

Chapter 1



Background and Rationale

1.1 Introduction of Malaria Situation

Malaria is a communicable disease caused by malaria parasite, which comprise four species of Plasmodium in human, Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, and Plasmodium ovale. P. falciparum is the most dangerous form of malaria since it may progress severe malaria, which is associated with death.

The typical clinical features of malaria are fever, shivering, headache, muscular pain or pain of joint, vomiting, dizziness, generalized convulsion and coma.

Anopheline mosquitoes transmit malaria from infected person to another. Malaria parasite comprises two stages. One occurs in blood cell of man, and the other develops in the gut of the mosquito. When an infected mosquito bites a healthy person, malaria parasite is passed to the person. Following the development of parasite in human blood red cell, a number of blood red cell are damaged and some other organ is damaged as well so that the death of patient with P. falciparum occur if cerebral malaria patient is not treated promptly.

Malaria is a curable disease in spite of resistance of anti-drug. Malaria disease and deaths due to malaria can be reduced when proper control and treatment is available.

Malaria is the world's most important tropical parasitic disease. It is the second communicable disease according to the number of death. Mortality due to malaria is estimated to be over one million deaths each year. It kills three hundred children under five years of age every day. In the worldwide, the prevalence of malaria is about 300-500 millions clinical cases each year and forty per cent of the world' s population which spread in 101 counties, is living at the risk of malaria. The geographical area affected by malaria has shrunk considerable over the past fifty years, but malaria control is becoming more difficulty and gains are being eroded. Increased risk of disease associated with the changes in land use such as road building, mining, logging and agricultural and irrigation projects, disintegration of health service, mass movements of refugees, climatic change, international travel and so on. Moreover, the emergence of multi-drug resistant strains of parasite is worsening the situation of malaria due to irregular and uncompleted treatment or imported case. In many developing countries, It is an enamours toll in human lives, in medical costs, and in days of labor lost.

Malaria in China has declined quickly because of decades of efforts. It was a major parasitic disease in the nation many years ago. A great achievement was reached after anti-malaria campaigns have been implemented since the 1950' s. Malaria prevalence in China becomes smaller and smaller in the scope. In most of northern China, indigenous malaria has been eliminated except for sporadic or imported cases. In 1990, 89 % of total population lived in the area with incidence less than 0.1 per 1000 population. Now the disease

of malaria mainly prevails in the southern of China, especially in Yunnan and Hainan provinces.

1.2 Basic Information For Yunnan

Yunnan province is a major endemic area of malaria in China. Malaria case reported in Yunnan account for about one third of total case reported in China. Moreover Yunnan is one of two provinces, which are still having transmission of indigenous *Plasmodium falciparum* malaria. In Yunnan malaria recently ranked the second or third cause of morbidity due to communicable disease.

Yunnan province is mountainous area. It lies in the southwest frontier of China within north latitude of $21^{\circ} 8'$ to $29^{\circ} 15'$ and east longitude of $97^{\circ} 31'$ to $106^{\circ} 11'$. There are 94% mountains and hilly areas among the total 394,000 square km. The total population in the province is 39,896,300 at the end of 1995. One third of total population are minority nationalities. There are 26 nationalities in the province totally. Its elevation varies from 76.4 meters to 6740 meter above the average sea level. Diverse topography causes the complication of weather. Tropical, subtropical temperate and frigid zones all exist in the province. The average temperature is 17.5 to 23.7 degrees Celsius.

Yunnan province shares the border of 4,061 Km long with Myanmar, Lao PDR, and Vietnam. 26 out of all 127 counties are located along the border with the 3 neighbors. It has the population of 5,375,000, which accounted for 14% of total provincial population. By contrast, the 26 border counties have about 50% of total malaria case reported in the reporting system (as shown in Table 1). It fluctuated and tends to increase of the share of percentage in the total cases.

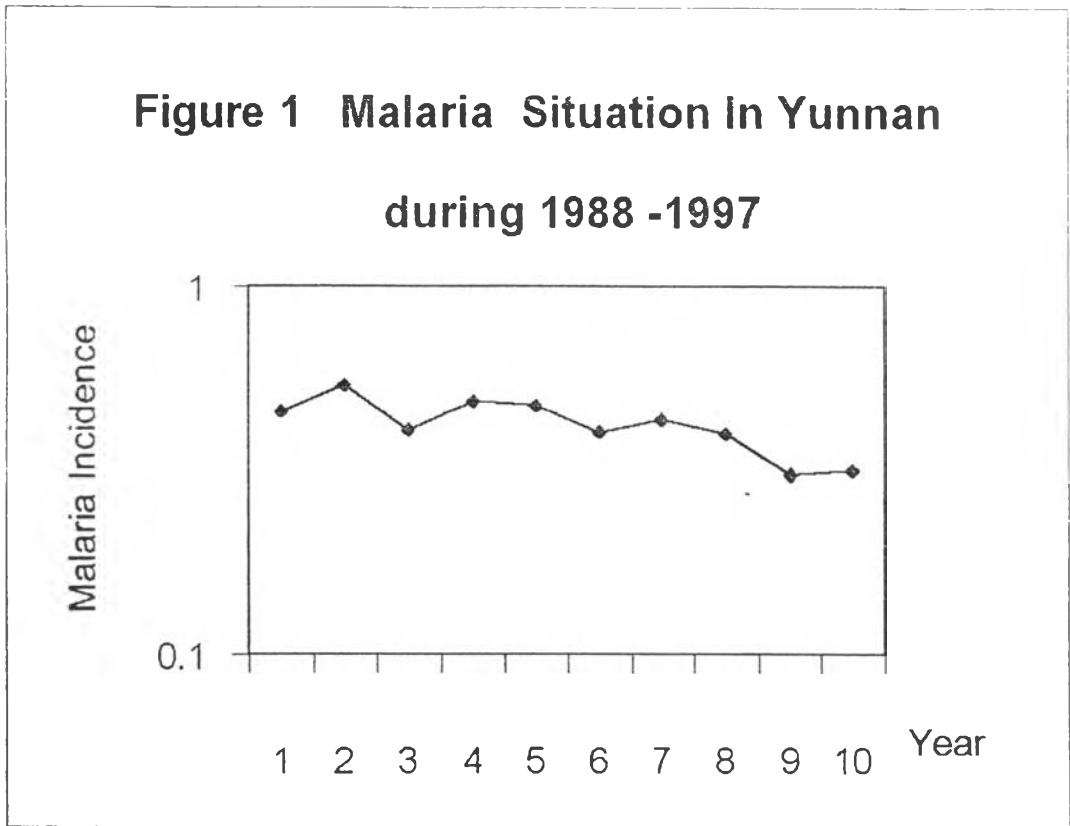
Table 1.1 The Malaria Situation In the border areas of Yunnan Province during 1992 -1997

Year	The whole Province		The border areas	
	No. of case	Annual malaria Incidence rate(1/1000)	No. of case	% of total in Yunnan
1992	17602	0.401	9725	55.25
1993	15107	0.471	7477	49.49
1994	16465	0.433	8016	48.69
1995	15249	0.397	8063	52.88
1996	11871	0.306	6711	56.53
1997	12393	0.316	8144	65.72

Source : The annual report of Yunnan Institute of Malaria Control

As shown in Figure 1, malaria situation during 1988 to 1997 is going down in the trend. Government stable finances malaria controls year by year, however it is very fluctuate and Yunnan is one of two provinces , which have indigenous Plasmodium Falciparum. There are complicate factors influencing the malaria endemic, such as environment factors, ecological, human behavior and social-economics and so on. As a communicable disease, malaria will easily lead to outbreak in community when the efforts of control are failed. For instance, malaria incidence rate in Yunnan has already less than 1 per 1,000 population in the late of 1960s, later the malaria incidence rate in Yunnan was beyond 5 per 1,000 population once in the early of 1970s due to failure of control. It was 1980s that the incident rate of malaria was less than 1 per 1,000 population again after many efforts of control.

**Figure 1 Malaria Situation In Yunnan
during 1988 -1997**



Source: Annual report of YIMC from 1988-1997.

1.3 Malaria Situation among the Three Neighbors

Vu Thi Phan (1998) shows that the malaria situation in the border areas linked with Cambodia, Lao People's Democratic Republic is more serious than others.

Lao People's Democratic Republic has seriously suffered from malaria according to malaria prevalence in all 17 provinces and malaria transmission all year round as reported by Pholsena (1992). The mortality was very high. Plasmodium falciparum is the predominant species.

Malaria has been identified as the most important public health problem in Myanmar according to F Tin (1992).

1.4 Border Crossing Movement

After implementation of the "Open Door" policy, China border trade has been very flourished. Both sides of people can get benefit from the international trade, timber, miner and other aspect cooperation so that many people gather to stay at the border area in both sides, which cause an increase of mobile population. Before 1985, there are 372,845 crossing from Myanmar into Yunnan at Wanding per year. During 1990, There are 1,230,462 crossings from Myanmar into Wanding. During 1995, There are 1,090,000 crossing at Wanding and 2,737,000 crossings at Ruili. It had more than 7,000,000 person times crossing border officially in 1995. The number showed by statistics had already over 13,000,000 person times in 1997.

However, It also increases the risk to spread malaria transmission. Historically, people share some culture, language, or ethnic. They married each other. They go to visit relatives on the neighbor country normally. Meanwhile, with the help of the complication of geographic situation, some illegal crossing occurred due to the benefit. The real figure of crossing border is much higher than the figure reported officially. This comes to the need of identification of the role of mobile population in the border malaria transmission.

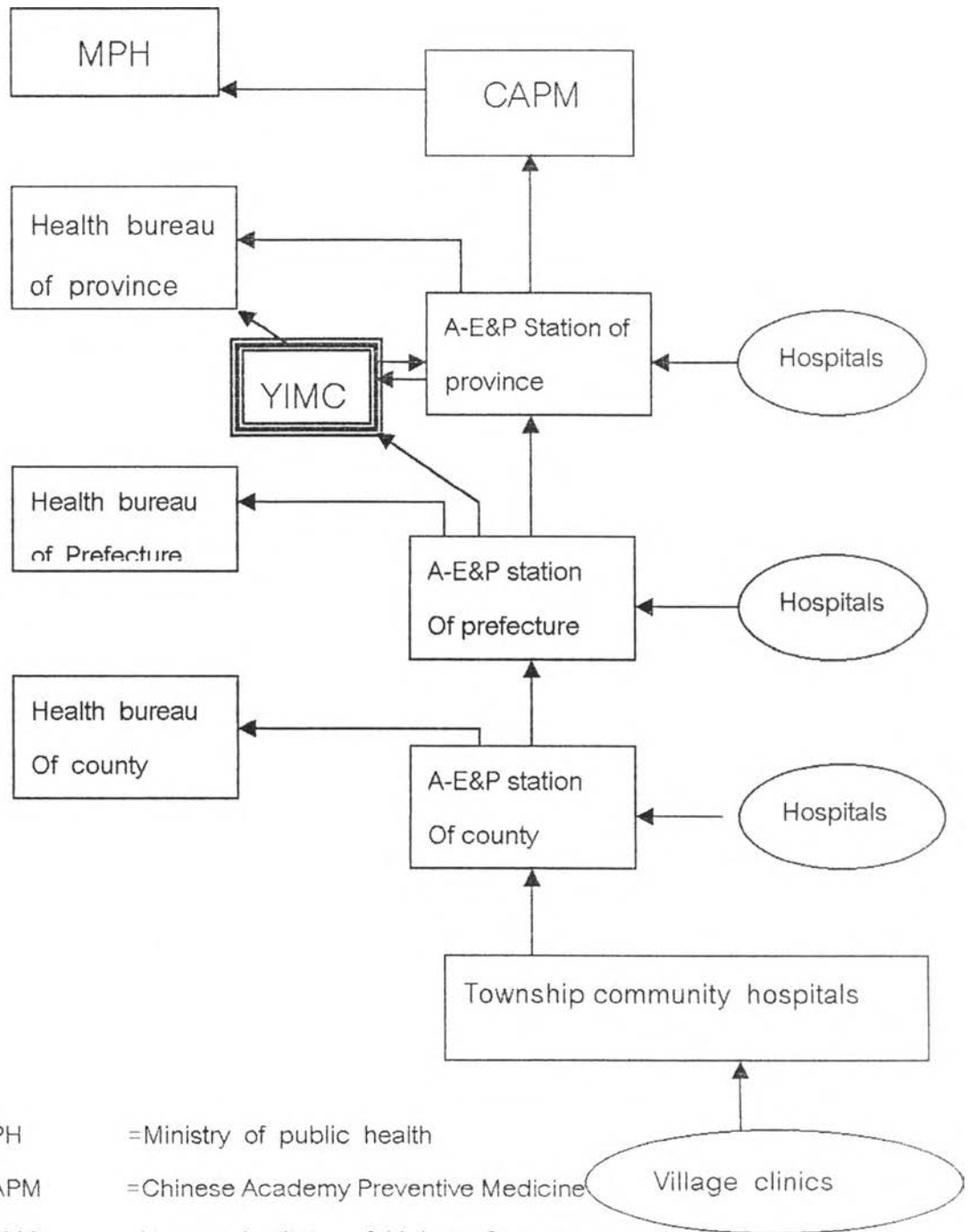
1.5 Malaria Reporting System in Yunnan, China

In China, Malaria is one of 35 notifiable communicable disease, which are obliged to be reported monthly by all public health facilities from peripheral to

central level. The anti-epidemic and preventive station will be in charge of malaria reporting system (Figure 2). On one hand, Diagnosis by typical clinic symptoms and presumptive treatment are still playing role in early diagnosis of malaria in rural areas due to the inaccessibility to health facilities with microscopy and microscopist, but the reporting system mainly show the figures confirmed by microscopes. Moreover, foreign cases have been excluded from the report system. On the other hand, Underreporting is another story. Zhu De-fu's survey show that the malaria case in the reality is 5 times or 5 times more in 1995. Third, With the economic reform in China, more and more private clinic and hospital is growing up. But this kind facility isn't including the disease reporting system yet. Meanwhile, payment mechanism decide that malaria patient will pay for service by out of pocket. They can go anywhere as they like, even self-treatment. Therefore, It is hard to know the magnitude of malaria, especially in the border area. Modeling its impact will help us to better estimate the problem and come to the appropriate control strategy.

As the frontier of southwest of China. Diversity of minor nationality culture and landscape in Yunnan abstract the people in inland of China. Most of them come from low- malaria or non-malaria transmission province. Their immunity is lower than the local people in the border. It is easy to get infection for them in the border. That will cause malaria import to inland province too when they return infected with malaria. Focusing the border malaria control is not only valuable for reducing morbidity and mortality of malaria in Yunnan, but meaningful for other province of China as well.

Figure 2. Malaria case reporting system in Yunnan , China



Note : MPH =Ministry of public health

CAPM =Chinese Academy Preventive Medicine

YIMC =Yunnan Institute of Malaria Control:

A-E&P station= Anti-epidemic and preventive station



Most of data in Yunnan come from this institute

1.6 Research Question :

Are there any effect on malaria transmission in the border areas of Yunnan from the border crossing among the international border regions? If have, Does different country play same role on malaria transmission in this areas?

1.7 Research Objectives :

1) General objectives:

To analyze the malaria control in the international border areas from economic point of view.

2) Specific objectives:

(1) To identify the role of border crossing movement in malaria control as a whole for each border line and determine the magnitude of malaria transmission in mobile population.

(2) To analyze resource allocation of malaria control activities.

1.8 Expected benefits

The study will help us to identify the effect of the border – crossing movement and know the magnitude of malaria in the border area more, then try to explore the resource allocation of malaria control activities from economic point of view. We hope this study will come up some policy implication which can benefit the malaria control in Yunnan, China.