ABREVIATIONS

ADB       = Asian Development Bank
ADB_CDC   = Asian Development Bank_Communicable Diseases Control
AusAID    = Australian Aid
Abate 1% SG = Abate 1% sand granule
Bti       = Bacillus Thuriensis Israeliien
COMBI     = Community Behavioral Impact
CNM       = National Center for Parasitology, Entomology and Malaria Control
C.F.R     = Case fatality Rate
CDC       = Communicable Disease Control
DF        = Dengue Fever
DfiD      = Department for International Development
GIS       = Geographical Information System
HCs       = Health Centers
HSSP2 Pooled Fund = Second Health Sector Support Program (HSSP2)
IEC       = Information Education and Communication
IVM       = Integrated Vector Control Management
MOH       = Ministry of Health
MOI       = Ministry of Interior
NDCC      = National Dengue Control Committee
NDCP      = National Dengue Control Programme
NCDD      = National Committee for Democratic Development
NGOs      = Non Governmental Organizations
OD        = Operational District
Pooled Fund finances by AusAID, DfiD, WB and UNICEF
SD        = Severe Dengue
PHD       = Provincial Health Department
RRT       = Rapid Response Team
TV        = Television
ULV       = Ultra Low Volume
WHO       = World Health Organization
WB        = World Bank
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Preface

Dengue fever infection is a viral disease caused by Dengue virus and transmitted from one person to another person through the bites of female Aedes mosquitos, *Aedes aegypti* or *Aedes albopictus*. The mosquito prefers to lay its eggs in the jars/containers in water is stored in every household in the country or in flower pots, tins, cans, coconut shells or bamboo scattered around the households in the community.

According to the technical reports of the World Health Organization (WHO), so far no vaccine is available and no drugs are effective against dengue virus infection; hence the treatment is only symptomatic. There are over 2,500 million people worldwide who are living in areas considered to be at risk of dengue, of which over 70% are living in the Asia Pacific region, including all ASEAN countries member countries.

Annually, the disease affects more than 50-100 million people worldwide, with 500,000 hospitalized cases, of which around 2.5% die each year. Through the reported data, we have been able to estimate that if there is any one admitted case with clinical symptoms in any locality, there are likely to be around 100 cases who are mild or asymptomatic but can still be carriers of virus and be able to transmit the virus to other people. In such a situation, if there are any cases admitted in the hospital, the risk of dengue transmission in the localities where such patients come from is very high.

The WHO has reported that the total dengue cases reported from among the 3 regions: Americas, South East Asia and Western Pacific have been increased by 90% in the 2 year period of 2006-2010. During the decade 2000-2011, the average annual increase in total dengue reported cases in the ASEAN region has been 18%, whereas in Cambodia this has been only 9%. Today, in Cambodia dengue has become endemo-epidemic, and there have been big dengue epidemics in some regions of the country which subsequently spread nationwide, particularly in 1998, 2007 and 2012. The significant increase in the number of dengue cases is closely related to the population growth, rapid urbanization, poor sanitation and low environmental hygiene, climate change all leading to the increases in Aedes, the dengue vector population as well as dengue virus infection.

The long term and effective measures for dengue prevention include integrated vector management (IVM), operational research, prompt investigation of dengue outbreaks, implementation of appropriate rapid response activities, understanding the basic signs and symptoms and bringing about early treatment seeking behavior among the general public especially to public health facilities. Emphasis should be laid on reducing dengue morbidity rate, preventing severe infection and reducing dengue mortality rate. The main keys to the success of dengue interventions rest with the communities themselves. Each and every family should feel responsible for and do everything possible to eliminate all mosquito breeding sites by themselves, protect their children against mosquito bites, transfer the suspected dengue patients, especially children to the public hospitals on time and also assist in the community mobilization efforts.

The National Dengue Strategic Plan 2013-2020, has been prepared with an emphasis on effective and proper surveillance and scaling up interventions nationwide. This strategic plan has been under preparation and revision since 2011 and finalized in early April 2013, through the close collaboration between the senior National Dengue Control Program team, technical advisor of the World Health Organization (WHO), technical advisor of the Asian Development Bank (ADB) and technical advisor of the World Bank (WB).
In order to fully and effectively implement all key dengue control activities and thus achieve the targets set as per the Cambodian Millennium Development Goals in time, the National Dengue Control Program would like to propose that all key stakeholders including related ministries, departments and organizations comply with this control strategy 2013-2020 that has been approved by the Ministry of Health.

Phnom Penh, 12th April, 2013

Ministry of Health
Minister
1. Background

Dengue fever (DF) and its more severe form, severe dengue (SD), are mosquito-borne viral diseases of global significance. The disease affects more than 100 countries worldwide, with 50 million infections each year. It is also a leading cause of hospitalization and death among children in Southeast Asian Countries. In the past 5 decades, the incidence has increased 30-fold globally. Several epidemiological conditions have accelerated the viral transmission by the main vector mosquito, Aedes aegypti. These include population growth, rural-urban migration and the inadequacy of basic urban infrastructure. Although research into dengue vaccines for public health use is in progress, currently the only method available for prevention and control is vector control.

Cambodia is one of the dengue-endemic and epidemic countries in the south-east Asian peninsula, and has been affected by a number of serious epidemics of severe dengue over the last decade. The epidemics appear at intervals of 3-7 years. In 1990 and 1995, there were major epidemics; 7241 cases (331 deaths) and 10,208 cases (424 deaths) were reported respectively. The worst year for dengue on record was 2007, when 39,851 cases with 407 deaths were reported (CFR = 1.03%). In view of the improved clinical management of SD and the increasing awareness of the general population, the case fatality rate has steadily declined from more than 4% in 1995 to about 1% in 2007 and to 0.3% in year 2009.

As dengue spreads to rural areas, cases of SD are being reported from remote rural areas. Consequently, the population at risk has increased from 3.5 million in the urban areas of Cambodia to almost 11 million. The magnitude of the public health problem in the country will continue to grow unless more effective measures are taken to reduce viral transmission.

2. Programme structure

The National Dengue Control Program (NDCP) based at the National Malaria Center (CNM) is directly responsible for dengue control in Cambodia. Under the current program structure, a National Dengue Control Committee (NDCC), headed by the Minister of Health, oversees the implementation of all national policies relating to dengue control. The NDCC consists of four technical sub-committees: Epidemiology, Entomology, Clinical Management, and Health Education. The committee meets regularly to update, evaluate and revise control activities as may be required.

With the exception of the Entomology and Health Education sub-committees, whose members are comprised exclusively from the National Center for Parasitology, Entomology and Malaria Control, the members of the Clinical sub-committee are clinicians from the National Paediatric Hospital and Kantha-Bopha Children’s Hospital, Kampong Cham Provincial Referral Hospital and Takeo Provincial Referral Hospital. For maximum efficiency in the epidemiological and serological surveillance of dengue, members of the Epidemiology sub-committee are recruited from the National Dengue Control Programme, Five provincial Sentinel sites and Pasteur Institute, National Institute of Public Health and the Communicable Disease Control Department.

The key role of the NDCP at CNM is to provide technical leadership and to coordinate all activities related to prevention and control of dengue in Cambodia. The main responsibilities are to:
1. Formulate a national dengue control strategy for each of the programme components, including Epidemiology, Entomology, Clinical Management and Health Education.
2. Develop a comprehensive plan of action for emergency preparedness.
3. Lead for implementation, monitoring and evaluation of the control activities.
4. Collect, compile and analyze epidemiological data and feed the information back to the target provinces as well as to the MOH and Health Partners, including producing annual program reports.
5. Estimate the financing needs for program response, including the need for insecticides, equipment and medical supplies.
6. Conduct entomological surveillance, assessment and monitoring of vector control.
8. Carry out operational research to develop and validate new vector control tools,
9. Organize training of health personnel in both public and private sector, on clinical, epidemiological, community and school based health education and vector control as a rapid response to dengue outbreaks.

3. Programme goal
To reduce the disease burden due to dengue and severe dengue to such an extent that they are no longer major public health problems.

4. Programme Objectives
The overall objectives of the NDCP are:
1. To reduce dengue mortality by at least 50% by 2020.
2. To reduce the morbidity of dengue by at least 25% by 2020.
3. To strengthen surveillance system for getting a reliable data on burden of the disease by 2015.

5. National Dengue Control Strategy
In its efforts to prevent and control dengue, the national strategy adapted for dengue control in Cambodia is based on the WHO Global Strategy framework and the newly formulated regional dengue framework:

- To expand existing surveillance systems to include dengue case detection;
- To strengthen clinical management in public and private sectors, and promote early referral and hospitalization, and appropriate treatment;
- To guide the implementation of integrated mosquito control with community and inter-sectoral participation;
- To prepare emergency preparedness plan for responding to dengue outbreaks;
- To enhance public awareness; and
- To conduct vector control research.

In the implementation of the six elements above, the NDCP, through its four sub-committees, has formulated the following specific dengue control strategies for the next seven years (2013-2020):

5.1 Improved clinical diagnosis and treatment of dengue
The diagnosis and treatment of severe dengue in Cambodia has been carried out following the national guidelines on dengue diagnosis and treatment formulated in 1996. The Guidelines were revised by the Clinical Subcommittee in 2002 based on the WHO Guidelines for Treatment of DF/SD in Small Hospitals and again in 2011. In addition, a schematic flow chart was made available to facilitate the early referral of dengue patients from Health Centers to referral hospitals or other higher level of care.
The Clinical Sub-committee will continue to conduct training for hospital staff (Doctors and Nurses) in order to improve clinical diagnosis, treatment and nursing care of dengue patients, and instructing private practitioners for referral dengue suspected cases to referral/national hospitals. The sub-committee is playing a vital role in reducing the current case fatality rate to below 0.8% by the year 2012.

Objectives:
1. To maintain high quality diagnosis, clinical management and nursing care.
2. To reduce the national case fatality rate from 0.45% in 2012 to 0.5% in 2015 and to 0.2% by 2020.
3. To equip hospitals to manage patient surges during dengue epidemics.

Activities:
1. Update the National Guidelines for clinical diagnosis and case management of dengue for use in referral hospitals and provincial hospitals.
2. Incorporate the National Guidelines on clinical management into Operational Guidelines for use at Health Centers.
3. Conduct information campaigns for private practitioners on the need for referral severe dengue cases, and for private hospitals about clinical diagnosis and case management, especially before the expected epidemic season.
4. Conduct public awareness campaigns through mass media, community and school information campaign on warning signs for dengue and severe dengue and early hospital seeking behavior.
5. Lead for the reparation of equipment, supplies and human resources at the National and Sub-national Hospitals prior to outbreaks of dengue.
6. Conduct training courses for hospital (Doctors and Nurses) on clinical diagnosis, management and nursing care of dengue patients, and on symptoms of dengue/severe dengue to HC staff.

Expect results:
1. Early referral and hospitalization of severe dengue cases.
2. Reduction of dengue case fatality rates.
3. Sufficient laboratory support for management of dengue patients in Referral/National Hospitals.
4. A reliable system for the referral of severe dengue cases to Referral/National Hospitals.
5. Sufficient supplies and trained medical personnel to manage patients during dengue outbreaks.

Evaluation and monitoring indicators:
1. Report about dengue cases and deaths in public and private hospitals.
2. Number of clinical guidelines, flow charts produced and distributed.
3. Number of hospital and HCs staff attended clinical training courses.
4. Number of private practitioners and private hospitals/clinics receiving dengue information packages.
5. Conduct survey on qualified medical staff and supplies available for managing dengue outbreak.
6. Identify issues or constraints facing hospitals for treating dengue cases.

5.2 Strengthening Dengue Program Management and Planning
The NDCP in the CNM that has been established is one of the most active Dengue Control Programmes in the region. It is envisaged that the capacity of the NDCP will have to be further developed in the next seven years. A new control strategy targeted community mobilization and
participation in control of dengue vectors in rural districts still yet to be developed. A new dimension of dengue vector control, incorporating the use of larvivorous Guppy fish and other evidence–based dengue control will be implemented and scaled up. All these strategies require staff with a high level of skill in programme management, implementation, and monitoring. The WHO is committed to continue providing technical assistance and capacity building to improve dengue control in Cambodia.

Objectives:
1. To improve overall programme management, implementation, monitoring and evaluation on dengue control strategies at both national and sub-national level.
2. To increase the efficacy of dengue prevention and control in both inter-epidemic and epidemic situations in order to reduce annual dengue incidence by 5% in 2015, 20% by 2018 and 25% by 2020.

Activities:
1. Staff training in project management and evaluation.
2. Systematic review of outcomes of activities conducted during the period 2007-2012.
3. Presentation of the results of the review to national and international partners.
4. Establish partnerships with national and international research institutes for the evaluation of dengue prevention and control in Cambodia.
5. Benchmarking of Cambodian dengue control programs against other national dengue control programs.

Expected results:
1. Evidence based approach to planning of dengue control measures.
2. Improved ability to assess the cost effectiveness of dengue control programs in Cambodia.

Evaluation and monitoring indicators:
1. Number of staff trained in project management and evaluation at national and sub-national level.
3. Reports of benchmarking of the Cambodian National Dengue Control Program against those of other dengue endemic countries.

5.3 Epidemic preparedness and outbreak response
Pending the development of new vector control tools, comprehensive distribution of larvicide (abate 1%SG and Bti WG) twice annually (in May and August) in all endemic areas will be continued. Epidemiological evidence suggests that larvicide (abate, Bti), if applied timely and adequately, has a significant impact on dengue transmission. This vector control activity, however, requires intensive planning, participation from local government and mass mobilization of community and personnel, and comprehensive monitoring to ensure very high coverage (at least 95% of jars and water containers) of larvicide application. It has to be applied at the beginning of rainy season (in May) and repeated in 3-monthly interval (in August) during the transmission season. In dengue outbreak areas, ULV space spraying to rapidly knock down the adults vectors is very crucial to slow down or contain the dengue transmission. From 2003-2012, the operational budget came under the support of a ADB_CDC and HSSP (World Bank Grant) and HSSP2 Pooled Fund (AusAID, DfID, UNICEF, and the World Bank). New partners will have to be sought in order to support this activity for the next five years.

Strengthen capacity to respond appropriately and effectively to dengue outbreaks by national and sub-national level. Pending a comprehensive national strategic plan for dengue prevention and control developed, and the multi year costing for this strategic plan, financial and human resources for the dengue control programme is currently inadequate for responding to dengue outbreaks. Reporting of outbreaks from the peripheral level is usually too late to allow an adequate response. Analysis of geographical clusters and coordinating prompt responses to probable outbreaks is lacking at the
Provincial level. The next seven years will focus on capacity building for Rapid Response Teams (RRT) at PHD, OD, and HC level for undergoing appropriate training in recognizing early signs of dengue outbreaks by using indicators or epidemiological thresholds at the local level predetermined by the epidemiological unit at the national level and how to report potential outbreaks to the central level through existing surveillance systems established by the Department of Communicable Disease Control. RRT at provincial and OD level will be responsible for outbreak investigations, including the use of rapid diagnostic tests and appropriate response activities (health education, source reduction, larviciding, ULV space spraying and monitoring). CNM will monitor the outbreak investigation at the operational levels.

Objectives:

1. To increase the capacity of Provincial Health Departments and Operation Districts on outbreak preparedness and rapid response to outbreaks.
2. To form partnerships with local government and NGOs for conducting health education campaigns in conjunction with emergency vector control operations.

Activities:

1. Establish outbreak management plans to ensure resource availability. Dialogues with NCDD/ MOI on allocating local budget to disease control.
2. Strengthen provincial communicable disease surveillance through existing surveillance systems, established by the Department of Communicable Disease Control to include dengue outbreak detection and response.
3. Establish a comprehensive plan for distribution and application of larvicide to cover all water jars/containers in all high risk districts/provinces.
4. Strengthen cooperation and responsibility from local government and collaboration from NGOs for vector control, including conducting community and school education campaign on dengue prevention and referral of suspected cases, activities for destroying vector habitats, and distribution of abate/Bti.

Expect results:

1. Reduction of dengue incidence
2. Increase resource mobilization and partnership with local government and NGOs and other donor partners
3. Effective management of focal outbreaks.

Evaluation and monitoring indicators:

1. Incidence of DF/SD and mortality rate in high risk provinces.
2. Lapse time between dengue outbreak reported and control action taken in dengue clusters.
3. Proportion of containers treated by larvicide.
4. Reduction in the number of adults Aedes aegypti in buildings where larvicide has been used.
5. Proportion of targeted households covered by ULV spraying.
6. Proportion of targeted households free of domestic rubbish.

5.4 Improved epidemiological and disease surveillance

To have an effective epidemiological surveillance system and the capacity to mount a timely and effective response to dengue outbreaks are the greatest challenges for the NDCP in 2013-2020. The following major areas will be focused on: to increase disease outbreak reporting from community and health facility (both public and private health facilities); to strengthen serological and virological
surveillance at the sentinel hospitals; to improve the quality of epidemiological data for effective use; and to develop sensitive indicators for decision making.

Objectives:

1. To expand the clinical surveillance system to capture non-hospitalized dengue patients.
2. To increase expand the capacity of Referral Hospital Laboratories for performing serological diagnosis of dengue.
3. To identify the dengue virus serotypes and genotypes circulating in Cambodia and identify any exotic strains.

Activities:

1. Training of laboratory staff to perform dengue serology safely and accurately.
2. Continue active case surveillance in five sentinel sites.
3. Link clinical and laboratory surveillance to evaluate the accuracy of the clinical reporting.
5. Extend GIS technology to provincial levels to facilitate epidemiological-entomological surveillance activities for analysis and reporting.
6. Establish a telephone hot line between CNM and Provincial Health Departments for data exchange and for use during outbreaks.

Expected results:

1. More reliable estimates of the number of dengue cases and location of dengue outbreaks in Cambodia.
2. Rapid exchange of data between NDCP and Provincial authorities.
3. An indication of the efficacy of any intervention measures.
4. Identification of entry of exotic dengue viruses into Cambodia.

Evaluation and monitoring indicators:

1. The proportion of laboratory confirmed cases of dengue.
2. Time lapse in the reporting of dengue cases from the Provincial Health Department to the National level.

5.5 Selective and sustainable vector control using integrated vector management (IVM)

This community based vector control requires a partnership with various NGOs, other government Ministries (Education, Information, Rural Water supply, Environment and Local Government) and community organizations. A school-based dengue project will be expanded to 22 high risk provinces with revised school curriculum. The National Dengue Control programme will take advantage of Cambodia’s large network of both international and local NGOs with experience in a variety of activities including health promotion and environmental hygiene and sanitation. These activities will be complemented by continued, judicious use of traditional control measures e.g. Temephos larvicide will continue high risk districts/provinces until larvae at those sites demonstrate significant resistance to this agent. Operational research (5.7) will identify appropriate replacement larvicide(s). Advocacy with policy makers on integrated vector management is planned for 2013. The use of sound principles and evidence-based dengue vector control is to be promoted.

Community-based dengue control has had some success in Cambodia, notably using community-school based health education and larvivorous fish for dengue vector control. Community-based interventions encouraging behavior change using Communication for Behavioural Impact in dengue prevention will be applied. Large scale use of larvivorous guppy fish will be promoted.
Objectives:
1. To implement a dengue vector control strategy using community and school-based approach and intersectoral participation in geographical areas of the highest risk of transmission.
2. To validate the community vector control measures.

Activities:
1. Carrying out a pilot project using the concept of COMBI (Communication for Behavioural Impact) on dengue vector control.
2. Implementing community and school-based vector control projects through improved inter-agency and community involvement in high risk districts. Carry out regular vector surveillance and monitoring in selected geographical areas
3. Monitoring vector susceptibility to insecticides used in vector control

Expected results:
1. Reduction in the number of potential Aedes breeding sites
2. Reduction in the number of productive breeding sites.
3. Reduction in the number of dengue cases.

Evaluation and monitoring indicators:
1. Number of districts implementing community and school-based dengue vector control
2. Proportion of properties with reduced potential Aedes breeding sites
3. Proportion of containers without Aedes larvae
4. Number of reported dengue cases

5.6 Health Education and Community Mobilization
Health education and communication strategies are formulated by a focal group at the National Programme level. The role of the Health Education and Community Mobilization component of the National Dengue Control Program is to make people aware of the signs and symptoms of dengue, its mode of transmission and how to avoid infection. This enables residents to complement the vector control activities by reducing mosquito breeding sites and aiding the use of larvicides. The education message is delivered by radio and TV broadcasts as well as by newspaper and mobile health education teams. All schools in target provinces will implement school-based dengue control with active collaboration with the School Health Department.

Objective
1. To increase the awareness of the community about prevention and control of dengue.
2. To enlist the support of the community to control dengue.

Activities:
1. Design, review and production of school-based dengue teaching curriculum.
2. Planning and coordinating mass media health education on dengue.
4. Enlist the support of NGOs in the community based dengue control activities.

Expected results:
1. Health education materials developed and disseminated to target groups.
2. Increased awareness in the community of dengue and active participation in prevention and control activities.
3. Reduction in Aedes indices.
4. Reduction in the number of cases of dengue.

Evaluation and monitoring indicators:
1. Number of schools implementing the dengue teaching curriculum.
2. Implementation of teaching curriculum by students.
3. Amount of mass media health education organized.
4. Proportion of villages in high risk districts conducted community information campaign.
5. KAP survey one and three months after the mass media and anti-dengue campaign.
6. Number of dengue cases in areas implementing the community control measures.

5.7 Strengthening operational research on dengue control
While concentrating efforts on the best use of existing dengue control interventions, the NDCP is undertaking operational research projects to improve and validate vector control measures. Specifically, the results include field evaluation of innovative vector control.

Objectives:
1. To validate new vector control tools in a Cambodian setting.
2. To collaborate with international organizations and local institutions in improving and facilitating research into the control of dengue.

Activities:
1. Systematic analysis of resistance to insecticide by mosquitoes from provinces with high rate of dengue transmission.
2. Conduct study on effectiveness and cost efficiency of different larviciding that are currently used in Cambodia.
3. Seek international and inter-institution collaboration in dengue research.
4. Preparing research protocols and seeking approval from the MOH, ethical committee if required.
5. Organizing training for research teams and undertaking research activities.
6. Conducting community-based studies such as community perception and KAP study.

Expected results:
1. Appropriately use of insecticides to which local species of Aedes are sensitive.
2. Better understand the epidemiology of dengue and vector bionomics.
3. New vector control tools validated and assessed.
4. Relevant outcomes incorporated into the national strategy for dengue control.

Evaluation and monitoring indicators:
1. Aedes sensitive to insecticide being used at the localities where they were trapped.
2. Report, scientific paper, presentation at the scientific meeting.
3. Number of research outcomes adopted by the National Dengue Control program.

6. Estimated Budget:

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National Center for Parasitology, Entomology and Malaria Control

Director

Dr Char Meng Chuor

National Dengue Control Program

Program Manager

Prof Ngan Chantha