CHAPTER 1

INTRODUCTION

สำนักงานวิทยทรัพยากร
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1.1 BACKGROUND AND RATIONALE

Malaria is the most important tropical parasitic disease by far in the world, and kills more people than any other communicable disease except tuberculosis. In many developing countries, malaria exacts an enormous toll in lives, in medical costs, and in days of labour lost.

In Indonesia, malaria is still a major public health problem, including South-east Sulawesi Province. About 92,319 (65.11/1000) malaria cases were reported from South-east Sulawesi Province during 1992 (Centre for Health Data, MOH-Indonesia. 1995). The main vectors of malaria in South-east Sulawesi are *Anopheles subpictus* and *An. barbirostris*. There are some species of anophelline mosquitoes strongly suspected as being vectors of malaria, i.e. *An. flavirostris* and *An. nigerrimus*.

A Malaria Control Programme (MCP) has been introduced in South-east Sulawesi province since 1969 to reduce parasite rate (PR) of malaria to become < 4% in the priority areas. But the vector control measures (VCM) have just began in 1973, i.e. indoor residual spraying (IRS) by using DDT. Another methods of vector control such as biological control by using predator fish have been applied since 1987. In 1992, a new insecticide so called Ficam^R (Bendiocarb) has been used instead of DDT. A larviciding method using *Bacillus thuringiensis* (Bti) to suppress the population of larval vectors was also introduced. In 1994, ICON^R (Lambda-cyhalothrine) was introduced as the insecticide for IRS.

After five years operations, the PR of malaria in South-east Sulawesi decreased from 40% in 1972 to 6% in 1977. However, in 1978 and 1979, the PR increased to 12 and 16% respectively and PR < 2% was achieved after 13 years spraying application . Since 1978, there were some fluctuations in PR because of inconsistency of the effects of the IRS. During the 1980's, some epidemics of malaria have been reported, with high numbers of cases and mortality.

The problems are that the vectors seem to avoid contact with DDT, and *Plasmodium falciparum* has become resistant to chloroquine in two of four districts (1982 and 1989). The vectors might change their behavior to exophagy and exophily (outdoor behavior). Since 1985, *An. barbirostris* has become tolerant to DDT. Another problem is the community behavior which does not support IRS. e.g. outdoor sleeping during the night time. These situations could cause wasteful IRS.

The budget constraint of vector control measures of the malaria control programme and the high cost of chemical insecticide, encourages the making of better

resource allocation and improving effectiveness and efficiency of the operations. Therefore, economic evaluation of the programme is needed to provide better information for better policy. The issue of cost-effectiveness analysis of malaria control programmes has been identified as a significant research priority in the WHO/Special Programme for Research and Training in Tropical Diseases (TDR, 1986).

The scope of this study will be limited to the economic evaluation of direct cost from a provider's perspective of the vector control measures of the malaria control programme in South-east Sulawesi province, Indonesia based on existing financial documents (DIP and PO) of the Communicable Diseases Control Project of South-east Sulawesi from the National Development Budget, with special emphasis on the indoor residual spraying from 1974 -1994.

1.2 RESEARCH QUESTIONS :

1.2.1 **Primary Question :**

What are the effectiveness and efficiency of vector control measures by indoor residual spraying in the malaria control programme with vectors behaviors gradually changed, to reduce parasite rate of malaria in South-east Sulawesi Province, Indonesia during 1974 - 1994 ?

1.2.2 **Secondary Questions** :

(1). What are the components of cost for vector control measures? How much and in what form are they incurred? Are there any alternative sources of financing?

(2). What is the effectiveness of VCM? What are the factors affecting effectiveness of VCM : e.g. change in vector behaviors and other factors such as changes in socio-economic development environments (income and education)?

(3). Is the VCM efficient? What factors are affecting the costs : Government policy or source of financing? How can the alternative sources of financing be generated?

(4). How can effectiveness and efficiency of VCM be improved? Is there any alternative of model for VCM?

1.3 HYPOTHESIS

The effectiveness and efficiency of vector control measures by indoor residual spraying of malaria control programme in South-east Sulawesi Province, Indonesia, during 1974 - 1994 in reducing the parasite rate of malaria are low, due to changes in resting behavior of vectors.

Based on the statement above, this study wishes to test two hypotheses concerning the effect of change in vector resting behavior (V^+) on IRS on the reduction of malaria parasite rate.

(1). The *effectiveness (Et)* of IRS is affected by the resting behavior of vector(s) :

Ho : $Et_V^+ = Et_V$ $\Rightarrow$ There is no different effectiveness among IRS due to change in vector resting behavior.

Ha : $Et_V^+ < Et_V$ $\Rightarrow$ The effectiveness of IRS is low due to changed vector resting behavior .

(2). The *efficiency (Ec)* of IRS is affected by the resting behavior of vector(s) :

Ho : $Ec_V^+ = Ec_V$ $\Rightarrow$ There is no different efficiency among IRS due to change in vector resting behavior

Ha : $Ec_V^+ < Ec_V$ $\Rightarrow$ The efficiency of IRS is low due to changed vector resting behavior

1.4 OBJECTIVES

1.4.1 **General Objective** :

To evaluate the effectiveness and efficiency of vector control measures by indoor residual spraying in the Malaria Control Programme due to change in resting behavior of vectors in the reduction of parasite rate of malaria at South-east Sulawesi Province, Indonesia during 1974 - 1994.

1.4.2 **Specific Objectives** :

(1). To determine the cost components of VCM (capital and operating costs; unit costs and source of costs) in the Malaria Control Programme.

(2). To measure the effectiveness of VCM by IRS in the Malaria Control Programme.

(3). To assess the efficiency of VCM and to estimate the contribution of IRS in the reduction PR due to changed vector behavior.

(4). To identify the factors affecting the cost and performance of VCM, and formulate an alternative model of VCM, in terms of the improvement of effectiveness and efficiency.

1.5 LIMITATIONS

The limitations faced in this study are due to :

(i). The main data used in this study are secondary data from the existing reports in the past, so that most of the variables could not be controlled.

(ii). Data on cost of malaria were collected only from the financial documents of the Communicable Diseases Control Project of South-east Sulawesi which were derived from the National Development Budget. Other sources of financing were not covered in this study.

(iii). Only a part of the data could be collected, because many of the documents, reports and records were not available.

(iv). Data on malaria vectors are very limited. Most data are only baseline data without enough follow-up. Recent data on vector susceptibility and behavior status are not available: significant change may have occurred in the intervening time period.

(v). Inadequate data can influence the internal and external validity of this study. Results of this study may not be applicable to the whole country, even though species of vector is the same.

1.6 EXPECTED BENEFITS

The results of this study will provide data and information for the providers, decision makers and/or scientists, such as :

(1). The effectiveness and efficiency of vector control measures of the MCP in South-east Sulawesi Province, Indonesia; how they can be improved.

(2). The amount of wasted resources due to inefficiency of indoor residual spraying

(3). The alternative model of vector control measures may be used to improve the efficiency and effectiveness of the programme.

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(4). The possible sources of financing for vector control measures from community participation or the private sector.

(5). Baseline data for further research in the future.

1.7. STRUCTURE OF THE THESIS

This thesis consists of six chapters. The first chapter is the Introduction which contains of background and rationale, research questions, hypothesis, objectives, limitations and the expected benefits of this study. Chapter 2 is a Review of Literatures related to the basic theories used in the study.

The main text of this thesis is divided into three chapters. Chapter 3 concerns the study area and research methodology. Research methodology describes the methods used in the study i.e. research design, the method of data collection and data analysis. Research design explains the study type/approach, population, sample, variables and the instruments to be used. Chapter 4 is Results which present and analyze data, and interpret the research findings. Chapter 5 is Discussion, which examines the implications of the analysis, relating the research findings with the earlier studies, and considers the original problem, questions and hypothesis in the light of the results.

The last chapter is the Conclusions and Recommendations. In this chapter, results are summarized, the implications are identified, and directions for further work are suggested. Recommendations are made for actions which should be taken based on the results of this study.