

The Epidemiology, Ecology and Strategy for Control of Dengue Hemorrhagic Fever in the Kingdom of Cambodia

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Abstract: Over the last ten years, child health in the Kingdom of Cambodia has been improving, but the infant mortality is still very high, with DHF one of the ten highest causes of mortality in children. The first cases of DHF were recorded in 1962 and since 1980 has become an important public health problem in the country. Large outbreaks were recorded in 1985, 1987 and 1990. Since 1980 this disease has spread from the most densely populated areas of Phnom Penh, Kandal and Prey Veng Province to all other provinces except some provinces in the northern part of the country.

In June 1992, the Ministry of Health established the DHF Control Committee comprised of four subcommittees: the Epidemiology, Vector Control, Health Education and Clinical Management Subcommittees. Two examples of control activities are described in this paper:

- Battambang Province in 1992 in response to a DHF epidemic already in progress.
- Phnom Penh in 1993 to prevent an expected epidemic.

Key words: Dengue hemorrhagic fever, control, Cambodia

Health status in Cambodia

Child health has been improving since 1980 but the infant mortality rate is still high (Table 1). The immunization coverage has increased to about 64% but many children are still dying from preventable diseases. DHF is included as one of the ten highest causes of mortality: acute respiratory infection, malaria, diarrhea, tuberculosis, DHF, typhoid fever, malnutrition, anemia, accidents, and measles.

In recent years, major social and ecological changes have increased the potential of DHF outbreak in Cambodia. There has been increased urbanization and crowding, and with increased economic property, more water jars as well as more tin cans and other non-essential water containers providing many more potential breeding sites for *Aedes aegypti*.

Table 1. Infant mortality (IMR) and under 5 years mortality (U5MR) in Cambodia

Year	1980	1990	1991	1992
IMR	212	125	127	125
U5MR	313	200	199	199

Epidemiology of DHF

The first case of dengue hemorrhagic fever (DHF) recorded in Cambodia was in 1962, with the first outbreak in 1972. Since 1980, when 347 cases and 20 deaths were reported, DHF has become an increasingly important public health problem in the country. The pattern of epidemics mimics other countries in the region with large outbreaks every two to three years, in 1983, 1985, 1987 and 1990, when there were over 7,000 reported cases and 300 deaths. In 1993 there was a large outbreak in Battambang and Banteay Meanchey Provinces, but fewer cases than expected in Phnom Penh.

This report describes background ecology of the disease in Cambodia and two examples of control efforts: first Battambang 1992 when the epidemic was already in progress and second Phnom Penh 1993 when the Ministry of Health launched a large education and larval control campaign to prevent an expected outbreak. Finally, there is a description of the structure and strategies of the Ministry of Health Dengue Hemorrhagic Fever Control Committee

Geography and Ecology of DHF in Cambodia

Since 1980, the disease has spread from the most densely populated south east part of the country, Phnom Penh, Kandal and Prey Veng Province, to all provinces with exception of the sparsely populated north-east part of the country. The disease has also spread from urban centers to more rural settings, district capitals and small market towns.

In recent years, major social and ecological changes have increased the potential for DHF outbreaks in Cambodia. There has been increased urbanization and crowding, and with increased economic prosperity, more water jars as well as more tin cans and other nonessential water containers providing many more potential breeding sites for *Aedes aegypti*. Moreover, there has been a great increase in inter-city transportation, making it more probable that viremic individuals, who may be only mildly ill, will carry the dengue virus to new mosquito populations, sparking new transmission foci.

Aedes aegypti and *Aedes albopictus* are found throughout the country, sometimes in very high population densities. Prior to control measures during the 1992 Battambang epidemic, some neighborhoods had a Breteau Index of more than 400, meaning an average of more than 4 water containers infested with *Aedes* larvae per house.

The Case Fatality Rate reaches over 12% in some hospitals due to late presentation and diagnosis, inadequate case management training and the availability of basic diagnostic equipment such as hematocrit centrifuges and pediatric blood pressure cuffs.

Finally, DHF is a relatively new and particularly difficult disease to control since the strategy for reducing mortality and morbidity depends on prevention rather than cure. Moreover, the prevention is directed at mosquito larvae in water jars, two things that have always been a familiar part of the home environment. Now, health promotion activities must

DHF in Phnom Penh, Battambang and all other Provinces Combined

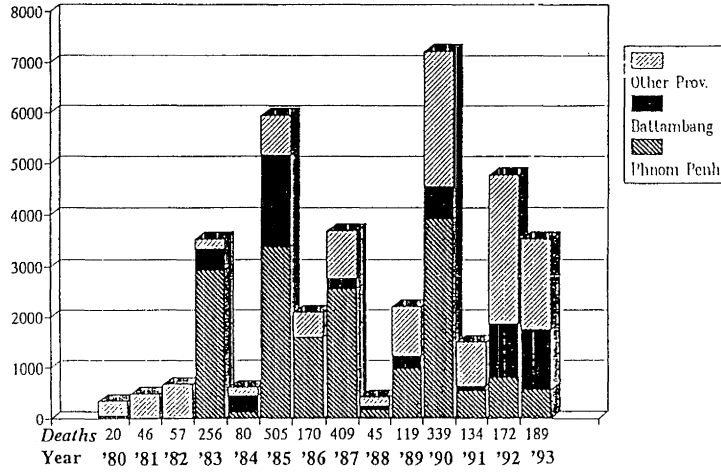


Fig. 1. DHF in Phnom Penh, Battambang and all other Provinces Combined in Cambodia, 1980–1993

DHF 1993: Number of Cases Reported per Province

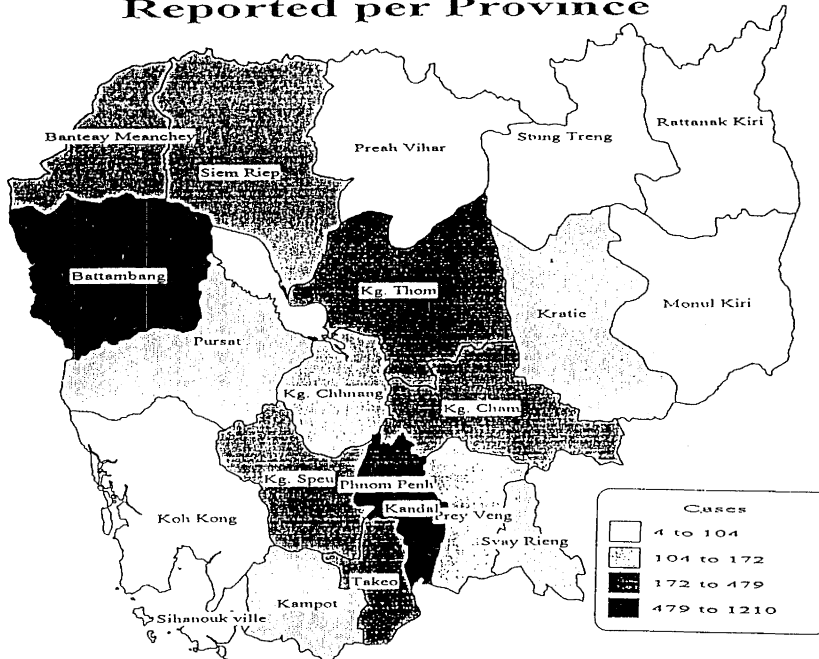


Fig. 2. Number of DHF cases reported per Province in Cambodia, 1993

convince people that this mosquito larva they have known all their lives and thought innocuous, is in reality very dangerous and must be destroyed.

These four social and ecological factors: urbanization and population movement, mosquito population density increases, insufficiencies in disease management, and community mobilization for prevention tend to increase the mortality and morbidity of the disease in Cambodia.

To meet these challenges, the Ministry of Health established, in June 1992, the Dengue Hemorrhagic Fever Control Committee comprised of four subcommittees. The committees receive broad support from various International and Non Government Organizations. Two examples of DHF Committee activities are described in the next section.

CONTROL ACTIVITIES

The Dengue Hemorrhagic Fever Control Committee was established by the Ministry of Health in June of 1992 with members from different departments within the Ministry and from Non-Government Organizations (NGOs).¹ The first concerted control effort was in response to the Battambang epidemic of 1992.

Battambang 1992: Response to an epidemic in progress

The first large outbreak in Battambang occurred in 1983 when there were 636 cases and 28 deaths recorded; in 1985 there were more than 1800 cases and 150 deaths and in 1990, 636 cases and 28 deaths. The DHF Control Committee concentrated on four areas: Case Management Training for physicians and nurses; Epidemiology; Health Promotion, including a "Dengue Day" clean-up and awareness campaign; and Vector surveillance and control, including temephos distribution and Malathion ULV spraying.

Larval indices showed a dramatic decrease with and overall decrease in the Breteau Index from 451.6 to 150.8 after the dengue day campaign and the first round of spraying and then to 27.2 after the temephos distribution and the second round of spraying: a decrease of 94%.

The number of cases fell in those parts of the city where vector control activities were carried out while they continued to rise in the surrounding districts, where cases peaked one month later in August.

¹The work of the committee received financial support from UNICEF, UNICR, UNDP, USAID, the Non-Government Organizations World Vision International and CONCERN and by WHO.

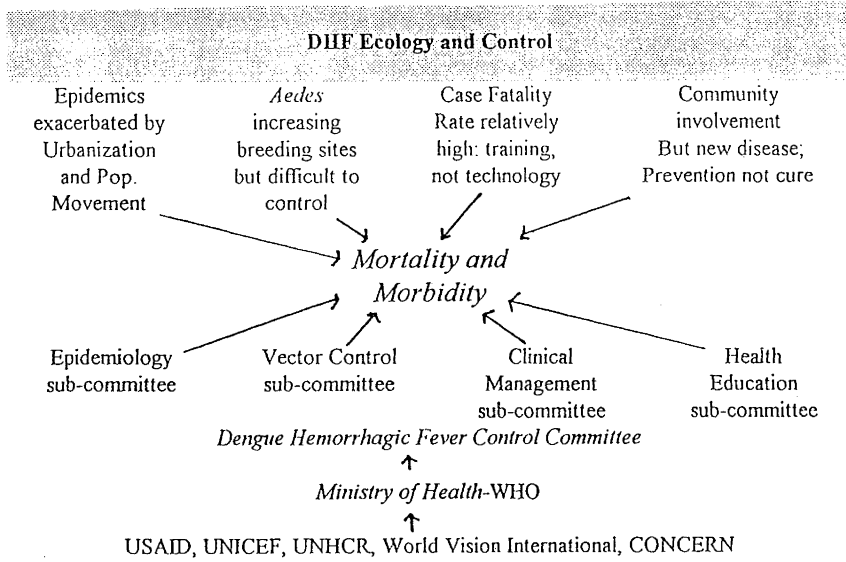


Fig. 3. DHF ecology and control

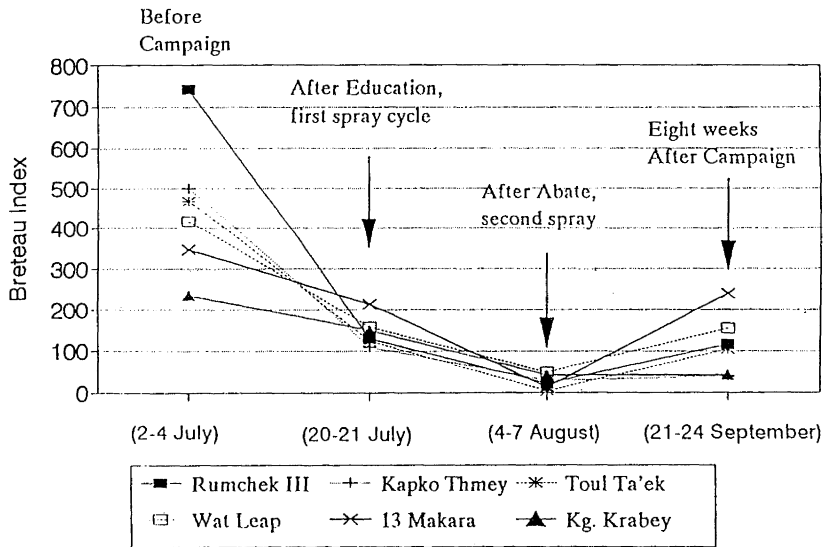


Fig. 4. Decrease in larval indices by mosquito control campaign

Three conclusions were drawn from the Battambang Campaign:

- First, after the education, clean-up campaign and insecticide applications, there was a dramatic decrease in *Aedes* indices for Battambang City. Temephos application to domestic water containers was very well accepted by the population.
- Second, while less clear than the entomological indicators, there was a drop in cases within Battambang City compared to other districts. Means were not available to determine if this shift in incidence patterns was due to the control campaign or rather everyone in those communities were already infected and there were not enough susceptible to maintain transmission.
- Third, the Battambang campaign showed the importance of rural dengue. There were education programs in other district but not enough staff or resources to cover the entire province. Even though the number of cases from the city fell there was still a great deal of transmission in areas outside the city. It showed that in the future it will be important to develop a program to address dengue in rural areas outside the main urban centers, possibly with pagodas and schools as the focus for education and vector control demonstration projects.

Phnom Penh 1993: Response to prevent an epidemic

The Ministry of Health anticipated a large dengue outbreak in 1993 in Phnom Penh, and using the experience gained from the 1992 Battambang epidemic, launched a large pro-

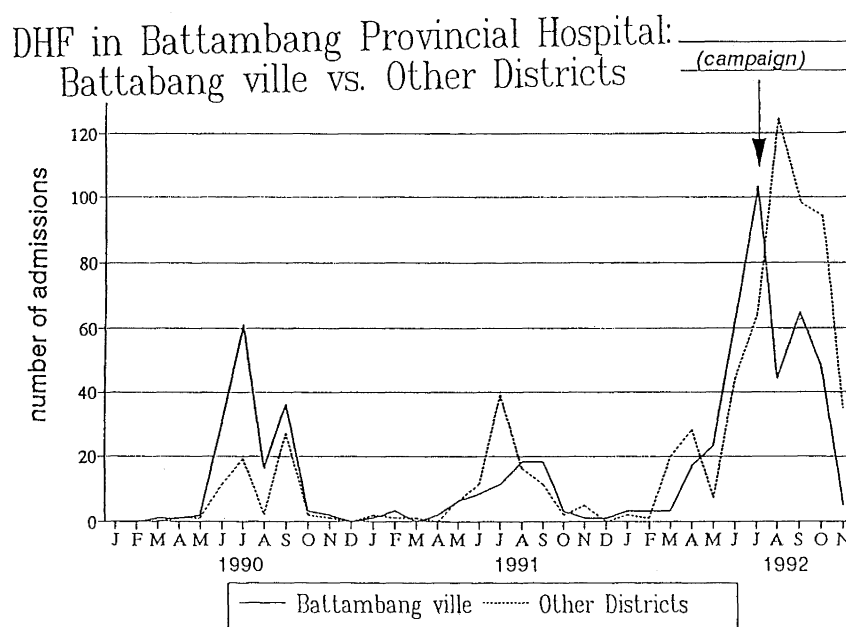


Fig. 5. DHF in Battambang Provincial Hospital compared with other Districts

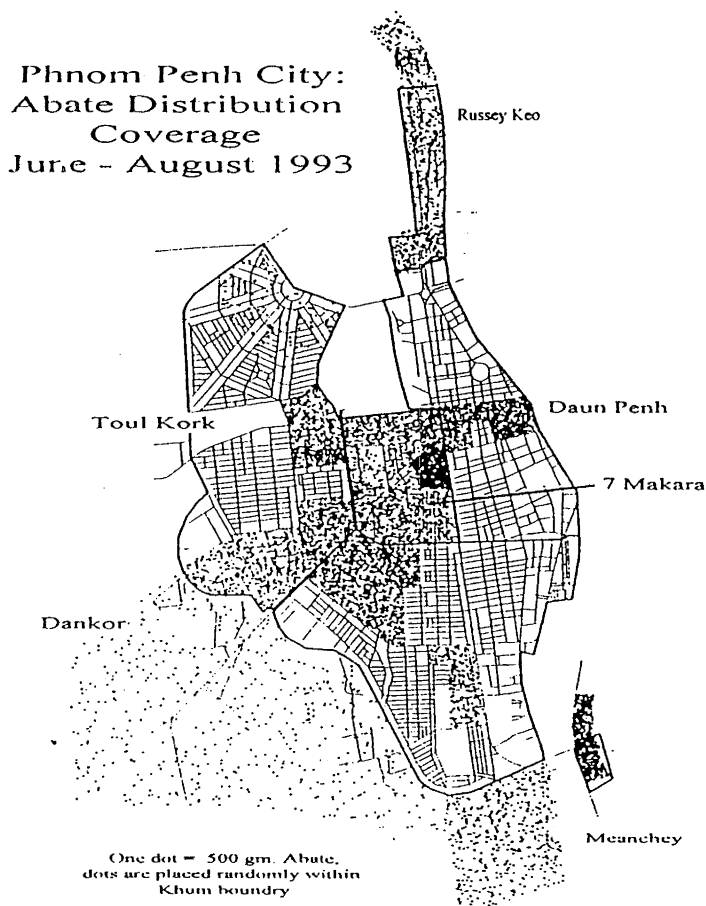


Fig. 6. Phnom Penh City: abate distribution coverage, June–August, 1993

gram of public education, training of clinicians and mosquito surveillance and control, including a distribution of 4500kg. of temephos in 48,000 houses in “high risk” parts of Phnom Penh. Surveys carried out the Municipal Health Department showed a large overall drop in the larval indices (Table 2).

There were relatively few DHF cases during 1993 compared to 1992 and 1990, when there were more than 4000 cases and 200 deaths in the city. Through to June 1994 there are still relatively few cases being reported.

Table 2. *Aedes Breteau* index (BI) in “high risk” areas of Phnom Penh, Cambodia, before and after dengue control campaign in June to July 1993

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BI	105	97	88	186	169	122	19	42	64	91	54	54

Dengue Hemorrhagic Fever in Phnom Penh Total Monthly Cases 1990 to June 1994

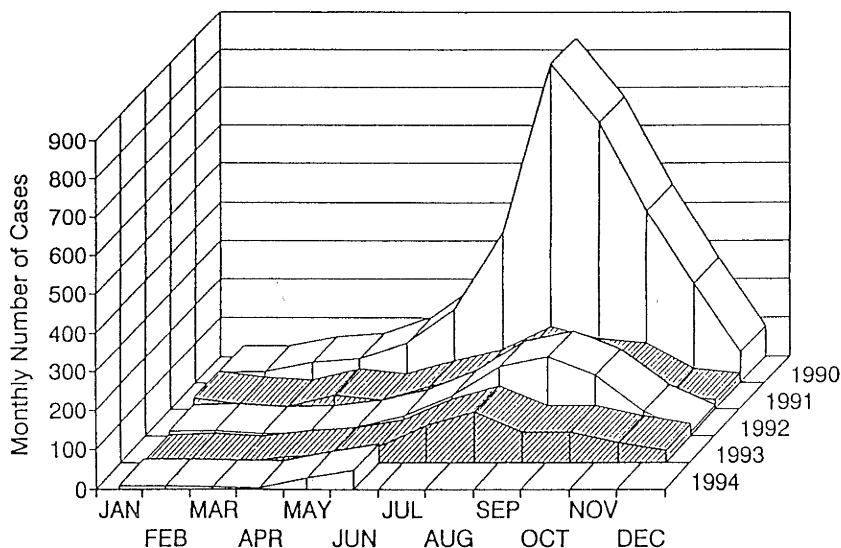


Fig. 7. DHF in Phnom Penh, total monthly cases, 1990–June 1994

CONCLUSION

Dengue hemorrhagic fever has become a major cause of childhood morbidity and mortality in Cambodia. There is no single answer to control DHF, no vaccine or drug against the virus and no “magic bullet” against the mosquito. It is an infection of communities and homes, and only through broad awareness and community mobilization can the mosquito vector be controlled. Likewise a reduction in mortality after the infection is acquired can only happen when mothers have the awareness and ability to recognize the disease and bring their child rather than treat at home until it is too late. Once on the hospital, the child’s survival depends not on sophisticated equipment and drugs, but on accurate diagnosis and basic nursing care. Too often the DHF case fatality rate is over 10%, while with proper case management it should be closer to 1%.

The Committee, working on ad hoc funding, has shown it can respond to an outbreak, as in Battambang in 1992, and can mount large preventive measures as in Phnom Penh in 1993. In 1994, the Committee is scheduled to receive solid financial support through a three year grant from the United States Agency for International Development.

The challenge now will be to strengthen these four basic sectors of epidemiology, vector control, health education and clinical management that while concentrating on dengue, will benefit much broader aspects of community development, health and child survival.

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