply existing strategies to the new areas which are planned to be covered.

3.2.2. Training and Capacity Building

Drug distribution interventions are in principle very simple but could become difficult to implement when very large groups of population are targeted in a short time. In Cambodia, all drug distribution interventions progressively scaled up from a pilot phase covering few provinces for a total of 250 000 -300 000 individuals. This sufficiently allowed the MoH/CNM staff to familiarize with the possible problems occurring during the distribution while at the same time the problems could be easily solved due to the relatively small scale of the operation. As the size of the programme progressively increased, the provincial and district managers also became more and more efficient and experienced. The current staffs, both senior and young professionals, have been progressively exposed to programme activities. Further, some of the senior staffs have significant academic qualifications as well as practical experience in health management. Training of trainers (TOT), targeting at provincial personnel, and training of district personnel targeting at community health staff, education staff and staff of Women's Union at district-level will be carried out only in the provinces where MDA is newly introduced.

3.2.3. Mass Drug Administration

- **Soil Transmitted Helminthiasis (STH):** Maintaining the high coverage of distribution of albendazole or mebendazole in SAC and Pre-SAC, in all provinces that had moderate to high prevalence of STH; progressive scaling up of the coverage of drug distribution in WCBA, to cover all at risk at least once per year integrating with existing campaigns

- **Schistosomiasis (SCH):** Distribution of praziquantel in districts endemic for schistosomiasis to cover entire population at risk one in two years

- **Foodborne Trematodiasis (FBT):** Distribution of praziquantel in districts endemic for opisthorchiasis

- **Strongyloidiasis:** Distribution of ivermectin in districts identified as high endemic

3.2.4. Morbidity Control

- **Lymphatic Filariasis (LF):** Morbidity care of the patients who already suffer from clinical manifestation of LF infection (~ 50 cases. Provide care through general PHC)

- **Schistosomiasis:** Morbidity care of the patients who already suffer from clinical manifestation of SCH infection

- **Trachoma:** Surgery of TT patients in all endemic areas in Cambodia (estimated at around 84,000 individuals)

3.2.5. Assessment/Surveillance for Elimination

- **Lymphatic Filariasis (LF):** Post-MDA surveillance will be carried out for five years (2011-2015). At the end of the surveillance, final assessment is carried out, and if there are no positive results, verification of LF elimination status will be initiated and a dossier will be prepared.

- **Trachoma:** Rapid assessment will be carried out in the provinces that have not been assessed so far. Then monitoring and surveillance will be conducted for 5 years in order for official declaration of elimination by 2015.

3.2.6. Social Mobilization

All drug distribution interventions conducted in Cambodia reaches a good coverage (over 80%) of the targeted population. Some key elements behind this successful implementation are;

- Informing of the population about the intervention and its justification in advance
- Providing information during the drug distribution campaigns in the form of distribution of posters, leaflets and the Guidelines in Treatment of Helminthiasis, which was produced by the Ministry of Health in 2003, at the time of MDA
- Involvement of local personnel (especially from ethnic minorities) in the drug distribution and dissemination of information
- Involvement of Village Health Volunteers for disseminating information and motivting people to comply with MDA
- Providing feedbacks on the activities conducted to all necessary levels

3.2.7. Integration

The utilization of the existing government structures and personnel for drug distribution is the most productive way to reduce costs and to increase efficiency of the interventions. In Cambodia, only existing governmental infrastructures are used to provide MDA. The country has demonstrated integration of NTD policies, activities and field implementation to further increase efficiency, including the following:

- In the 6 implementation units (districts and provinces) where the once-yearly MDA for LF with Albendazole and DEC was conducted once a year, the period of the distribution was arranged to comply with the calendar of treatment required to control morbidity associated with STH.

- In the two provinces where schistosomiasis is endemic the distribution of praziquantel was combined with mebendazole to control STH and SCH together.

- The infrastructure that is in place for Vitamin A distribution campaigns is utilized to reach pre-school children for deworming, thus significantly reducing the cost of deworming.

3.2.8. Partnerships

All partners active in the field of NTD control or involved in activities targeting the same age groups are invited to participate in the planning discussions in most occasions, so as to take maximum advantage of the resources available and of the activities already implemented. For example where National Centre for Mother and Child Health/ UNICEF are already providing vitamin A to pre-school children, their logistics will be used to provide also deworming to the same age group, thus allowing for covering large number of preschool children at marginal cost.

Normally this kind of collaboration is productive for respective partners:

- Coverage of vaccination campaigns is increased when additional benefits like Vitamin A or deworming are offered to the participants
- The cost of providing deworming is extremely reduced (marginal cost) because the logistics and the personnel are already in place.

3.2.9. Inter-Sectoral Linkages (Water, Sanitation, Agriculture, Animal husbandry)

NTDs are most often found in places with unsafe drinking water, poor sanitation and insufficient hygiene practices. Therefore, improvement of sanitary condition and hygienic practices of the target population is an integral part of NTDs control intervention.

Inter-sectoral linkages will be created between the integrated NTD control programme and other programmes that aim at improvement of sanitation and wastewater treatment (e.g. The Ministry of Education, Ministry of Women Affairs, Ministry of Agriculture, Ministry of Rural Development, FAO, UNICEF, UNDP etc). While the MoH, CNM and NEH take charge of medical and parasitological aspects of the NTD control programme, the inter-sectoral network will make sure that the activities done by other programmes and sectors for improvement of sanitation and agricultural practices target at NTD-endemic areas to exert simultaneous effects on elimination and control of NTDs.

3.2.10. Monitoring and Evaluation

The monitoring of preventive chemotherapy interventions has been carried out regularly in Cambodia. WHO will continue its effort in the Region to improve quality, specificity and timeliness of all key data related to NTDs. The followings are key areas of focus in Cambodia:

- **Monitoring of the health impact:** periodical surveys assessing prevalence of NTD and parasitological and nutritional status of the populations at risk will be carried out every 2-3 years.

- **Monitoring of coverage:** Cambodia has a system in place to collect coverage data. Monitoring of coverage will be conducted systematically and improvements will be made as we go on. Evaluation of reported coverage will also be done with a sample survey. In addition, surveys will be planned to evaluate parasitological and nutritional (e.g. Hb %) indicators 2-3 after mass preventive chemotherapy interventions. National program routinely commits for regular surveys and in addition, to fill identified gaps, funding proposals will be separately submitted to the partners for monitoring and evaluation.

- **Reporting of adverse events:** Cambodia has a passive reporting system in place to report any serious adverse events following MDA. Systems for reporting serious adverse events established by the pharmaceutical companies and WHO, will also be followed.

4. References:

1- World Health Organization. Global plan to combat neglected tropical diseases 2008–2015. Geneva, World Health Organization, 2007 (WHO/CDS/NTD/2007.3).

2- World Health Organization. Trachoma control: a guide for programme managers. Geneva, World Health Organization,2006 (also available at http://whqlibdoc.who.int/publications/2006/9241546905_eng.pdf

3- WHO –UNICEF Joint Statement. Prevention and control of schistosomiasis and soil transmitted helminthiasis. Available at: http://www.who.int/wormcontrol/documents/joint_statements/en/ppc_unicef_finalreport.pdf

4- Montresor A, Dai Tran Cong, M. Sinuon, R. Tsuyuoka, C. Chanthavisouk, R Velayudhan, C. Capuano, Strandgaard H. A.S. Tee Dató. Helminth control in Western pacific countries: six year later PLoS Negl Trop Dis. 2008;2(8):e278. Epub 2008 Aug 27.

5- Centre for Parasitology, entomology and Malariology (CNM). National data at CNM, Ministry of Health, Cambodia. Dec 2010.

6- Sinuon M, Tsuyuoka R, Socheat D**,** Montresor A, Palmer K. Financial costs of deworming children in all primary schools in Cambodia (2005) Transactions of the Royal Society of Tropical Medicine and Hygiene, 99, 664-668.

7- Ministry of Health, Cambodia. National policy and guideline for helminth control in Cambodia by the National Task Force for the control of soil-transmitted helminthiasis, schistosomiasis and for the elimination of lymphatic filariasis. Phnom Penh 2003.

8- Stich AHR, Biays S, Odermatt P et al. Foci of Schistosomiasis mekongi, Northern Cambodia: distribution of infection and morbidity. Tropical Medicine and International Health 1999;4:674-685.

9- Hisakane N. Mathematical modelling for transmission of Schistosomiasis mekongi; Kratie province Cambodia. Proceedings of Asia Pacific Congress for Parasitic Zoonosis, Gifu Japan 22 – 24 August 2006.

10- Ottesen EA et al. The global programme to eliminate lymphatic filariasis: health impact after 8 years. PLoS Neglected Tropical Diseases, 2008, 2(10):e317 (also available at http://www.plosntds.org/article/info:doi/10.1371/journal.pntd.0000317

11- Annual Report for the National Programme to Eliminate Lymphatic Filariasis, Ministry of Health, Cambodia. 2008.

12- National strategic plan for prevention of blindness. National Programme for Eye Health, National Eye Hospital, Ministry of Health, Phnom Penh.1995.

13- Global elimination of blinding trachoma (Resolution WHA51.11).[Adopted by the Fifty-first World Health Assembly on 16 May 1998 .]Geneva, World Health Organization, 1998 (also available at http://www.who.int/blindness/causes/WHA51.11/en/index.html

14- Report of the WHO Expert Consultation on Food-Borne Trematode Infections and Taeniasis/Cysticercosis. Vientiane, Lao People's Democratic Republic, 12–16 October 2009. Geneva, World Health Organization, 2010

5. Budget summary (USD):

NTD	NTD Activities	2011	2012	2013	2014	2015	5-Year Total
STH	Advocacy	30,000	20,000	20,000	20,000	30,000	120,000
	Mapping						
	Social Mobilization and Health Education	100,000	100,000	100,000	100,000	100,000	500,000
	Training & refresher training	120,000	30,000	30,000	60,000	30,000	270,000
	Mass Drug Administration	200,000	200,000	200,000	200,000	200,000	1,000,000
	Drug Distribution	100,000	100,000	100,000	100,000	100,000	500,000
	Data collection	24,000	24,000	24,000	24,000	24,000	120,000
	Monitoring and Evaluation	80,000	80,000	24,000	80,000	80,000	344,000
SCH	Social Mobilization and Health Education	15,000	15,000	15,000	15,000	15,000	75,000
	Training & refresher training	5,000	5,000	5,000	5,000	5,000	25,000
	Mass Drug Administration	15,000	15,000	15,000	15,000	15,000	75,000
	Monitoring and Evaluation	5,000	5,000	10,000	5,000	5,000	30,000
LF	Post-MDA Surveillance 1	0	0	100,000	0	100,000	200,000
	Post-MDA Surveillance 2	0	0	0	0	100,000	100,000
	Preparation of dossier	0	0	0	0	30,000	30,000
	Finding any new focus & treatment	10,000	10,000	10,000	10,000	0	40,000
FBT	MDA, IEC and supervision	100,000	100,000	100,000	100,000	100,000	500,000
	Mapping, study	30,000	50,000	0	0	0	80,000
Trachoma	TF/TI surveys, TT screening in endemic provinces	50,000	50,000	0	0	0	100,000
	TT surgery	220,000	220,000	220,000	220,000	0	880,000
	Workshop, monitoring and evaluation	30,000	30,000	30,000	30,000	0	120,000
	Rapid assessment and elimination declaration					120,000	120,000
Strongyloidiasis	Advocacy	20,000	0	100,000	0		120,000
	Mapping	60,000	60,000	0	0	0	120,000

	Social Mobilization and Health Education	150,000	50,000	50,000	50,000	50,000	350,000
	Training & refresher training	40,000	0	60,000	0	0	100,000
	Mass Drug Administration	50,000	50000	100000	100000	100000	400,000
	Monitoring and Evaluation	15000	15,000	30,000	15,000	15,000	90,000
TOTAL		1,469,000	1,229,000	1,343,000	1,149,000	1,219,000	6,409,000

Drug needs (Tablets):

NTD	Drug	2011	2012	2013	2014	2015
STH	Albendazole/mebendazole	17.6 million	17.6 million	17.6 million	17.6 million	17.6 million
SCH	Praziquantel	100,000	100,000	100,000	100,000	100,000
FBT	Praziquantel	200,000	200,000	200,000	200,000	200,000
Trachoma	Tetracycline/Azythromycin	350,000	350,000	350,000	350,000	
Strongyloides	Ivermectin	5.2 million	5.2 million	5.2 million	5.2 million	5.2 million