



## CHAPTER 2

### REVIEW OF RELATED LITERATURE

The literature on the economic analysis and the economic evaluation of malaria control is fairly extensive. Less is in the literature the experiences of community health workers at the village level. Surprisingly, very few studies have considered the economic analysis of the village volunteers or community health worker's performance for particular disease control at the community or the village level. Also, the performance of the CHWs has been assessed in different ways by different studies. The following related literature review will be done in three sections with respect to :

- i) the concept of the community health worker,
- ii) the evaluation of his or her performance,
- iii) the economics of malaria control regardless of the methods of control in different programmes in Africa and Asia;
- iv) the economic evaluation techniques, and finally
- v) the indicators of malaria control impact measurement regardless of the methods of control.

#### 2.1 Concept of the Community Health Worker

This section of the concept of the Community Health Worker considers first the concept itself with the denominations throughout some countries and reviews the evolution of the definitions of CHW. Then the tasks of the CHWs in the communities are analyzed with emphasis on malaria control. Lastly, the question of whether CHWs are volunteers or are salaried workers is examined.

The concept of the community health worker has been deeply discussed in a paper entitled "Community Health Workers: Policy and Practice in National Programmes, A review with selected annotations" by Walt (1988, 4-10). According to the author, the term community health worker encompasses a wide variety of workers which have been in existence for years. These range from barefoot doctors and auxiliary nurses who have had up to several years of training (WHO 1978) to briefly trained primary health workers. They are variously named barefoot doctors or rural health aides (China), village health volunteers (Thailand, Sri Lanka), village health workers (Bénin, Zambia), village medical helpers (Tanzania), and health promoters (Colombia, Peru), among others. The diversity of names reflects in a considerable variety of tasks these workers perform.

In the 1980s, there has been an attempt to include all CHWs in one global concept. In pursuance of the goal Health For All by the Year 2000 through PHC (WHO, 1978), small scale CHW programmes have been converted into large scale programmes. This has often been done hastily, resulting in some loss of flexibility and commitment at the local level, leading to a narrower, yet more idealistic definition of the CHW. This process is clarified if the current definition of the CHW

is compared with the reality of many situations.

Although until recently, most CHWs were described as people who were selected by the community, resident in the community and were from the community, two recent definitions have deliberately eschewed one aspect of this description. A WHO review of national experience in the use of CHWs suggested that:

*"the CHW is a person from the community who is trained to function in close relationship with the health care system"* (Ofosu-Amah, 1983).

A later definition suggested that:

*"the CHWs are generally local inhabitants given a limited amount of training to provide specific basic health and nutrition services to the members of their surrounding communities. They are expected to remain in their home village or neighbourhood and usually only work part-time as health workers. They may be volunteers or receive a salary. They are generally not, however, civil servants or professional employees of the Ministry of Health"* (Berman and others, 1987).

In "Alternatives to primary health care, Volunteers in Thailand", Hongvivatana and others (1988, 11, 55-57) described the community health workers in Thailand as village health volunteers (VHVs) and village health communicators (VHCs), who are assigned the tasks of disseminating health information, health education, and coordinating health work in the village.

Describing the CHWs, a memorandum from a WHO meeting (WHO, 1988) said that within the health services based on PHC approach, the first line of treatment facilities is at the village level and is served by a community health worker who is supplied with drugs by the health services. Usually, only one antimalarial drug, chloroquine, is available at this level. The community health worker, after brief training, diagnoses malaria based on the history and accompanying clinical symptoms, and starts treatment. Treatment failure and seriously ill patients at this level are referred to government staffed facilities for investigation and treatment.

In his paper entitled "primary health care: the basis for malaria control in Hubei, China", Li and others (1995) acknowledged that malaria control activities should be carried out in the context of primary health care through the combined effort of health professionals and rural health services who work on a voluntary basis for rural populations. Villages doctors and health units are the base of the health network which has three levels, county, township and village. This is comparable to the district, commune and village levels in Bénin. The health services at the township and village levels are the main force in primary health care, and are responsible for implementing malaria control measures. The village doctor, similar to the village health worker in some developing countries, carries out much of the

organization, propagation and practice of malaria control.

The question of whether CHWs are volunteers or are salaried workers underlies a deeper concern about accountability. There is often an implicit acceptance that volunteer CHWs demonstrate a level of commitment and service to the community that salaried CHWs do not. It is argued that CHWs' dual allegiance to their communities and to the health services can create conflicts of loyalty if, for example, it is the government that pays their salaries (Vaughan, 1980). The memorandum from the WHO meeting (WHO, 1988) which considered the CHWs as the first line of treatment at the village level within the health services based on PHC approach stated that the CHWs are generally remunerated in some way by the villagers. Whether CHWs ought to be volunteers, supported in kind by the community, or paid through community and government funds, has been debated by de Zoysa and Cole-King (1983) in their paper entitled "Remuneration of the community health worker : what are the options?" The authors looked at the arguments for and against each alternative, summarizing them as a guide to policy-makers. Volunteers are cheap and although motivation often comes from some sort of commitment, other reasons behind voluntarism have to be considered. There are high drop-out rates in volunteer programmes, making planning difficult and increasing training costs. It is important to ask if volunteer are being exploited and whether it is right to demand that CHWs work voluntarily when health professional are salaried. Community support, be it by insurance schemes (which require organization), fee for service (which can exclude the poor) or co-operatives (which do not bring in regular income) has its drawbacks, despite appearing ideologically sound, because it makes CHWs accountable to the community. External fund from government is often more dependable, but the inclusion of CHWs into government service requires career and pay structures which draw them away from their communities.

Much of the literature tends to imply that volunteers are the ideal to which most CHWs schemes aspires, assuming that there is a sufficient pool of willingness, margin of personal security and benevolence to conduct voluntary social service in the villages, small towns and urban slums (Miles, 1985). The reality is that most national programmes pay their CHWs either a salary or an honorarium, that almost no examples exist of sustained community financing of CHWs (Gray, 1986), and that even NGOs tend to find ways of rewarding their CHWs. Moreover, while there are programmes where CHWs work on a completely voluntary basis, attrition rates are high; or the few enthusiastic and reliable volunteers are overloaded with tasks from other agencies and sectors. A WHO review concluded that there is little evidence that the mobilization of volunteers in national CHW programmes is an effective policy (WHO, 1988).

According to Walt (1988, 4-10), the main feature of community health workers are that they are local people and are not expected to move away from the community they serve. They are preferably women, but some programmes are dominated by men. They receive a very short training, and unlike the health professionals, they are unlikely to have the opportunity to be promoted to higher positions, or to be

transferred to another part of their country. In most national programmes unlike in Bénin, they are generally paid a salary or honorarium and are identified closely to the health services. Finally, they mostly act as extenders of health services than as development or change agents.

## 2.2 Performance of the Community Health Worker

The performance of village health volunteers in Thailand has been described by Hongvivatana and others (1988) as high if the latter are enthusiastic and able to plan and conduct the PHC work mainly on their own, with minimum interference and guidance from tambon health workers. The moderately active are those who worked off and on, rather intermittently and uncommittedly, and needed much push and interference of the responsible health workers. Others three studies of the performance of VHVs by the MOPH critically quoted by the same authors, measured the VHVs performance with different indicators. Firstly, in the Health Planning Division study, the performance was measured by the number of services contacts per volunteer during three months period (based on the volunteers' service records). That measurement was said to have failed to analyze fully the differential work performance level of VHVs. Likewise, methodological questions arose as to whether the three-month duration was too short for the average service contact numbers to be a meaningful indicator of volunteers' performance. Another methodological drawback was the too small sample of VHVs (only 32 in 32 villages) to claim generalizability of the findings. Secondly, the Training Division study attempted to measure performance by the PHC elements/tasks ever performed by the VHVs, and the quality of care rendered by them. Although the study employed quite a large data set, a careful reader could not help questioning the reliability as well as the validity of the data which were likely seriously to have been influenced by interview interaction effects. Thirdly, Inter-regional study measured VHVs' performance crudely in terms of dichotomous "more" or "less" effectiveness based on rating scales of the extent of which the VHVs reportedly performed assigned PHC tasks/elements. The authors criticized that it was a pity that the study report did not provide adequate information for the reader to assess the method involving village leaders/key informants, VHVs and Village health communicators. They concluded that finally, one can also question the representativeness of the sample used by this study.

With the contribution of village doctors in malaria control in Hubei in China (Li and others, 1995), the morbidity has decreased drastically from more than 1% in 1973 to 1.34 per ten thousand by 1992. The performance of the village doctors in malaria control was measured by the change in malaria morbidity.

Concerning the factors which can affect the village doctor's performance, Su and others, (1990) found that the age, the number of years of experience and the level of education might play a great role. Likewise, the strengthening of the supervision and the guidelines to villages doctors and combined methods of mosquito control with the elimination of source of the infection have decreased malaria incidence

from 0.87% in 1989 to 0.44% in 1990 in Hubei in China.

Regarding the evaluation of CHW programme in the literature, it is striking that, although some evaluations of either CHWs performance or CHWs programme have been carried out, how little can be concluded from their findings about the effectiveness of CHWs. Partly, this is due to the methodological difficulties of carrying out such studies and the financial implications of rigorous design. But blind spots are also evident. For example, very little consideration has been given to the cost of such programmes. One exception is the review of six CHWs programme by Berman and others (1987) which attempted to quantify their cost-effectiveness. The attempt of this study is to analyze costs and benefits of CHWs among others economic analysis tools.

Berman (1984), in a previous study of coverage and equity of village health workers in Java, Indonesia, concluded that small numbers and other methodological problems make it difficult to draw conclusions, but the research suggested that services provided by village health workers (VHWs) who are volunteers, achieve significantly higher level of population coverage than similar clinic-based services. In most cases, VHWs showed no bias towards better-off clients and may in fact favor poorer beneficiaries.

In a study of childhood mortality among users and non users of PHC in a rural West African community, Velema and others (1991) compared the utilization of PHC by 74 children aged 4 to 35 months who died in 1986 or 1987 to that of 230 controls who survived. The controls were individually matched by date of birth, sex and place of residence to the cases. The authors found that children who died had had significant fewer contacts with the village health workers (VHWs) in the last 6 months prior to death. Children who had more regular contact with the VHWs throughout life were better protected than children for whom contact had been less systematic. They concluded that the VHWs contribute to a better survival of young children through regular contact with the households.

### **2.3 Economics of Malaria Control**

Malaria is widely recognized as one of the most important public health problems in tropical countries, especially in sub-Saharan Africa which accounts for 90% of malaria cases per year in the world (OMS, quoted by CNLP, 1994, 3). It is also a major economic burden to the society. Its economic impact on households has been demonstrated by few researchers amongst whom Ettling and others (1994) assessed the economic impact of malaria in Malawian households. The authors reported that over 40% of all households, independently of income level, reported expenditures on malaria treatment. The overall direct expenditures on treatment of malaria in household members was 28% of annual income among very low income households; and only 2% of annual income among low to high income households. The indirect cost of malaria, calculated on the basis of days of work lost, represents 3.1% of annual income among very low income households and 2.2% of annual income among low to high income households. Very low income households

carried a disproportionate share of the economic burden of malaria among these households, consuming 32% of annual household income compared to 4.2% among households in the low to high income categories. In the study to be designed by this methodological research, the economic burden for households is expected to be less in communes with CHWs compared to the ones without CHWs.

The economics of malaria control according to Mills (1991, 143-165) is much broader than simply the application of techniques of cost-effectiveness and cost-benefit analysis, and is concentrated on the five following areas of concern:

- who gets malaria?
- what are the resource costs of malaria?
- what determines an individual's or a community's demand for malaria control measures and treatment?
- what are the characteristics of the various means to satisfy this demand, i.e. of the supply of control and treatment measures?
- what policies follow from the comparison of the costs and consequences of different means of supply?

However, pursuing her analysis of the economics of malaria control, Mills concentrated on its economic evaluation in terms of cost-benefit analysis and cost-effectiveness analysis; the essential difference between both is that in cost-effectiveness analysis, health effects are retained in natural units whereas with cost-benefit analysis, they are converted into money terms, whether using the human capital method or another.

In an economic analysis of several types of malaria clinics in Thailand, Ettling and others (1991) found that the periodic mobile clinic which served five villages on a fixed weekly schedule had the lowest community cost (paid by patients and their families) and low average institutional cost, compared to large central town clinic and peripheral subdistrict clinic. They also demonstrated that the addition of periodic clinic to a system of central and peripheral clinic increased the number of malaria cases treated. Also, the use of a combination of central, peripheral and periodic clinic which maximizes the access to malaria treatment, minimizes the social cost of malaria. In Bénin, it is expected that the use of the full capacity of the peripheral level, i.e. the combination of district hospital, commune health centre and CHWs in villages (see Health system and referral structure of Bénin on page 7) will maximize the access to malaria treatment for malaria treatment seekers and minimize the social cost of malaria.

Picard and others (1993) estimated the costs and the cost-effectiveness of bed net impregnation alone or combined with chemoprophylaxis in preventing mortality and morbidity from malaria in Gambian children in West Africa. Taking expenditure of both money and time by public authorities and village volunteers into account, they found that bed net impregnation alone and the combined strategy (bed net impregnation combined with chemoprophylaxis) were both highly cost-effective. The indicators used were the cost per child-year protected, the estimated cost per death and clinical episode of malaria averted

and the estimated cost per healthy year of life saved.

Mills (1993, 333-335), in a paper entitled "Is malaria control a priority? evidence from Nepal" presented a methodological framework for analyzing cost-effectiveness which includes resources-saving consequences, as well as health consequences. Cost-effectiveness analysis has traditionally compared the cost of a health intervention or programme with its health effects, expressed in terms of indicators such as morbidity or mortality (though intermediate indicators such as service have often been used as proxies). The methods used to collect data on control costs, cases and deaths prevented, treatment costs averted and production gained are described and the assumptions required by the analysis are made explicit. In the Nepal programme as well as the CHWs programme in Bénin, malaria control programmes included a substantial element of treatment (see operational definitions).

As economic tools are to be used to answer the major question of this research, the following section will describe the economic evaluation techniques.

#### 2.4 Economic Evaluation Techniques

Economic evaluation has been defined by Mills and Gilson (1988, 76) as:

*"the quantitative analysis of the relative desirability to the whole community of investing in alternative projects or programmes"*

where desirability is assessed in terms of both costs and consequences. 'Consequences' is used here as the generic term for the beneficial results of a programme (often termed effects or benefits, depending on the techniques of analysis being used). Within this broad definition, there are many forms of economic evaluation (see figure 2.1). Only those forms which examine both costs and consequences for two or more alternatives fit the above definition and can be described as full economic evaluation studies.

- **Cost-minimization analysis (CMA)** is based on prior epidemiological findings which show that the outcome of interest is achieved to the same degree by two or more interventions. The technique is used to identify the least cost intervention.

- **Cost-effectiveness analysis (CEA)** investigates the best way of achieving a single objective by comparing effects and costs. It evaluates either:

- \* which of a number of possible interventions will achieve a given health objective at least cost, or
- \* given a fixed budget, the intervention that maximizes the effectiveness of the expenditure.

Its results are expressed either as cost per unit of output (total cost of the intervention divided by total health effect) or as effect per monetary unit (total health effect divided by total available resources).

- **Cost-benefit analysis (CBA)** values both cost, and benefits in monetary terms, and compares them, assessing whether the project or programme is desirable through the use of decision criteria (e.g. if the benefit cost ratio [benefits divided by costs] is greater than one, the project or the programme is worthwhile).

- **Cost-utility analysis (CUA)** is a form of CEA, but it measures the effects of a project or programme in terms of utilities (the quality-adjusted health outcome caused or averted). Like CEA, it can focus on either minimizing cost or maximizing effect; and its results are expressed, for example, in terms of Quality Adjusted Life Years (QALY) or QALYs per monetary unit.

		Are both costs and consequences examined ?			
		No		Yes	
Is there a comparison of $\geq 2$ alternatives	No	Examines consequences only	Examines costs only	Cost-outcome description	
		Outcome description	Costs description		
	Yes	Effectiveness evaluation			1. Cost minimization analysis
					2. Cost effectiveness analysis
				1. Cost benefit analysis	
				2. Cost utility analysis	

Figure 2.1: Forms of Economic Evaluation

[Source: adapted by Mills and Gilson (1988, 77) from McMaster University Health Sciences Centre (1984)]

The root differences between these techniques concern their evaluation of health outcome (consequences) and their breadth of analysis. CMA and CEA tacitly assume that the health objectives which the project serve are worthwhile. CUA permits choice between a much wider range of interventions, but still ultimately assumes that at some cut-off point of cost per QALY, a programme is worthwhile. CBA in theory permits assessment of whether the health objectives are worth achieving in the first place.

All economic evaluation techniques involve three basic steps:

- identification of costs and consequences,
- measurement of costs and consequences,



- valuation of costs or of costs and consequences.

In the present study, both cost-benefit analysis and cost effectiveness analysis will be used as economic tools to evaluate the CHWs' performance in malaria control at village level in Bénin.

## 2.5 Indicators for Measuring Malaria Control Impact in Communities

Mills (1993, 333-335) presented in her methodological study the immediate health effects of prevention or cure of malaria as cases prevented through prompt treatment, and deaths prevented. Appropriate effectiveness indicators are therefore cases prevented, deaths prevented, days of healthy life gained and discounted days of healthy life gained. Cases and deaths prevented can in principle be estimated either by comparing current incidence and case fatality rates that existed before the control programme started; or by comparing areas with control programme with those without control programme. The latter approach will be preferred in this study. Cases (deaths) prevented would then be cases (deaths) without the programme minus cases (deaths) with the programme.

In a study of the economics of communicable disease control (in the case of malaria in Thailand), Pornchaiwisukul (1993, 163) presented a theoretical framework centered on explaining the effects of disease control on health risk and economic output. Regarding the effect of disease control, the framework emphasized on models of morbidity and mortality rates as outcome of malaria control and showed the malaria morbidity rate as a more appropriate indicator than annual parasite incidence, as effect of disease control on health.

Likewise, Alonso and others (1993, 37) used malaria specific morbidity and malaria specific mortality as indicators to investigate the effects of insecticide impregnated bed nets and targeted chemoprophylaxis on morbidity and mortality from malaria during one malaria transmission season in a group of rural Gambian (West-African) children aged six months to five years. The authors compared three groups of children; the first group in 17 PHC villages where bed nets were impregnated with insecticide and children were given chemoprophylaxis with Maloprim<sup>m</sup>, the second group with bed nets impregnated with insecticide and children given a placebo and the third with no intervention.

The same indicators as above mentioned will be used in the second part of the present study to analyze the effectiveness of CHWs contribution in malaria control at the village level in Bénin; malaria morbidity rate and malaria mortality rate will be used to measure the difference in morbidity (number of malaria cases averted) and in mortality (number of deaths from malaria prevented) between two groups of communes with and without CHWs.

According to Walt (1988) in "Community Health Workers: Policy and Practice in National Programmes", designing scientific evaluation approaches of CHWs that satisfy the quantitative standards of

epidemiologist, as well as the qualitative demands of social scientists is problematic. While the effectiveness of a CHW programme might best be assessed by changes in mortality and disease prevalence in the community, it is notoriously difficult to design an evaluation that can confidently demonstrate causal relationship between CHW inputs and decrease in general mortality and morbidity. That is the reason why this economic analysis will concentrate not on the measurement of general mortality and morbidity in the communities beneficiaries of the programme, but only on malaria specific morbidity and malaria specific mortality in both types of communes (experimental and control).

Walt concluded that rigorous evaluation are very few and far between because partly many of the programmes have not been in place for long, but mostly because there are enormous methodological problems of research design and logistics to carrying out an evaluation of a CHW programme.