CHAPTER II

ESSAY

Education of Women as a Strategy

in the Control of Dengue Fever in Surin

2.1 Introduction

Dengue fever, dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) are prevalent in over 100 countries and territories and threaten the health of more than 2.5 billion people, living in urban, peri-urban and rural areas of tropical and subtropical regions. Annual incidence is estimated to be in the tens of millions, with an estimated 500,000 hospitalized cases of DHF/DSS, 90% of whom are children under the age of 15 years, the average mortality rate is 5%, with some 24,000 deaths each year (WHO, 1998).

The first outbreak of dengue fever in Thailand was reported in Bangkok in 1958. There were 2,706 cases and 296 deaths with a morbidity rate of 10.6/100,000 population and a case fatality rate of 10.9 %. The first outbreak outside Bangkok was reported in 1964 and DHF then gradually spread from the urban area to suburbs and small towns and even to rural areas. By 1978, the disease had spread throughout the length and breadth of the country and has persisted in an endemic form since then

In 1972, there were 23,782 cases and 685 death, the highest number of cases ever reported during 1958-1972, however the case fatality rate was only 2.88%. The disease outbreaks occurred once every year during 1958-1972 and once every two years during 1973-1980 (Daengharn, 1996).

Dengue fever is a viral infection common throughout the tropical regions of the world. The day-biting Aedes aegypti and Aedes albopitus mosquitoes transmit the virus.

The dengue virus has four flavors call serotypes, which are called Den-1, Den-2, Den-3 and Den-4. Getting infected with one serotype doesn't protect one against the other serotypes.

Dengue occurs in two forms: dengue fever (DF) and dengue haemorrhagic fever (DHF). Dengue fever (DF) is a severe flu-like illness that affects older children and adults but rarely causes death. Dengue haemorrhagic fever (DHF) is a second more severe form, in which bleeding and occasionally shock occur, leading to death. It is most serious in children. Dengue haemorrhagic fever is a deadly disease and early diagnosis and treatment can save lives. Unless proper treatment is given promptly, the patient may go into shock and die. The symptoms of dengue fever vary according to the age and general health of the patient. Infants and young children may have a fever with a measles-like rash, which is difficult to distinguish from influenza, measles, malaria, infectious hepatitis and other diseases with fever. Older children and adults may have similar symptoms or symptoms ranging from mild illness to very severe disease.

Characteristics of dengue fever

- Abrupt onset of high fevers.
- Severe frontal headache.
- Pain behind the eyes, which worsens with eye movement.
- Muscle and joint pains.
- Loss of sense of taste and appetite.
- Measles-rash over chest and upper limbs.
- Nausea and vomiting.

Characteristics of dengue haemorrhagic fever and shock

- Symptoms similar to dengue fever.
- Severe and continuos stomach pains.
- Cold or clammy skin.
- Bleeding from the nose, mouth and gums and skins bruising.
- Frequent vomiting with or without blood.
- Sleepiness and restlessness.
- Excessive thirst (dry mouth).
- Rapid weak pulse.
- Difficulty in breathing.
- Fainting.

The incubation period

The incubation period for DF/DHF can be as short as 3 days and as long as 14 days. The average incubation period is 4 to 6 days.

Transmission

Dengue viruses are transmitted in nature by day-biting Aedes mosquitoes. The most important mosquitoes vector is the highly domesticated and urban species, Aedes aegypti; secondary mosquito vectors include Aedes albopitus. Mosquitoes may become infected when they take a blood meal from a viremic person. Viremia is present for about 24 hours prior to onset and for an average of 5 days after onset of illness, usually coinciding with the period of fever. Mosquitoes that become infected from viremic blood require a period of incubation (the extrinsic incubation period) of about 8- 12 days, depending on the temperature, before they can transmit dengue viruses to another person. During this time the virus grows through the midgut and infects a number of tissues in the mosquitoes, including the salivary glands. Transmission requires the infective mosquito (with infected salivary glands) to take another blood meal, or to probe an individual in search of blood. Multiple feedings or probing by an infective mosquito may result in transmission to multiple persons in the same household or building, all having a set of illness within a few days of each other.

Treatment

There are no drugs to cure both DF and DHF. The treatment for both DF and DHF is only symptomatic.

Immunization

No vaccines are currently available. Encouraging progress has been made on development of a vaccine for DHF/DSS by researchers at Mahidol University in

Bangkok, Thailand. The vaccine is currently undergoing clinical trials, although it is uncertain when it will be available for general use.

The Dengue mosquito

Aedes aegypti, the mosquito, that transmits the dengue virus, is small (approximately 5mm in size), with black and white stripes on its legs and back. Mosquitoes that are carrying the dengue virus will give the disease to humans when they bite and thus introduce the virus into the human body.

Dengue mosquitoes bite in the early morning and the late afternoon. The mosquito rest indoor, in closets and other dark places. Outside, they rest where it is cool and shaded. The female mosquito lays her eggs in water containers in and around homes, schools and other areas in towns or villages. The larvae, known as wiggles, hatch from the mosquito eggs and live in the water for about a week; they then change into a round pupal stage for one or two days, after which the adult mosquito emerges ready to bite.

Where does the dengue mosquito breed?

Dengue mosquitoes breed in any water-catching or storage containers in shaded or sunny places. Favored breeding places are barrels, drums, jars, pots, buckets, flowers vases, plant saucers and roof gutters, refrigerator drip pans, catch basins, drains, soak-a way pits, cements. cemetery urns, plant leaf axils. bamboo stumps, tree cavities places where rain water collect or is stored (WHO, 1998 & WHO, 1996).

2.2 The Problem Situation

2.2.1 Why is DHF is a problem:

Dengue fever with its severe form such as dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) has become a major public health problem in recent years. Outbreaks of epidemic proportions resulting in high morbidity and mortality are now more frequent in endemic countries. According to estimates more than 2.5 billion people are at risk of infection in over 100 countries. Tens of millions of cases of dengue fever and at least five hundred thousand cases of DHF/DSS with a mortality of about 5% occur each year world-wide. A majority of cases (around 95 %) are among children of less than 15 years of age in many countries of Southeast Asia. DHF has become the leading cause of hospitalisation and death among children. In Thailand, this year alone, 13,268 people have been infected with DHF, out of which 26 have died (Bangkok Post, Nov. 21, 2000). The disease is not only showing geographic spread. but its incidence is also increasing (SEARO, 1996).

2.2.2 What is the priority problem?

Since 1958 until now dengue fever/dengue haemorrhagic fever has become a significant public health problem in Thailand. The number of dengue cases has increased slowly each year the morbidity rate between 1959-1968 was 1-25/100.000 in the following decade (1969-1978) the morbidity rate rose to 7-89. During the third decade (1979-1988) the number of dengue cases had increased 25-325/100.000,

reaching its maximum point in 1987 when 174,285 dengue cases and 1007 death cases were reported. In the fourth decade (1989-1998) epidemics of dengue fever occurred in a 2-4 year cycle, during which the number of dengue cases varied between 30,000 to 100,000 per year (morbidity rate: 50-170) (Table 2.1).

Table 2.1 Morbidity, mortality and case fatality rates of DHF in Thailand, 1958-1996.

Year	Cases	Deaths	Morbidity Rate (/100,000)	Mortality Rate (/100,000)	CFR (%)
1958	2158	300	8.87	1.23	13.90
1959	2706	296	10.92	1.19	10.94
1960	160	21	0.62	0.08	13.13
1961	1851	65	6.99	0.25	3.51
1962	561	36	2.05	0.13	6.42
1963	5947	308	20.88	1.08	5.18
1964	2215	173	7.49	0.59	7.81
1965	7663	385	25.06	1.26	5.02
1966	5816	137	18.47	0.44	2.36
1967	2060	65	6.34	0.20	3.16
1968	6430	71	19.16	0.21	1.10
1969	8670	109	25.11	0.32	1.26
1970	2767	47	7.61	0.13	1.70
1971	11540	299	30.88	0.80	2.59
1972	23782	685	61.81	1.78	2.88
1973	8280	315	20.92	0.80	3.80
1974	8160	328	20.05	0.81	4.02
1975	17767	438	42.43	1.05	2.47
1976	9616	361	22.43	0.84	3.75
1977	38768	756	88.28	1.72	1.95
1978	12547	308	27.93	0.68	2.45
1979	11478	127	24.92	0.28	1.11
1980	43328	403	91.96	0.85	0.93
1981	25670	257	54.06	0.54	1.00
1982	22250	159	45.89	0.33	0.71
1983	30025	559	60.71	0.46	0.76
1984	69101	496	137.12	0.98	0.72
1985	80076	542	154.94	1.05	0.68
1986	27837	236	52.88	0.45	0.85
1987	174285	1,007	325.13	1.88	0.58
1988	26926	179	49.37	0.33	0.66
1989	74391	290	133.95	0.52	0.39
1990	92005	414	163.43	0.74	0.45
1991	43511	137	76.79	0.24	0.31
1992	41125	136	71.16	0.24	0.33
1993	67017	222	114.88	0.38	0.33
1994	51688	140	87.47	0.24	0.27
1995	60330	183	101.46	0.31	0.30
1996	37929	116	63.09	0.19	0.31
1997*	43107	81	71.71	0.13	0.19

*Data as of Oct 2, 1997.

Source: Division of Epidemiology, Ministry of Public Health, Thailand.

In 1998, the beginning of the 5th decade, 120,000 dengue cases and 400 deaths were reported. At present dengue fever is found throughout the whole year in Thailand, although the epidemic occurs during the rainy season (May-October). Every year the highest number of dengue cases occurs during the period of July-August (Pantana, 1999).

The dengue haemorrhagic fever (DHF) statistics in Thailand during 1998 show the following: the number of DHF cases were 126,348 (morbidity rate: 207 75), whereas 432 people (0.34%) died from DHF (mortality rate: 0.70).

Pantana, (1999) reported the highest incidence of dengue fever cases in 10 provinces in 1998 as follows:

Table 2.2 The highest incidence of dengue fever cases in 10 provinces in 1998.

Province:	No of DF cases
Nakornsrithamarat	9,157
Bangkok	9,025
Udonthani	4,701
Ubonratchathani	4,621
Khon Kaen	3,664
Nakornpanom	3,516
Surin	3,481
Songhkla	3,436
Roi Et	3,310
Chiang Mai	3,128

The DF/DHF situation in Surin Province, Thailand, during 1987 – 1999

Surin suffered it's most serious epidemic in 1987 with a morbidity rate rising to 345.72, whereas the morbidity rate decreased to 50.71 during the following year. However during the last 10 years the trend increased every year, with most of the cases being children between the age of 5 – 14 years. In 1997 a serious epidemic continued until 1998. From January 1 until December 31, 1998 the number of reported dengue cases was 3,533 (morbidity rate: 258,32) and 2 death cases (0.06%) The statistics show that the morbidity rates in 1997 and 1998 were higher than 10 years ago, but also that the incidence was higher throughout the entire year (Department of Public Health Surin. 1999).

The following are the reported numbers of cases of dengue fever and dengue haemorrhagic fever and death by region in Thailand during -2000:

Table 2.3 Number of Dengue cases and death by region in Thailand 2000

Area	Cases	Morbidity rate(/100,000)	Death	Mortality rate (/100,000)	CFR (%)	Population
Central region	11,173	55.85	14	0.07	0.13	20,004,696
North-eastern region	1,524	7.13	1	0.00	0.07	21,379,428
Northern region	1,566	12.92	5	0.04	0.32	12,124,939
Southern region	1,714	21.02	9	0.11	0.53	8,152.638

Source: ivision of Epidemiology Ministry of public health, Thailand.
data as 15 Dec 2000

Table 2.4 Dengue situation in Thailand (1998-2000)

Year	Dengue cases	Morbidity (/100,000 population)	Case fatality rate (%)
1998	129,954	211.42	0.33
1999	24,826	40.39	0.22
2000	15,977	25.91	0.18

Source: Division of Dengue fever Control, Ministry of public health, Thailand, 2000
Dengue situation in Thailand (Jan 1,2000-Dec.15,2000)

Total Dengue cases 15,977 cases, Death 29 cases

Morbidity rate = 25.91 Per 100,000 population

Mortality rate = 0.05 Per 100,000 population

Case Fatality rate = 0.18 percentages

Table 2.5 Dengue situation in Thailand reported case by regions, 2000

Area	Dengue cases	Death cases	Morbidity rate (/100,000 population)	Mortality rate (/100,000)	CFR
North region	1,566	5	12.95	0.04	0.32
North-Eastern region	1,524	1	7.13	0.00	0.07
Central Region	11,173	14	55.85	0.07	0.13
Southern region	1,714	9	21.02	0.11	0.53

Source : Division of Dengue fever control, MOPH, Thailand, 2000

Table 2.6 Dengue situation in Surin,2000

(Year)	Morbidity rate	Mortality rate	Case fatality rate
1997	184.69	0	0
1998	258.32	0.15	0.06
1999	19.75	0.22	1.10
2000	3.40	0	0

Source : Department of Public Health, Surin (data as 14 July 2000)

In 1999, many dengue cases were found in May whereas the highest incidence of dengue cases was found in August. The highest incidence of dengue fever in 1999 was seen in 3 districts in Surin: Muang districts, Chompra district and Kawaosinarin district. The morbidity rates in these three districts were 47.78; 44.11 and 33.50 respectively.

In 2000, dengue fever was found throughout the whole year whereas the highest incidence of dengue fever was registered in Kawaosinarin district with a morbidity rate of 16.77.

Were in 1997-1999 most of the dengue cases children of age 0-14 years; in 2000 (data as 12 July 2000) most of dengue case were children between 10-14 years with a mortality rate of 12.17.(Department of Public Health Surin,2000)

Table 2.7 Reported dengue cases by district in Surin

Zone	District	Population in 2000	1999					2000				
			Dengue cases	MB.R	Death	MT.R	CFR	Dengue cases	MB.R	Death	MT.R	CFR
1	Muang	213,434	102	47.78	0	0.00	0.00	28	13.12	0	0	0
	Municipality	42,854	12	29.06	0	0.00	0.00	12	28.00	0	0	0
	Prasat	153,868	6	3.88	0	0.00	0.00	11	7.15	0	0	0
	Kapchreng	63,354	9	14.07	0	0.00	0.00	3	4.74	0	0	0
	Panomdongrak	35,414	1	2.82	0	0.00	0.00	2	5.65	0	0	0
	Kawasinarin	35,780	12	33.50	0	0.00	0.00	17	47.51	0	0	0
2	Srikorapum	141,392	19	13.34	1	0.70	5.26	4	2.83	0	0	0
	Sangkala	123,495	2	1.62	0	0.00	0.00	9	7.29	0	0	0
	Lumduan	29,550	1	3.40	0	0.00	0.00	4	13.54	0	0	0
	Sumrongtab	54,273	2	3.68	0	0.00	0.00	1	1.84	0	0	0
	Boached	37,870	6	15.92	1	2.65	16.67	0	0.00	0	0	0
	Srinarong	44,629	1	2.25	0	0.00	0.00	3	6.72	0	0	0
3	Chumpolbury	69,878	8	11.49	0	0.00	0.00	4	5.72	0	0	0
	Thatum	99,311	19	19.12	1	1.01	5.26	3	3.02	0	0	0
	Chompra	61,040	27	44.11	0	0.00	0.00	3	4.91	0	0	0
	Ratanaburi	94,553	27	28.58	0	0.00	0.00	6	6.35	0	0	0
	Sanom	45,753	11	23.91	0	0.00	0.00	0	0.00	0	0	0
	Nolnarai	35,514	8	22.54	0	0.00	0.00	1	2.82	0	0	0
Total		**1,381,962**	**273**	**19.75**	**3**	**0.22**	**1.10**	**111**	**8.03**	**0**	**0**	**0**

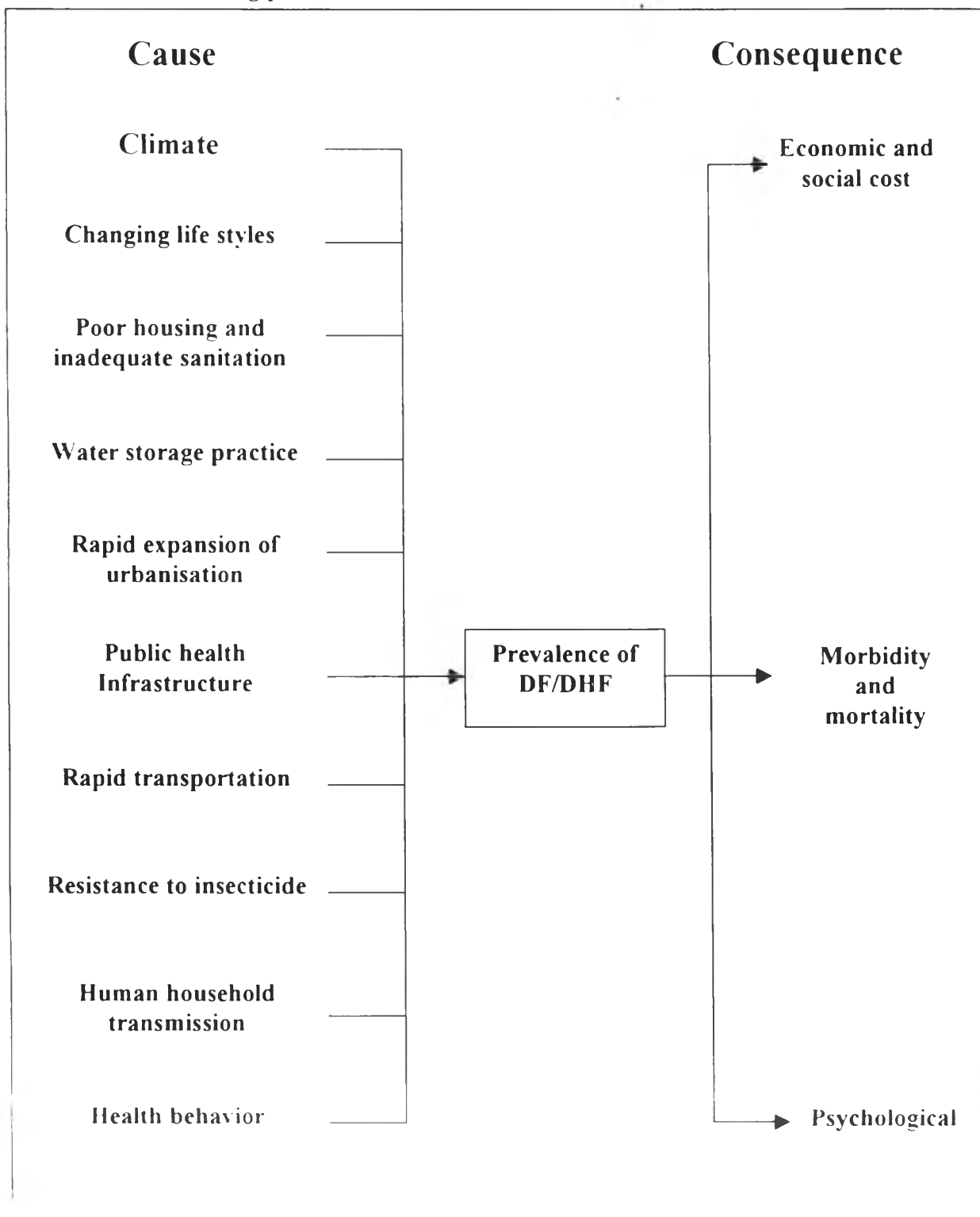
Source : Department of Public Health Surin, 2000

According to above information, prevalence of dengue fever and DHF among children in Thailand is the priority problem, since children less than 14 years old are mostly affected

2.3 The Mechanism of The Problem Situation.

Why does dengue happen?

Figure 2.1 A conceptual framework showing causal relationship of factors affecting prevalence of DF/DHF



2.3.1 Causes

Climate - Seasonality

Outbreaks of dengue usually occur in urban areas during the rainy season, but occasionally during the dry season. Humidity and temperature have an effect on dengue transmission. Due to high humidity during the rainy season mosquito survival is longer On some occasions mosquitoes may be more abundant during dry than rainy seasons. For example water cooler re-circulation may provide mosquito-breeding sites during the dry season. The time required for ingested virus to reach the salivary glands of mosquitoes varies with temperature and is an important variable in triggering epidemic transmission, the higher the temperature, the shorter the extrinsic incubation period. Temperature may also affect the maturation of mosquitoes. Higher temperatures producing smaller females, which are forced to take more blood meals to obtain the protein, needed for egg production. This has the effect of increasing the number of individuals infected by single female and thus the vector capacity of the mosquito (Gubler et al, 1997).

Global warming is also increasing the necessity for prevention, according to world wildlife fund spokesman, Dr. Paul Epstein, from Harvard Medical school. He warned in a November 1998 report on climate change, which was submitted to the United Nations, that the warming of the earth will cause a rise infectious disease including dengue, malaria, cholera, yellow fever and encephalitis (Kenyon, 1999). Also the El Nino caused change in weather patterns is thought to have an effect on the mosquito life cycle (Economist, 1998).

The coastal mountain ranges of Costa Rica had long confined dengue fever, to the country's pacific shore. But in 1995 rising temperatures allowed Aedes aegypti mosquitoes to pass the coastal barrier and invade the rest of the country. Dengue also advanced elsewhere in Latin America, reaching as far north as the Texas border. By September the epidemic had killed 4,000 of the 140,000 people infected (Linden, 1996).

Scientists using computers to simulate the general circulation of the earth's climate have predicted that rising global temperature will increase the potential transmission of the dengue fever virus. Dengue fever is now considered the most widespread virus infection transmitted to man by insects, whether measured in terms of the number of human infections or the number of deaths. The report, by Jonathan Patz, MD, MPH, at the John Hopkins University School of Public health and his colleagues appeared in the March 1998 issue of Environmental Health Perspectives the monthly journal of the National Institute of Environmental Health Sciences.

Most of the new areas of increased potential risk were predicted to be temperate regions that currently border on endemic zones. These areas represent places where human and the primary carrier, the mosquito Aedes aegypti, often co-exist, but where lower temperatures now limit disease transmission. The dengue virus is not vulnerable to any vaccine or drug. Major epidemics of dengue have occurred in the Southeast United Stated, the largest in Galveston, Texas in 1992, when over 500,000 people were stricken. The last outbreak in Texas occurred as recently as 1995, during an unseasonably hot year. The researchers used three different general circulation models

To predict the patterns of global climate change: all three showed that dengue's epidemic potential increase with a relatively small temperature rise. The higher a virus' epidemic potential, the fewer mosquitoes are necessary to maintain or spread dengue in a vulnerable population.

The geographic range of Aedes aegypti is limited by freezing temperatures that kill over wintering larval and eggs, so that dengue virus transmission is limited to tropical and subtropical regions

An estimated 2.5 billion people are currently at risk from dengue infection and since the late 1970s, dengue has re- emerged in the Americas. In 1997, 240,587 cases of dengue were reported in Brazil alone, according to Brazilian ministry of Health January, 1998, responding to weather generated by El Nino, dengue transmission rates in Southeastern Brazil increased nearly six- fold from 1997 levels. Outbreaks in urban areas infested with Aedes aegypti. can be explosive, involving up to 70-80 percent of a population (Key et al. 1998)

Changing life styles

Changing life styles have contributed to expanding geographic distribution and increased population densities of Aedes aegypti, For example, most consumer goods are packaged in non-biodegradable plastic or cellophane that is discarded in the environment, making ideal Aedes aegypti larval habitats. Also, there has been a dramatic increase in automobiles and thus used automobile tires that are discarded in the environment, these also make ideal mosquito larval habitats (Gubler, 1996).

Poor housing and inadequate sanitation

Poor housing and inadequate sanitation facilities provide the perfect environment for mosquitoes to breed.

Water storage practice

Unreliable water supply leads people to keep water storage tanks and the use of container to store water for future use. This practice often results in the creation of breeding sites and thus higher vector densities.

Slums and Aedes breeding

There is a close correlation between DHF and poverty. Proliferation of slums and the growth of squatter settlements, often lacking piped water and adequate sewage facilities provide ideal breeding sites for Aedes aegypti. Chan (1985) stated in Singapore, entomological surveys of slum areas in the mid and late 1960 showed profuse Aedes aegypti breeding in all sorts of containers both inside and around the slum houses. The inside of slum houses would typically be dark and damp, with large numbers of adult Aedes aegypti was being found resting on clothing, furniture and other objects.

Rapid expansion of urbanisation

Unplanned and uncontrolled urbanisation in some countries, has result in deteriorating housing and inadequate water, sewer, and waste management systems and to an increasing population of rodents, mosquitoes, and other animals living in intimate

association with crowded human populations. DF/DHF occurs more frequently in places, which have experienced a substantial increase in their urban population.

Human-household transmission

Once an infected mosquito enters a house, a member of a household can becomes infected. The probability of multiple infections in the household increases and eventually results in a cluster of dengue infection. In Honduras, five members of a family became ill from dengue, four of them had onset within 4 days. In one extreme case 29 of 30 members of a household in China were infected. In dengue endemic areas, the spreading of the disease is a function of the probability of contact between human, virus and mosquito. The importance of the movement of infected children as a mechanism of spreading dengue should be recognised. Enormous population growth in major cities and urbanisation of rural areas in the tropics in the past few decades has definitely contributed to more frequent and larger dengue epidemic, thus reports of a positive correlation between human density and the magnitude of dengue transmission are not surprising.

In Malaysia, Malays began to migrate in large numbers to urban areas, resulting in 50 percent increase in DHF hospitalisation rate for that ethnic group (Gubler et al, 1997).

Transportation

The worldwide increase of commercial transport, accompanied by increased intercontinental travel, in the last decades, has provided an ideal mechanism for the

rapid movement of both infected travellers and the dengue mosquito/virus. Aedes aegypti infestation, whereby merchant shipping served as a means of transport, has been documented both in South America and in Thailand. Also ground transportation provides an official mechanism of dissemination of both mosquito vectors and viruses. Transportation of mosquito vectors by passenger cars across a national border has also been documented (Gubler, et al, 1997). The large numbers of cars used for transportation in dengue-endemic urban areas clearly favours the rapid spread of vector and viruses and an increased contact among humans.

Public health infrastructure

The public health infrastructure required to deal with, epidemic vector-borne, infectious diseases has deteriorated during the past 30 years in most countries. Limited financial and human resources, and competing priorities for those resources have resulted in a "crisis mentality " among public health officials. The emphasis has thus been on implementing emergency control measures in response to epidemics rather than on developing programs to prevent epidemic transmission. This approach has been particularly detrimental to dengue prevention and control because in most countries surveillance is very poor. The passive surveillance systems relied on to detect increased transmission are dependent upon reports by local physicians who often have a low index of suspicion and do not consider dengue in their differential diagnosis of dengue-like illnesses. As a result, the epidemic has often reached or passed peak transmission before it is detected and emergency control measures are implemented, too late to have any impact on the course of the epidemic (Gubler, 1997).

Insecticide resistance

Since the late 1940s, resistance in Aedes aegypti to a range of insecticide has been documented in many parts of the world. For example adult Aedes aegypti in Puerto Rico do have a high known resistance to organochlorine insecticides (Gubler et al, 1997).

Health behaviour

The behaviour of people, concerning their own health, plays an important role in both the prevention and control of DF/DHF. The use of bed nets during the mosquito biting time, improved sanitation and increased awareness concerning disease prevention does lead to a decrease in vector density and transmission rates.

2.3.2 Consequence

Impact of dengue fever outbreaks.

a. On morbidity and mortality.

Outbreaks of dengue result in increasing morbidity and mortality rates for both DF and DHF. For example, by 1996, Aedes aegypti had re-established itself throughout Central America and subtropical parts of South America (Venezuela: 32,000 cases of DF infection and 5,000 DHF cases; Colombia: 12,000 DF and 107 DHF cases;

Central America 50,000 DF and nearly 600 DHF; Mexico 11,000 DF and 355 DHF cases.

In the Caribbean more than 25,000 cases of dengue fever were reported in Puerto Rico for 1994-1995, representing the largest epidemic of DF in 30 years. During the same period the U.S. Virgin Islands had an epidemic of dengue fever after two hurricanes (Clark et al, 1996).

In Vietnam an outbreak of dengue fever in 1998 killed 120 people, five times more than in 1997. The government said that children are especially susceptible. In June 1998 at least 17 children died from dengue fever in the southern province of Dong Nai, Vietnam's Ministry of Health stated that 46,373 people had contracted the disease in 1998, triple the figure for this time in 1997. Most cases occur during or after the rainy season, which began in June 1998 (Henderson, 1998).

In 1998, in Indonesia, according to official figures, which probably reveal only a fraction of the disease's impact, over 700 people have died from dengue fever this year, including 54 in Jakarta. In the first quarter there were two and a half time more cases as last year.

In Thailand, where infections are three times as high as last year, in April 1998 the Public Health Ministry said the risk of dengue was higher than 40 years. Dr. Suchitra expects more people to get dengue fever this year than in 1987, the year of the last pandemic, when 170,000 people caught dengue fever (Economist, 1998).

b. Economic and social cost

Costs include those of treating the sufferers directly; the indirect social costs of those associated with vector control, diagnosis and out-patient treatment of mild cases, and intensive care of the severity ill. Adult's lost work to attend to children's illness.

Finally there are costs associated with lost of life. A study by Von Allmen and others (1979) from Puerto Rico, with a population 3 million, in which the economic cost of the island's dengue fever epidemic of 1977 is calculated. Included are direct costs for medical care, vector control measures indirect costs for lost production due to absenteeism and illness by patients and parents caring for sick children. The direct costs ranged between US$ 2.4 million and US$ 4.7 million. Indirect costs ranged from US$ 3.7 million to US$10.9 million, with total costs of the epidemic ranging between 6.0 and 15,6 million US$.

Expenditure on patient care and vector control measures is considered to be in the range of 7.8 to 20.2 percent of the total expenses. Chan (1985) provided a thorough description, including a cost analysis of the Singapore vector control program. The most important element of the program is source reduction- elimination of breeding sources for mosquitoes. Trained, uniformed public health officers are authorised to enter premises, inspect for, and destroy breeding sources. Destruction of breeding sources includes removing water-collecting refuse and sealing water storage containers. This environmental program is supplemented, in time of epidemics; by chemical control- fogging premised those have or are near places that have high Aedes aegypti indexes. Public health education, primarily through pamphlets, seeks to motivate and

teach the population to eliminate breeding sites. During outbreaks, television, radio, and newspapers provide additional publicity.

Moreover Singapore enacted the Destruction of Disease-Bearing Insects Act to require that persons comply with directives of the commissioner of health to eliminate breeding sources. Violations are punishable by fine. Chan reported that the environmental (Aedes) control program cost three to four Singapore dollars per person per year in 1973 to 1974, or S$ 1.36 to S$ 1.82.

Outbreaks of dengue fever and especially dengue haemorrhagic fever place a severe strain on the health care services of the countries affected. In a 1995 study carried out by the faculty of Tropical Medicine of Mahidol University in Thailand/ in collaboration with the Faculty of Economics of Chulalongkorn University in Bangkok, Thailand, several parameters [treatment- seeking behavior, direct impact, i.e. cost of the illness of patients

(average 7.9 days) and time cost spend by parents/caretakers(average 9.5 days), and direct impact due to disruption of family life resulting in increased expenses] were identified. From the provider side, expenditures for the hospitalization of DHF patients included drug, laboratory and nursing costs and the cost of prevention and control. The estimated costs for this items are provide in as following:

Costs of DHF control in Thailand

		US$
1. Cost due to morbidity (per patient)		
User cost: total patient	cost child	113.0
	Adult	154.6
Provider cost: hospitalization		44.0
Total morbidity cost	**child**	**157.0**
	Adult	**198.6**
2. Cost due to mortality (per patient)		
Funeral cost	child	395.0
	Adult	648.0
Potential income loss (50 working years)		120,000.0
Total mortality cost	**child**	**120,395.0**
	Adult	**120,648.0**
Cost for prevention and control in 1994		
Ministry of Public Health annual budget		1,868,968.0
Bangkok Municipality Administration annual budget		112,000.0
Ministry of interior (75 province, est. 0.25 million/province)		2,891,400.0
Total prevention and control cost		**4,872,368.0**

Note : Costs from provider do not include salaries, administration and supportive expenditures(WHO,1999).

c. Psychological

The main problems that they faced during the illness episodes are stress, such as: stress created by having someone sick with dengue at home; by not knowing what it was or what to do, or by having to leave other children at home by themselves. Stress because of anxiety or because of economic problem concern money spent and income

lost. Another problem is the post-infection depression of which the patient suffers and which delays their recovery from DF/DHF.

2.4 What could be done to improve the situation and how would they bring improvements.

In Thailand, even though the government has been carrying out dengue fever prevention and control projects around the country, the incidences of dengue fever are still high. There is no drug to cure dengue fever and vaccine is now being in clinical trials in Thailand.

In general, the only method of control or preventing dengue and dengue haemorrhagic fever is to avoid being bitten by Aedes aegypti mosquito. Control can be two levels, the control of adult mosquito and control of mosquito larvae. Control of mosquito larvae habitats by elimination of mosquito breeding places (source reduction) by cover water containers, remove of rubbish, used biological control such as temephos sand granules placed in water container to kill larvae.

Control of adult of adult mosquito larvae by spraying with insecticide, using mosquito coils and electric vapour mats, mosquito nets, repellents, and screens in windows and doors. However, spray insecticides are expensive and are ineffective for routine mosquito control. The use of chemicals in the eradication of adult Aedes aegypti poses several problems regarding both the practical implementation and the

effectiveness of the various methods. Aerial ULV treatments are considered as the best method during urban dengue and yellow fever epidemics, when rapid coverage is a priority, but require specialised skills and experience, since careful route planning is crucial. Also meteorological variances, such as changes in wind direction, can greatly reduce the efficacy of this method. ULV spraying from vehicles is more time consuming and require well-trained staff, as is the case with thermal fogging.

There are still many debates on the efficacy of these methods since their efficacy seem to be at least short term, especially for indoor species like Aedes aegypti. Spraying of insecticides that aim both to kill the adult mosquito and make potential containers inhospitable to larvae, face the problem of resistance, which has been reported in many parts of the world and a decreasing acceptance of the public.

Mechanical methods such as bed nets, windows/door netting is still useful as long as properly used. Doors and windows should be kept closed as much as possible and the netting should be replaced when damaged. Bed nets should be regularly impregnated with N.N-diethyl-m-toluamide (DEET) and should be replaced when damaged, although Aedes aegypti shows maximum activity during the day. With many people taking a rest in the afternoon in many dengue-endemic countries and still some biting going on during dawn and in the dark, the bed net still is an effective means of prevention.

The use of repellents containing N.N-diethyl-m-toluamide (DEET) is an effective means of preventing mosquito bites, but requires frequent application because

of perspiration. It might be less favoured in the use with children, as care has to be taken in applying the repellent. Its main use is for travellers in endemic areas. Anti-mosquito sound devices have yet failed to prove their efficacy.

The ovitraps' aim is to saturate the environment with enough traps in order to outnumber the "nature" larval sites and thereby reduces the reproductive potential of females (Chan, 1985). However this method might be unrealistic, as a high number of traps is required, and a lot of personnel to maintain the traps.

Oil like e.g. kerosene and diesel oil is able to kill larvae and pupae. However they are hardly used anymore because of availability of insecticides. Polystyrene balls as a barrier against oviposition has also been suggested (Gubler et al, 1997).

The reduction of larval sites is still the most important vector control method in combination with protection of water storage containers. However both methods require constant vigilance by both the public health authorities and the general public. In order to be effective methods the public needs to be able to identify the various types of larval site and the motivation to clean up the larval site on a regular basis. Continuous involvement of the public is crucial in the prevention of dengue fever and makes co-operation with and encouragement from the government an absolute necessity (Chan, 1985 & Gubler et al, 1997).

The program example that was proposed as an effective community participation program for the control of Aedes aegypti, was carried out in dengue

control through schoolchildren in Thailand. In 1992, a national dengue control program was started through school children. All primary schoolchildren were expected to participate in vector control by eliminating Aedes breeding places within their schools and household areas with a target of reducing DHF morbidity among schoolchildren from 447.8 per 100,000 to 240 per 100,000 by 1996, and to 160 per 100,000 by 2001. The project had achieved the goal of morbidity reduction to 219.2 per 100,000 populations by 1996. The project was also evaluated from 96 school samples nation-wide during September- November 1994. It was found that 93.7% of the schools sample had been involved in the project. 62.5% of the province, 64.3% of the districts surveyed showed decreasing morbidity rate among both schoolchildren and all other age groups (Wangrungsarb, 1997).

Indonesia

DHF Control by Source Reduction through School Health program and Village DHF- working Groups in Indonesia. Studies carried out during 1992 and 1993 revealed that 18 to 35 % of the breeding foci of Aedes were associated acquired with school building and around 80% of school going children acquired infection in schools. The Sub-directorate of arbo-virus, Directorate-General of Communicable disease Control and Environmental Health, developed a strategy for the Control of DHF by source-reduction methods through inter sectional co-operation; firstly through the Department of Culture and Education. It was entrusted upon schoolchildren to eliminate all Aedes breeding foci in schools, yards, communities and students' own houses. Secondly through the Ministry of Home Affairs, village DHF worker groups were constituted for

undertaking source reduction activities, later evaluated by health centres. The evaluation studied revealed a high degree of success of these campaigns (Yatim,1996).

Vietnam

In Northern Vietnam, copepods of the genus mesocyclops were used for biological control of Aedes aegypti, the principal vector of dengue viruses, by inoculation into wells, large cement tanks, ceramic jars and other domestic containers that served as Aedes Aegypti breeding sites. The use of mesocyclops was complemented by community participation with respect to recycling to eliminate unused and discarded containers that collect rainwater and provided Aedes aegypti breeding sites that could not be treated effectively with mesocyclops. Aedes aegypti disappeared from 40 houses of the treated village in August and has not reappeared. When used in combination with community recycling, Mesocyclops is an easy and inexpensive method of Aedes aegypti control
(SN et al, 1998).

Copepods are crustaceans. They are found almost everywhere where water is available and they constitute the biggest source of protein in the oceans. Most of the economically important fishes depend on copepods and even the whales in the Northern hemisphere feed on them. Trillions of little copepod guts produce countless faecal pellets contributing greatly to the marine snow and therefore accelerating the flow of nutrients and minerals from surface waters to the bottom of the seas. Predatory freshwater copepods have been successfully used to control pests like Dengue feve.

Cuba

The Cuban program has been hailed as one of the few success stories in Aedes aegypti control. It was initiated in 1981 during the first and largest DHF epidemic in the Americas. During the epidemic the Cuban government trained and mobilised over 15,000 civil defence workers to go from house to house implementing mosquito control and educating the citizens about dengue and how to control Aedes aegypti. Massive amounts of insecticides were used for both larval and adult control. Water containers were treated with temephos (-abate), houses were sprays with residual insecticide, and weekly ULV sprayings with Malathion were conducted both indoors and from the street. With the Aedes aegypti population reduced to an unprecedented low level after the initial control efforts. The Cuban government then set a goal of eradication. Although this has not been achieved, the program was successful in reducing and maintaining the Aedes aegypti house index of less than 0.1% and in preventing any further dengue transmission. People were instructed on how to prevent mosquitoes breeding in and around their homes and thousands of inspectors were sent to check individual households, and enforce the anti-mosquito breeding laws. People were fined if Aedes aegypti larval habitats were found on the premise (Gubler et al, 1996).

Temephos is one of a few organophosphates registered to control mosquito larvae, and is the only organophosphate with any appreciable larvicidal use. It is an important resistance management tool for mosquito abatement programs.

The above studies show that community participation in control of dengue fever via larval source reduction can reduce morbidity and mortality of dengue cases and also can provide short-term success as well as long term sustainability.

Community participation

Community participation became one of the main principles of primary health care. The Alma Ata Declaration of 1978 stated that "requires and promoted maximum community and individual self-reliance and participation in the planning organisation, operation and control of primary health care and to this end develops through appropriate education the ability of communities to participate" (WHO, 1978).

This was the result of the acknowledgement by the WHO that although the health strategies of the industrialized world – that of big hospitals, drugs and curative medicine - had been exported to the developing world for thirty years, the health of the world had not improved but had in fact worsened. The acknowledgement led to the development of a new strategy in which Primary Health Care (PHC) became the code word in order to achieve the goal known as "Health for All by the year 2000". Primary Health Care consists of eight combined components:

- Education about common health problems and what can be done to prevent and control them;
- Maternal and child health, including family planning;
- Promotion of proper nutrition;
- Immunization against major infectious diseases;
- An adequate supply of safe water;

- Basic sanitation;
- Prevention and control of locally endemic diseases;
- Appropriate treatment for common diseases and injuries.

Primary Health Care is based on the following concepts put together as a comprehensive strategy:

- PHC should be shaped around the life patterns of the population;
- It should both meet the needs of the local community and be an integral part of the national health care system;
- It requires an integrated approach of preventive, promotional and rehabilitative services for the individual, family and community;
- The majority of health interventions should be undertaken as close to the community as possible;
- The balance among these services should vary according to the community needs;
- The local community should be involved in the formulation and implementation of health care activities;
- Decisions about the community's needs and solutions to its problems should be based on a continuing dialogue between the people and the health professionals who serve them.

Since the Alma Ata Conference, PHC has enjoyed solid progress as well as serious setbacks. However where PHC has been implemented it has brought important benefits to women, where it has raised their self-esteem and their contribution to the community, by improving both their health and education. At the same time it placed more women in positions of responsibility and encouraged initiative.

Its success is partly due to the fact that PHC relies on home self-help and community participation as well as on the fact that it stresses prevention and control rather than cure.

What does ' community participation mean'?

A variety of different interpretations have been placed on the term ' community participation', each of which can give rise to a different form of practice. Participation means in its broadest sense, to sensitize people and thus to increase the receptivity and ability of rural people to respond to development programs, as well as to encourage local initiatives. With regard to development... participation includes people's involvement in decision-making processes, implementing programs... their sharing in the benefits of development programs, and their involvement in efforts to evaluate such programs. Participation involves... organized efforts to increase control over resources and regulative institution in given social situation, on the part of groups and movements of those hitherto excluded from such control (Rifkin,1990).

Community participation is the process by which individuals and families assume responsibility for their own health and welfare and for those of the community and develop the capacity to contribute to their and community's development (WHO, 1978). Community participation refers to the involvement of the people in a community development project. It is also a process by which the individual and the community identify problems, evolve solutions and found the resources to solve their problems, accept programs and take the responsibility to become self-reliant.(Ministry of Rural Areas and Employment , 199- -).

How do people participate!

Five different levels can be distinguished in a community's participation in programs with an important health services component;

People participate in the benefits of the programs. Members of the community receive services and education provided by planners and agencies, such as curative services, preventive immunizations, antenatal care, improved water, supply and sanitation facilities, and health information. In many cases, obtaining these benefits involves only attendance at a clinic or payment of small fee for the services, maintenance or materials provided by health staff and /or the government .In such instances community participation may be considered as passive. In all health programs that are community-oriented rather than individual-oriented, community do receive benefits and many passively accept the health services that are provided.

People participate in program activities. For example, member of the community contributes land, labor and money to health program. They may help construct a clinic or distribute contraceptives, or pay for drugs and other medical supplies for the program. They may become community health workers and provide mothers and children with simple services and education. This can be considered as active participation, but those concerned do not participate in the choice of activities to be undertaken or in decisions as to how they will be carried out, which remain the prerogative of health planners, agencies or the government. The members of the community simply agree to carry out the activities laid down by the planners.

People participate in implementing health program. In addition to participating in benefits and activities, members of the community may choose the site of a clinics run drug-purchasing schemes, organize infant welfare and nutrition clinics etc. At this level, those involved have some managerial responsibilities, since they make decisions about how these activities are to be run. However, planners to whom the members of the community have to refer for advice, supervision and approval decide on the activities to be undertaken and the program objectives to which they contribute. It is therefore the planners rather than the community who are the focal points for these activities.

People participate in monitoring and evaluating program. In addition to the above, members of the community help planners to judge whether the program objective have been met- and if not, why not. At this level they are involved in deciding how to measure objectives and I systematically monitoring activities. They are in a position to modify program objective but not to determine that objective they, a task, which is still the prerogative of the planners.

People participate in planning program. In addition to participating in the ways described in the four preceding sections, people from the community (usually leaders and key members such as teachers, etc,) actually decide what health programs they think should be undertaken and ask health staff, agencies and/or the government to provide the expert knowledge and/or resources to enable the activities to be pursued. Members of the community decide upon and manage a health program that includes services and provides the necessary resources to achieve their objectives. This is the

level at which community participation is the broadest, in both range and depth. It involves members of the community in receiving benefits, in joining in activities, in implementing projects, in evaluating and monitoring program, and in making decisions about, and taking responsibility for, program policy and management. It is the ideal towards which many programs strive. (Rifkin, 1990)

Cohen and Uphoff (1980) regard participation as multidimensional phenomena that they define as "the involvement of a significant number of persons in situations or actions, which enhance their well-being; e.g. their income or self-esteem". In their view three dimensions characterise participation: 1) what kinds of participation are occurring; 2) who participates and 3) how participation is developed. They distinguish 4 types of participation for the first dimension: a) participation in decision making; b) in implementation; c) in benefits and d) in evaluation. Decision-making and implementation are part of the participation in the inputs of the program; they refer to goal setting, authorisation, information, labour and recourses. Benefits refer to participation in the outputs of a program, such as materials, social and personal benefits. Within the second dimension the scope of participation is most important, which can be determined by identifying the different groups and their roles in the participation. The third dimension (how participation is occurring) can be accomplished by determining the following factors. a) Is participation initiated by the community or by local leaders; b) are the inducements voluntary or coercive: c) is participation on an individual or group basis; d) is there direct participation or indirect representation; d) the duration of the participation; e) the scope of the participation; i.e.

whether participation is once, intermittent or continuous and f) do the people have the capacity to obtain the benefits they seek.

Additionally the context in which the participation is to take place, i.e. the characteristics of the program and the environmental setting, which will determine the patterns of participation, will have to be considered.

What is a community!

The term " community" itself, usually means a geographic community, a group of people living in the same geographic area, such as a rural village or an urban neighborhood. It may also mean a function community, such as a religious, ethnic, or occupational group whose members interact but do not all live in the same geographic area. In all cases, members of a community are people who share some common identity, one that distinguishes them from members of other communities. Community mean a locality or small geographical area, a group of people sharing some interests, a network of relationships at the local level (Ministry of Rural Areas and Employment,199--).

2.5 Proposed Intervention

The proposed intervention in this study is participatory learning program through women in order to prevent and control DF/DHF, which are adapted from the Participatory method, and popular education method.

Rationale to the use of PLP in this study

The provision of health education on DF/DHF prevention and control only is sometimes not enough or does not change people's behaviour, since they are most often not an integral part of the learning process. Raising awareness only often will not lead to a change in behaviour; since this will only occur when people discover and learn by themselves. PLP is the process that encourages people to think, share their own ideas, plans, analysis and take action in order to solve their problems together.

What are the participatory methods?

Participatory methods encourage the participation of individuals in a group process, no matter what age, gender, social class or education background. They are especially useful for encouraging the participation of women (who in some cultures are reluctant to express their views or unable to read and/or write. Participatory methods are designs to build self-esteem and a sense of responsibility for one's discussions.

They try to make the process of decision-making easy and fun. They are designed for planning at community level. Participants learn from each other and develop respect for each other's knowledge and skill.

Why use participatory methods

Participatory methods have succeeded where other strategies have failed. They are based on principles of adult education and have been field-testing extensively.

Field experience has shown that participatory method can lead to a far more rewarding experience for community workers. Having tried participatory technique and found the experience worthwhile, community workers usually do not want to return to their earlier methods. These method helps people to feel more confident about themselves and their ability to take action and make improve in their communities. (wood et al, 1999)

Popular education method

Popular education describes education for social change, which emerged in Brazil in the 1960s. It challenged the way people were taught in school, a way that silenced them and made them conform. It questioned schooling that was past of an oppressive political, social and economic system.

The principles of popular education

Popular education is a type of education

Which:

- take place within a democratic framework
- is based on what learners are concerned about
- Poses question and problems.
- Examines unequal power relations in society.
- Encourage everyone to learn and everyone to teach.
- Involves high levels of participation.
- Includes people's emotions, actions, and Uses varied activities.

Popular education also follow a cycles of stages

It:

- Begin with people's own experiences.
- Moves from experience to analysis
- Move from analysis to encouraging collective action.
- Reflects and evaluates its own process.

Popular education works on the idea that learning happens in stages and that People learn best at different stages (Mackenzie, 1993)

Since DF/DHF is a community problem rather than an individual one, applying the Participatory method, Popular education method are considered to be the most appropriate for this study.

Rational to the use of women

Women as providers of health care; reasons for involving women in health activities.

1) Women have a traditional and natural role in providing health care, since they are the principle providers of care within the family and to some extend in their communities. As mothers they also act as role model for their children.
2) Women have stronger community roots, especially in developing societies. In volunteering to become community health workers or becoming active in other areas of community life, they provide a continuity that is essential in rural development and health programs.

3) The opportunities provide for communicating with other women during the course of normal domestic tasks such as water collecting, shopping etc. This increases the chance for much valuable information to be passed on to other women.

4) Women spend more time at home than other family member; they thus can pay more attention and time in eradicating breeding sources from their immediate environment.

5) Women are also more directly affected by the consequences of DF/DHF, since they are taking care of their sick children and thus have to invest more time to conduct all their normal tasks. During the time a woman cares for a sick child, she might not be able to do paid work or generate income and so loses money. Since they have a direct interest, women might therefore be more motivated to engage in eradication programs then men.

2.6 Conclusion

Dengue fever/dengue haemorrhagic fever (DF/DHF) has become a major public health problem and a leading cause of hospitalisation and death among children under 14 years of age in Thailand. Dengue fever and DHF/DSS has spread rapidly in these regions, even in countries where it has been eradicated previously and has economic and social implications. The social cost are associated with the serious and potentially fatal development of DHF/DSS, the fear of large epidemic might cause in a population and the impact of potential loss of life (both economic and social). The economic loss

due to a large epidemic consist of the loss in productivity, the loss of tourism due to fear of infection of the disease and the heavy economic burden on an often inadequate health care system and the costs of large scale control measure such as spraying.

Factors contributing to the emergence/re-emergence of dengue fever/dengue haemorrhagic included rapid expansion of urbanisation, seasonally, rapid transportation, inadequate sanitation, etc. There is no treatment for DF/DHF; treatment is only symptomatic. Vaccine is in clinical trials in Thailand. Many methods were used to combat with Aedes aegypti mosquitoes such as ULV spraying, insecticide spray, and source reduction to eliminate breeding site. Many studies have shown that the most effective method of controlling Aedes aegypti mosquito is community participation via source reduction. Therefore, this study will use community participation through women groups as a means to decrease DF/DHF and DSS, since women traditionally spend more time at home than any other family member and are thus in a good position to participate in eradication programs. Women associations, women leaders and women health volunteers can also be used for dissemination of eradication programs to the community.

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