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THE ECONOMIC COST OF MALARIA AND THE BEHAVIOUR OF FARMERS TOWARDS MALARIA CARE IN AMANSIE EAST AND KWAEBIBIREM DISTRICTS OF GHANA

BY

JANET AMA DZATOR (Mrs.)

A THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMY AND FARM MANAGEMENT, UNIVERSITY OF GHANA, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE MASTER OF PHILOSOPHY (M. PHIL) IN AGRICULTURAL ECONOMICS.

SEPTEMBER, 1994

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DEDICATION

To my Dad, brothers and sister, husband and to the memory of my late mother.

Above all I dedicate this work to God Almighty for seeing me through.

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ACKNOWLEDGEMENT

I extend my sincere thanks to the Almighty God for helping me to complete this work successfully.

I am greatly indebted to my Supervisors, Dr. W. K. Asenso-Okyere, Dr. (Mrs.) R. Al-Hassan and Dr. G. T-M Kwadzo, especially Dr. W. K. Asenso-Okyere for his guidance, constructive criticisms and valuable suggestions throughout the course of my work. I am grateful to my supervisors for the encouragement given to me.

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Janet A. Dzator

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ABSTRACT

The study focused on malaria care seeking behaviour of farm households in general. Time and money costs of care, the impact of socio-economic factors affecting health care seeking behaviour and household choice of malaria care providers were investigated.

The findings show that households appear to be more sensitive to time costs in choosing malaria care providers. The report presents direct costs and indirect costs of treating an episode of malaria and also traced malaria treatment behaviour.

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CHAPTER ONE

INTRODUCTION

1.0 The setting

The amount of money a household is willing to devote to malaria care is related to the behaviour of the household towards general malaria care. Knowledge of such behaviour is useful in designing malaria control programmes and cost sharing schemes.

Although malaria is the major health problem in Africa, there is very little research on its economic impact. Factors promoting certain patterns of health care seeking behaviour such as the user charges borne by individuals and families for seeking health care were introduced recently. Comprehensive estimates of the economic costs of malaria to individuals and communities are rare in many African countries although they are important for decision making.

1.1 The Problem

Agriculture is the main source of income in most rural areas in Ghana and labour is the most important single input in rural agricultural production apart from land. Malaria has important economic consequences for rural agricultural communities. The relatively high prevalence of the disease during and just after the rainy season which unfortunately coincides with peak agricultural activities have serious implications for agricultural labour supply

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which has already been diminishing with increasing migration of young men and women to the cities. Often demand for agricultural labour supply overshoots its supply during the wet season and thus pull up wages for farm labour. With the increase in farm wages, households are expected to substitute hired labour with its own labour. However, this source of labour has been dwindling with children going to school and polygamy reducing in many communities. The households labour supply situation can be exacerbated when diseases such as malaria inflict on some of the members of the household. It is therefore important that immediate care is sought so that household productivity is not unduly compromised. The dramatic change in peoples behaviour towards health care observed after the introduction of the Hospital Fees Regulation (1985) in Ghana as documented by Waddington and Enyimayew (1988) suggests that there exist some form of relationship among cost of health care services, income and health care seeking behaviour of people. However,quantitative evidence is limited in the literature in many African countries. This makes it difficult to devise equitable health care financing schemes. The availability of the cost of care and knowledge about the malaria care seeking behaviour of individuals and or households will therefore be useful in guiding the enactment of pragmatic policies that will ensure the utilisation of health services for human resource development.

A study which is therefore aimed at analysing the health care seeking behaviour of farmers who form the majority of the people in the rural areas is considered timely in the current era when major

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health financing reforms are being introduced in most developing countries.

1.2 Objectives of the study

The general objective of the study is to estimate the economic cost of malaria and to determine the impact of time, monetary costs of malaria and other socio-economic factors on health care seeking behaviour of agricultural households in two districts of Ghana.

The specific objectives are;

1. to estimate the direct and indirect costs of seeking malaria care;
2. to ascertain the malaria care seeking behaviour of households; and
3. to estimate the determinants of the demand for health care.

1.3 Data Sources

This study formed part of a large research project which was undertaken by the Health Social Sciences Unit of the Institute of Statistical, Social and Economic Research.

The data for the study was obtained from primary sources through a survey conducted in the Amansie East and Kwaebibirem districts of Ghana. After selecting the study areas in collaboration with personnel from the Ministry of Health,

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reconnaissance visits were made to these areas. Twenty-one communities were selected for the survey. Amansie East and Kwaebibirem have some similarities. They are both agricultural districts with tree crops as the major products. Whereas Kwaebibirem district has a commercial diamond mining activity, Amansie East district is adjacent to Adansie West district where one of the richest gold mines in the world exist.

Information on household malaria care seeking behaviour, costs of seeking care, income and other socio-economic variables were obtained through personal interview of a sample of farmers using a pre-coded structured questionnaire. The sample was the same one being used by the Policy, Planning, Monitoring and Evaluation Department (PPMED) of the Ministry of Food and Agriculture (MOFA) which has been collecting monthly agricultural price statistics from farmers in all districts. According to the PPMED the sample is a random sample of all the farmers in a district.

This study was household based although certain aspects were devoted to collecting data based upon individuals. A household in this study is defined as all people who eat from the same pot and sleep under the same roof in three months of the 12 months preceeding the interview. In a few of the communities where the PPMED sample list did not exist, a random-convenience sampling technique was used in the selection of households. In this technique communities were mapped out by land marks, for example, roads and every second or third house depending on the size of the community was selected. Interviews were granted to the first

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household head encountered and who was willing to participate after explaining the selection procedure.

Questionnaires were administered on a total of 1300 households heads but 1289 questionnaires were used for the analyses after cleaning the data. The distribution of usable questionnaires was: 747 from Amansie East district and 542 from Kwaebibirem district.

A time and motion chart was designed and used to collect data on waiting time from health care facilities within the two districts. A random accidental sampling technique was employed to select patients at the out-patient-departments (OPD). Selected patients were followed and timed at the various points of activity such as arrival, registration, consultation, laboratory, dispensary and departure. Timing was clandestinely done without the knowledge of patients. This procedure was adopted to allow normal behaviour and or to prevent the patients from hurrying through the activities or otherwise.

Information on agricultural wage rates and public goods like schools, sources of drinking water and sanitation in general was gathered using a semi-structured community questionnaire.

All the questionnaires were pre-tested in Asuaba and Adeiso in the Eastern region before they were used for the actual field survey. The communities chosen for the pretesting have similar climatic conditions and economic activities like the selected communities for the study.

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1.4 The study areas

The **Amansie East district** is in the Ashanti region and is bounded on the north by the Bosomtwi-Kwawoma district assembly, south by the Adansi West district assembly, West by the Amansie West district assembly, North-West by Upper Denkyira district assembly, and on the East by Asante-Akyem district assembly. The district has three major rivers which are the Offin, Oda and Domkra and an important lake, Lake Bosomtwi. These rivers and the Lake offer fishing opportunities for many farmers in the area.

The weather has a double maxima rainfall pattern. The main wet season is from March to mid July followed by a short dry season and then a minor wet season from mid September to the end of November. The vegetation cover is mainly that of the tropical rain forest type. Farming is the main occupation and cocoa, maize, cassava and plantain form the bulk of agricultural produce in the district. Other economic activities include surface gold mining at Afoako and private transport operation.

The district has a total population of about 166,658 [census,1984] with an average growth rate of about 2.6 per cent per annum. In terms of health care facilities the district is endowed with 2 government, 3 mission and 1 private hospitals; 2 health centres; 23 Public Health Care [PHC] centres and 4 maternity homes of which one each is under private and mission management and the remaining two are under the management of the district assembly. From the available statistics disease morbidity figures follow the national trend with malaria ranking highest

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among the reported cases at the Outpatient Department (O.P.D.). It is the highest cause for admission and second highest cause of death after anaemia in the district.

Eleven communities were selected for the field survey in this district. They are: Kokotrour, Afoako, Abodom, Dedease, Asamang and Kokofu, Tweapease, Jacobu, Adamso, Samanhyia, Fiankoma and Dominase. All the communities have year round motorable roads and they are served by public transport services except for Tweapease. Apart from Samanhyia where there is no junior secondary school, the rest of the communities have primary and junior secondary schools. Apart from Dadease, Tweapease, Adamso, and Samanhyia (some of which are cluster villages) all the communities have either treated pipe borne water or wells with pump. Only three of the communities namely Tweapease, Adamso and Samanhyia do not have public latrines. Hospitals are situated at Kokofu, Dominase and Jacobu. Like other rural areas in Ghana, there are a number of traditional and spiritual healing centres in the Amansie East district.

Kwaebibirem district is one of the 15 districts in the Eastern region with a population of 126,649 [Census, 1984]. There are two well marked wet seasons in a year with a typical rain forest vegetation cover. The heaviest rainfalls are recorded between June and August and the minor between September and November. Agriculture is the main occupation of the inhabitants and the major crops cultivated include cocoa, palm fruit, plantain, cassava, maize and citrus. Diamond is also mined in the district.

The health care facilities in the district are; 1 quasi-

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government hospital [the Mines Hospital], 1 mission hospital, 4 government health centres/posts and 1 mission health post, 3 private clinics, 1 mission clinic and 5 Maternal and Child Health [MCH] clinics. Between the years 1990 and 1991, malaria featured prominently as the number one ailment for the cause of admission and for OPD attendance.

Communities selected for the survey in this district are Takyimang, Abenaso, Asuom, Otumi, Kade, Atobriso I and II, Nkwantanang, Apinamang, Akwatia and Kusi. The roads linking all the communities are motorable throughout the year. Primary and junior secondary schools are also available in all the communities. Senior secondary and or technical schools are available in Kade, Asuom and Akwatia. The two hospitals in the District are located in Kade and Akwatia. Few of the communities also have clinics and maternity homes but traditional and spiritual healing facilities exist in all communities except Kusi where there is none.

1.5 Organisation of the Thesis

The study is organised into 5 chapters. Chapter 2 summarizes the socio-economic importance of malaria. It focuses on the perceived importance of the disease especially to agriculture and other economic development activities both in Ghana and elsewhere. In chapter three the costs of seeking malaria care is presented. Chapter 4 focuses on choice of malaria care seeking behaviour and the demand for malaria care is discussed in chapter 5. A summary

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of major findings, policy implications of the findings for health care financing and conclusions are drawn in chapter 6.

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CHAPTER TWO

THE SOCIO-ECONOMIC IMPORTANCE OF MALARIA

2.0 Introduction

A labour intensive agricultural economy like Ghana's may suffer crop output losses as a result of malaria morbidity and mortality. Knowledge of the rainfed agricultural calendar reveals that there are certain periods of the year in which some particular agricultural work must be done. For instance, harvesting, sowing and planting cannot be done throughout the year. Illness during such specific periods may endanger crop yield. Unfortunately, the peak of malaria transmission and morbidity coincides with the onset of the rains and some few months after the rains when most of these important activities are performed.

Across the eco-epidemiological areas identified by the epidemiology division of MOH there is in general a high endemicity of malaria with intense perennial transmission. Even in the Northern savannah where transmission is noted to be seasonal it was noted in the MOH Malaria Action Plan (1992) that transmission is changing from seasonal to perennial. Increasing construction of large numbers of small to medium scale dams for agricultural purposes have contributed to the intensive perennial transmission of the malaria parasite because of the presence of water and the possible year round cultivation of crops and fishing.

Apart from dams for agricultural purposes some economic

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activities in many parts of the country render the areas malarious. The numerous small-scale diamond mining activities in the Eastern Region and small-scale gold mining activities in the Eastern, Ashanti and Western Regions are usually accompanied by the creation of pools of water which serve as effective breeding sites for the vector Anopheles gambiae . In Akwatia in the Eastern region where large scale diamond mining occurs, the open cast mining operations are accompanied by areas which collect water during the rainy season and serve as effective breeding sites for the mosquito vector.

The debilitating effects of the disease on victims and the shadow effect of the disease on other household members through the provision of care during illness for example, may induce labour shortage when it is most needed. Households are thereby faced with low levels of production, hunger and poverty in the long run.

National statistics from Rwanda, Chad and Ghana, showed that malaria accounted for more cases , more deaths and more potential days of healthy life lost than any other one cause (Shepard et al, 1991). Long term data from Zambia, Togo and Rwanda similarly showed that the incidence of malaria increased by 7, 10, and 21 percent, respectively, every year over the 1980s (Ibid). It was suggested that the increasing incidence of the disease was associated with population migration, growing resistance of the parasite to antimalarial drugs such as chloroquine, limited resources for malaria treatment and control, irrigation and other development activities that create mosquito breeding sites.

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Economic stagnation and decline were also identified as causes for the general health problem (Shepard et. al, 1991).

2.1 Socio-economic importance of malaria

Estimates of the cost of particular diseases are intended to provide information on the value to be gained from reductions in their prevalence or incidence. Such information may be useful, for example, in determining priorities for planning and financing health care services, and in evaluating whether the benefit from a particular disease prevention programme justifies its cost.

In an effort to focus on a long neglected aspect of malaria in Africa, four case studies across the continent had been performed by Shepard et al. (1991), to quantify the impact of malaria on Africa, a summary of which is shown in table 2.1.

The average cost per case of malaria for all sub-Saharan Africa was estimated to be $9.84 (in constant US dollars): $1.83 for direct costs and $8.01 for indirect costs. Given the average value of goods and services produced per day in Africa to be $0.82 during the time of the study, the estimated cost per malaria episode was found to be equivalent to 12 days of output. By 1995 the average cost of a malaria case was projected to rise to $16.40 due to increasing case severity and chloroquine resistance. At the same time per capita output was predicted to fall to $0.77 thereby increasing the burden of a case of malaria. In terms of time the per capita cost of the disease was estimated to be equivalent to

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21 days of output. The burden is forecasted to rise from $1.34 in 1987 to $4.02 by 1995.

Table 2.1: Direct and indirect economic cost of malaria and the equivalent days of per capita output lost in Africa.

Area	Direct cost per capita (US $)*	Indirect cost per capita (US $)*	Total cost per capita (US $)*	Output per capita (US $)*	Equivalent No. of days of output lost to malaria
Sub-Saharan Africa	1.83	8.0	9.84	0.82	12.0
Rwanda	0.63	2.25	2.88	0.83	2.5
Burkina Faso (Solenzo Dist.)	0.26	0.89	1.15[a]		3.0
Chad (Mayo-Kebbi Dist.)	0.01	0.59	0.60		5.0
Congo (Brazzaville)	0.27	0.47	0.74		<1

Source: Compiled from Trop. Med. Parasitol. 42 (1991)

* Values are in 1987 US dollars

[a] Health care providers pay about 14% of the direct cost.

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In Africa as a whole, the annual economic burden of malaria was estimated to be $0.8 billion as at 1987 and it is estimated to rise to $1.7 billion in 1995. The economic burden represented a 0.6 per cent of the share of GDP in 1987 and a 1 per cent share of GDP for 1995 (Shepard et.al. 1991).

In Rwanda, Shepard et. al, (1991), estimated the total cost of malaria for 1989 to be $2.88 per capita (in 1987 U.S. dollars). Of this cost $0.63 per capita represents the direct cost of treatment including care for out-patients and hospitalised cases in both government and private facilities as well as self treatment. The other $2.25 per capita represent the indirect costs of productive time lost to malaria morbidity in adults and in providing care for sick children. The indirect cost also include the value of life time earnings lost through premature malaria mortality. Average output per day per capita of the Rwandan economy at the time was $0.83 resulting in the loss of 3.5 days of production or an equivalent of 1 percent GDP. Across the country (Rwanda) the average cost of each of the 1,772,271 reported malaria cases in 1989 was $11.82. The break down gave $2.58 as direct cost and 9.24 as indirect cost. The incidence of the disease was noted to have risen eight-fold from 1979 to 1990 (Ettling and Shepard, 1991). In rural Rwanda where it was reported that daily output per capita was less than half the national average, user fees to patients for treatment in public health facilities in the rural areas were found to be only 5 per cent of operating expenses. It was reported that if the entire direct cost per case were passed on

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to patients, it would represent 29 days of individual rural cash income (Ibid).

In Burkina Faso, Sauerborn et.al, (1991) used household data on health service utilisation and agricultural production to estimate the direct and indirect costs of malaria. Cost per case averaged $5.96 and cost per capita was $1.15. Indirect cost due to mortality was the largest component and was noted to be $0.89 per capita. The direct cost for providing malaria care per capita was $0.26. Travel and drug costs to households accounted for 86 per cent of the direct cost and the remaining 14 percent represented Ministry of Health expenditure on other services provided for treating a case of malaria. The daily marginal productivity of labour was used to estimate the indirect cost of malaria. Out of the total work days lost to malaria, 75 per cent of the days were lost during the agricultural food crop season, 11 per cent during the cash crop season and 14 per cent during the maintenance season. The value of the production lost was estimated to be $0.10 per capita (Ibid).

Nur and Mahran (1988) estimated a total of 9,741 work hours to be lost to malaria from a sample of 250 tenant farmers in Sudan over a period of one year. Although 62 percent of this loss were noted to be compensated by healthy family members, a negative shadow effect of malaria is reported to emerge in the form of abstracting women from household activities and children from school. It was also found that malaria reduced tenants efficiency by 50 per cent through debilitating effects and the occurrence of

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the disease was highest within seasons where demand for agricultural labour was at its peak.

Malaria is often noted to be one of the most serious obstacles to human efforts to develop agriculture, establish permanent settlements or in any way modify the environment. The disease is not only one of the most widespread diseases in the world but also the number one killer of people, especially in the tropics. Figures provided by the World Health Organization (WHO) indicate that some 2.2 billion people or 40 per cent of the worlds' population are at risk from malaria. Of this population 90 per cent of them carrying the parasite are in tropical Africa. The disease is also said to claim over one million lives per year of which 80 per cent are under five.

In Ghana malaria accounts for about 9 per cent or 16,000 of all deaths per year. Over 30 per cent of all hospital admissions in the country is attributed to malaria. In table 2.2, malaria is shown to account for about 40 per cent of all diseases reported in the country's health institutions. The proportion of malaria to other disease did not vary much even with different reporting rates. This supports the findings of the Ministry of Health (MOH) that malaria is hyperendemic in Ghana (MOH,1991).

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Table 2.2: Reported Cases of Malaria in Ghana, 1985-1991

Year	No. of Cases	Percent of all diseases	Reporting rate
1985	593,368	40	41
1986	807,019	39	61
1987	1,141,893	43	58
1988	1,232,882	43	65
1989	1,556,169	44	77
1990	1,438,713	38	83
1991	1,372,771	40	82

Source: Centre for Health Statistics/Epidemiology Division, Ministry of Health, Ghana, Various Years.

The importance of the disease is further supported by general epidemiological data. With respect to prevalence, malaria is the most important disease in Ghana, followed distantly by diarrhoea and urinary tract infection (Asenso-Okyere, 1994).

Being the largest disease problem malaria is also the number one disease to claim the highest number of days of healthy life among other diseases. Malaria accounts for 15.4 percent or 58,427 days of healthy life lost per year per 1000 population in Ghana (table 2.3). With these evidences the importance of malaria to productivity among the economically active population especially in agriculture cannot be overemphasised.

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Table 2.3: Types of Disease and their Impact on Health Status

Rank Order	Disease Classification	Days of Healthy Life Lost Per Year per 1000 Population	Percent of Total
1	Malaria	58,427	15.4
2	Prematurity	34,432	9.1
3	Measles	23,033	6.1
4	Birth injury	22,612	6.0
5	Sickle Cell Disease	21,797	5.9
6	Pneumonia,Child	20,857	5.5
7	Kwashiorkor, Marasmus	19,312	5.1
8	Dysentry and Gastroenteritis	17,322	4.5
9	Neonatal Tetanus	14,847	3.7
10	Accidents (All Kinds)	11,137	2.9
11	Tuberculosis	10,097	2.7
12	Stroke	8,915	2.4
13	Pneumonia, Adults	8,743	2.3
14	Psychiatric Disorder	8,542	2.3
15	Cancer	7,315	1.9
16	Pregnancy, Complications of	6,005	1.6

Source: Ministry of Health, 1978. A Primary Health Care Strategy for Ghana, Accra. 0

Currently the authorities of the Ministry of Health in Ghana have designed an elaborate strategy to mount a malaria control programme. At the same time, the Ministry of Food and Agriculture is also about to vigorously pursue an intensive programme on small scale irrigation projects which paradoxically may increase the breeding sites of the mosquito vector. Although the link between increased malaria transmission and increased irrigation activities is not documented in Ghana the disease has now become a perennial health problem in Northern Ghana instead of its seasonal nature in the recent past (MOH, 1991). In line with the recommendations of the World Bank [1991] concerning differential application of user fees for rural dwellers and urban dwellers it is expected that knowledge of health care seeking behaviour of farmers especially in

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the current era when irrigation development and malaria prevention are being highly encouraged in the country can be a useful guide to decision making.

The relationship between agricultural development programmes such as irrigation and the incidence of malaria noted above explicitly illustrates the argument that health affects development and development also affects health. Figure 2.1 illustrates how malaria infection affects productivity which in turn may lead to low incomes (or increased poverty) which may pre-dispose people to malaria infection or increased severity. Thus, malaria and poverty are engaged in a vicious cycle. Malaria infection results in poor health which can lead to loss of life (or loss of healthy productive days) or reduced labour efficiency thereby causing reduction in household output and income which negatively affects ability to pay for malaria care services. People become more sick because they cannot afford to pay for efficient treatment services and therefore they become poorer because they cannot work efficiently (Asenso-Okyere, 1992). The question one would like to ask therefore is how can this vicious cycle be broken so that access to health care, especially the poor, can be increased so as to improve upon the welfare of people.

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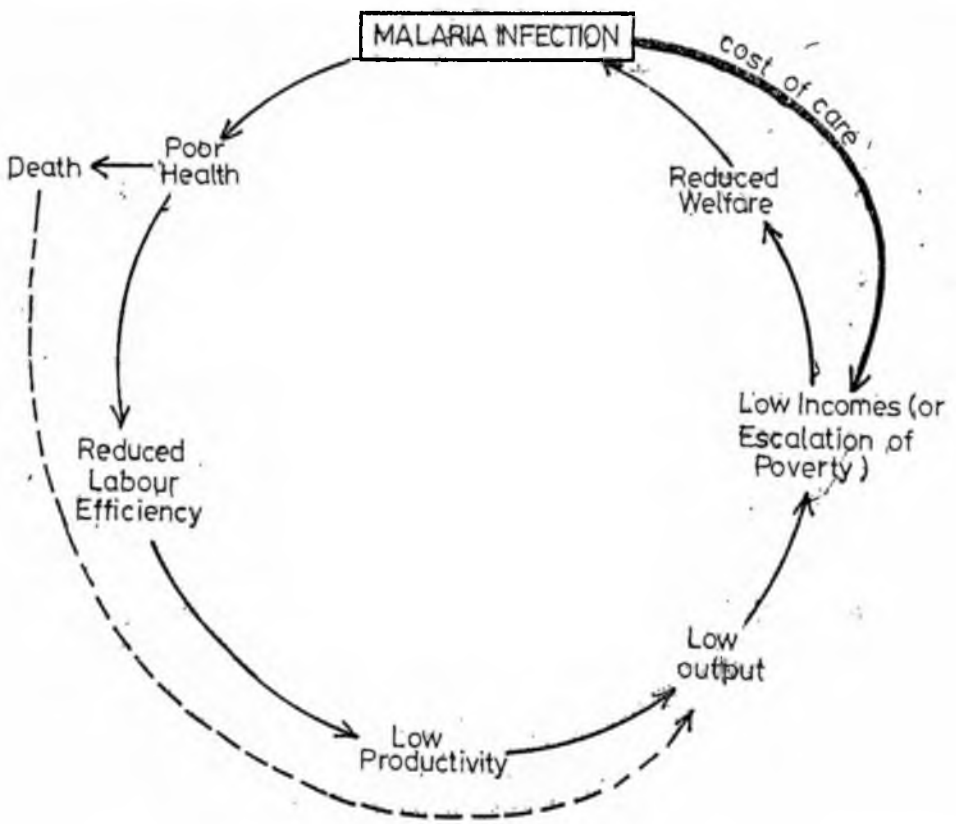
Fig 2.1: THE VICIOUS CYCLE OF MALARIA AND HOUSEHOLD POVERTY.



Source: Asenso-Okyere (1992). Socio-economic aspects of malaria. A paper presented at the National workshop on malaria, Accra, Ghana 16–20 November, 1992.

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2.2 The shadow effect of malaria on agriculture

Apart from cash expenses on cases of malaria treated at health care facilities, Shepard et.al. (1991) found that there are other expenses incurred by households. Labour quality is noted to be affected by malaria morbidity both during acute attacks and as a result of cumulative effects of the disease on an individual who has had repeated attacks. Similarly, debility may reduce the value of or quality of output through an influence on production and decision about crops. A case in point is the shifting of rural farmers in Paraguay from more lucrative cash crops which are labour intensive to less labour critical but also less valuable crops when they were subjected to the threat of malaria (Conly,1975).

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CHAPTER THREE

HOUSEHOLD COST OF SEEKING MALARIA CARE

3.0 Introduction

Intervention policies have prevented the maintenance of market determined prices for health care. However, the evolution of adjustment programmes in most developing countries has tended to re-orient the health care market towards a market economy. Except for very few disease cases like leprosy and tuberculosis, there are charges for disease treatment in Ghana under the Hospital Fees Regulation (1985) Legislation. Fees paid for registration, consultation and laboratory services, and drugs among others are part of the direct costs incurred by patients when they visit health care facilities. Travel costs to and from health care facilities and sometimes to distant drug stores to purchase prescriptions also form part of the direct costs incurred by households. The value of lost time to production as a result of malaria is also an economic cost to households, although indirect in nature.

3.1 Cost Sharing in the Health Sector

Cost sharing measures have been introduced into the social sectors (health and education) as part of Ghana's economic reforms Owhich began in 1983. Under the cost recovery legislation for the

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health sector fees differ by: (i) type or level of facility (health post versus health centre, (ii) treatment location (urban versus rural), (iii) age (children versus adults), (iv) nationality (Ghanaians versus non-Ghanaians) and (v) type of service (curative versus preventive, type of diseases, type of procedure, etc). With regard to service level and treatment location highest fees were charged at teaching hospitals followed by regional hospitals, district hospitals, urban health centres, and the lowest fees at rural health centres and posts in that order. Children pay fees ranging from 50 per cent to 67 per cent of the adult fees depending upon service level and treatment location. Non- Ghanaians pay fees which range from 133 per cent to 267 per cent of the fees paid by Ghanaians. Also patients suffering from certain diseases are subject to pay the charges for drugs but are exempted from all other charges. In general natal medical services are exempted and health-service personnel are also exempted except for special amenities(Asenso-Okyere, 1991).

Apart from government health services, the non-governmental organizations including the private and the mission providers have been charging user fees to recover their costs long ago. The traditional and the spiritual systems also operate some form of cost recovery although it is more informal and it is often termed as a thanks offering. The private medical practitioners including midwives have full cost recovery plus profit schemes and users pay for all the services they receive at these facilities.

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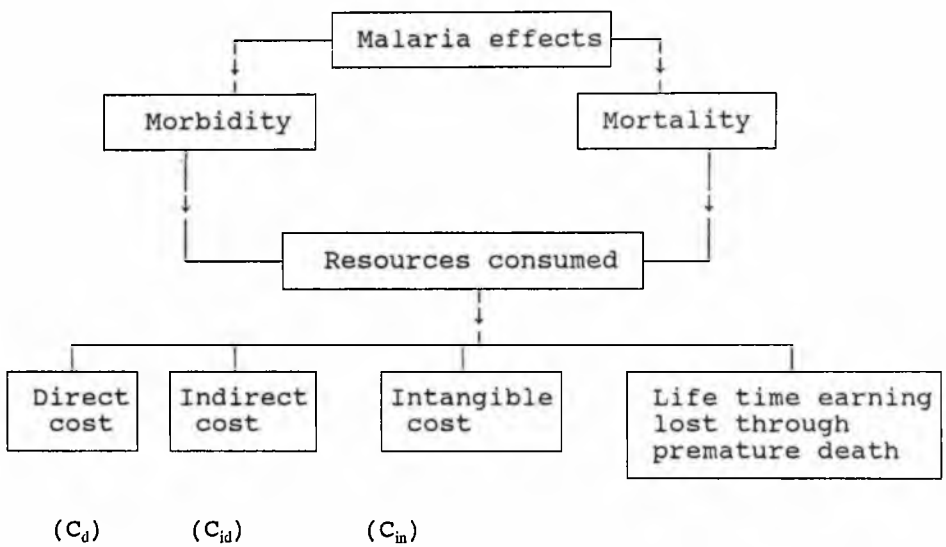
3.2 The economic cost of malaria

Malaria like any other disease imposes health and economic problems on individuals, households and the society at large.

The two health effects of morbidity and mortality lead to the consumption of resources and these resources may involve incurring costs which may be direct, indirect or intangible. Pre-mature deaths will lead to loss of life time earnings (figure 3.1).

Fig. 3.1 Economic effects of malaria



(C_d) = f[cost of drugs, consultation cost, laboratory service charges, other user charges, transportation cost]

(C_{id}) = g[opportunity costs of travel, waiting and lost of productive time]

(C_{in}) = h[monetary value of pain, grief,and suffering of patient and family].

Source: Adapted from Shepard et.al. (1991): Economic cost of malaria for Africa. Trop. Med. Parasitol. vol 42.

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3.2.1. Direct cost

The direct cost of malaria includes cash payments for treatment and preventive measures taken by individuals, households and governments. Specifically this aspect of cost includes direct payment for drugs, consultation, laboratory tests and transport charges to and from health care facilities. Government and or health system expenditures on drugs and control programmes are also included in this category of cost.

3.2.2 Indirect cost

The indirect cost component mainly refers to the value of time lost to malaria through morbidity, debility and mortality. Malaria is characterized by successive episodes of high fever coupled with musculoskeletal pains, headache, intestinal symptoms followed by exhaustion and weakness (Asenso-Okyere, 1991). The duration of an attack of malaria depends on the level of acquired immunity and the availability and administration of effective treatment among other things (Sauerborn, 1991). It is therefore obvious that depending on the severity of the disease some amount of time would be lost to production.

Time lost to production as a result of the disease may include travel time to health care facility, time spent at the facility by an individual waiting for a turn to consult a prescriber or obtain some service, time spent in nursing a sick household member, or time missed on a production activity by an economically active

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household member. This idea of time lost suggests reduction in both the effective quantity and quality of labour inputs which can limit economic output. The total value of these times lost to production constitutes the indirect cost of the disease.

With regard to human resources, life lost to diseases through premature death is also an aspect of indirect cost to society. This cost is however difficult to estimate. The impact of malaria on quality of life is also vital but intangible. The summary of the costs of malaria is shown in table 3.1.

Table 3.1: Sources and effect of Economic Costs of Malaria

Type	Source	Effect
Direct costs	Treatment and prevention	Expenditures of households and governments
Indirect costs	Mortality, morbidity debility, treatment time	Economic output (e.g.crop yields)
Intangible	Health status	Quality of life effects

Source: Culled from Trop. Med. Parasitol. 42 (1991).

The impact of these costs can be examined either from the perspective of the individual, household or nation. In other words costs of malaria and any other disease as noted by (Castro et al,

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1988) can be analyzed either from a microeconomic or macroeconomic point of view. The micro level study considers the impact of the disease on individuals and households while the macro effects could be analyzed through the evaluation of national control and preventive programmes in relation to national product.

3.3 Methodology

The number of malaria cases in the sample was taken to be the cases reported by the respondents during the household survey. Two recall periods of one month, and between two months to one year from the day of interview were used. The two periods were used primarily to enable a large number of cases to be obtained for the analysis while at the same time recognising the inaccuracy in the data for a long recall period.

At the household level a structured questionnaire was used to guide the patients to recall all direct expenses they made on the malaria episode reported. Respondents were given the option to either report expenses on specific services such as registration, consultation and drugs, etc, or to report the lumpsum payments they made.

Information on drugs prescribed for malaria and their corresponding prices as well as registration and consultation fees in addition to laboratory fees for a normal malaria test were collected from health care facilities.

Due to difficulties in obtaining good estimates of life time

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earnings lost through premature death the original Shepard (1991) economic cost of malaria model which did not consider the cost consequences of death was used in this study. The cost of malaria per episode was determined by estimating the average cost of treatment either at home or in a health care facility per sick individual with respect to severity. Analyses were done for each district and for the combined sample.

3.4 Estimation of direct cost

The total direct cost of the disease include all expenditures on malaria victims as well as other direct expenditures on caretakers who accompanied the sick to seek treatment at a health care facility. It was observed that while the actual treatment costs were directly incurred by patients, there were some expenditures on caretakers also. For example, in cases where health care services were sought outside the resident community of the victim of the disease, transportation fare has to be paid for both the caretaker and the patient unless the patient is a child. For the purpose of computation, children 10 years and below were considered to travel for free. Ten years was chosen as the cut off age because labour from children of that age and below were not hired for fee at the study areas just like in many places in Ghana although this group of children may work for tips. Transportation costs for such cases were therefore only recorded and computed for the adult caretaker if there was any. It was also assumed that only one person goes to buy prescriptions for a patient when necessary

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and as such costs were computed for one person for cases where people had to travel to buy drugs.

3.4.1 Results on direct cost

Generally, costs in current cedis were higher for severe cases than mild cases. On average, the total treatment cost was ¢2227.35 or US $3.23 for mild cases and ¢4414.49 or US $6.40 for severe cases using the combined sample As shown in table 3.2, facility costs form a major component of household expenditure on treatment of malaria. As a percent of total treatment cost, total facility cost represent over 49 percent of all treatment costs in the sample.

For the specific costs reported, the cost component of drugs are very outstanding both at the facility level and from vendors. Apart from mild malaria in Kwaebibirem district where drugs from facility represented 64.8% of total treatment cost and that from drug store represent 21.9% of the total treatment cost, there was not much difference between drug cost from health care facility and drug store for the severe cases. Cost of drugs obtained from health care facilities ranged between 34.3% and 64.8% of the average treatment costs while those from drug store ranged between 21.9% to 38.5% of the total treatment cost per case of malaria. If the cost of drugs from both the facility and drug stores are added then drugs comprised over 60% of the cost of treatment of malaria.

It is also seen from table 3.2 that quite a substantial amount of the drug cost is incurred at drug stores as health care

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facilities cannot provide all the drugs prescribed.

In nominal values laboratory fees are more stable. The total costs per case for the combined sample were ¢592.86 (US $0.86) and ¢553.73 (US $0.80) for severe and mild cases respectively. Transportation costs to facility in current cedis were generally higher for severe cases than mild cases of malaria as people may travel far to seek special care for the severe cases. In Amansie East district the average cost of travel to facility was ¢617.30 (US $0.89) and ¢175.00 (US $0.25) for severe and mild cases, respectively and for the Kwaebibirem district it was ¢564.82 (US $0.82) for a severe malaria and ¢65.00 (US $0.9) for mild malaria. With regard to the combined sample transportation cost to facility represented 13.1% and 5.9% of the total costs for severe and mild cases, respectively.

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Table 3.2:Average direct costs of services and drugs per case for treating malaria at health care facility (in cedis)

	AMANSIE EAST		KWAEBIBIREM		COMBINED SAMPLE	
	Severe	Mild	Severe	Mild	Severe	Mild
Registration	195.75 (3.4)	159.26 (6.5)	91.83 (2.5)	130.00 (8.8)	132.20 (2.9)	155.22 (7.0)
Laboratory	713.33 (12.2)	553.73 (22.5)	291.67 (8.1)		592.86 (13.4)	553.73 (24.9)
Cost of drugs supplied	2002.50	846.69	1596.38	953.08	1754.51	856.94
at facility	(34.4)	(34.3)	(44.1)	(64.8)	(39.7)	(38.5)
Total facility cost	2911.58	1556.68	1979.88	1083.08	2479.57	1565.89
Facility cost as percentage of total treatment cost(%)	49.97	63.12	54.67	73.63	56.17	70.30
Cost of drugs purchased	2245.35	718.43	1034.38	321.47	1324.74	518.69
from store	(38.5)	(29.1)	(28.6)	(21.9)	(30.0)	(23.3)
Transportation cost to facility	617.30 (10.6)	175.00 (7.1)	564.82 (15.6)	65.00 (4.4)	576.70 (13.1)	132.51 (5.9)
Transportation cost to buy drugs	52.70 (0.9)	15.56 (0.6)	13.44 (0.4)	0.79 (0.1)	22.32 (0.5)	9.74 (0.4)
Other costs	0.00 (0.0)	0.41 (0.0)	14.43 (0.4)	0.69 (0.0)	11.16 (0.3)	0.52 (0.0)
Total treatment cost (cedis)	5826.93 (100.0)	2466.08 (100.0)	3621.38 (100.0	1471.03 (100.0)	4414.49 (100.0)	2227.35 (100.0)
Total treatment cost (US dollars)	8.44	3.57	5.25	2.13	6.40	3.23

Source: Survey data.
Figures in parenthesis are percentages of the total cost.
Exchange rate: US $1.00=¢690.21

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Generally, transportation costs to buy drug were comparatively low and they represented less than 1% of the average total costs for treating malaria. This is not surprising since many drug stores have sprang up in many parts of the country in response to the liberal import policy of the government and thereby cutting down on the distance travelled to purchase drugs. Average cost of travel to buy drugs was ¢22.32 (US $0.03) and ¢9.74 (US $0.01) for severe and mild cases of malaria, respectively.

3.5 Estimation of indirect costs

Since time can be used in either productive or leisure activities there is an opportunity cost to it if it is used in any other way. The time involved could be considered as a scarce resource which has been switched from its best alternate use and therefore could be valued at the marginal product of labour.

The concept of marginal cost of labour (MCL) is usually used in economics to evaluate the opportunity cost of time. Brandt (1980) indicated that in subsistence agriculture where land is easily available and labour is by far the most important input variable for production, the MCL can be approximated by the marginal product of labour (MPL). This product he noted relates the market value of agricultural output to the amount of a person's time used to produce the output.

In calculating the indirect cost in this study few assumptions were made. The first was that children between the ages of 10 and 17 were assumed to be working at half the rate of adults. Also the

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adult work force comprise all people within the ages of 18 and 60 which correspond to the age of majority and retiring in Ghana, respectively. Agricultural wage rates were used as the opportunity cost of labour. Although demand for agricultural labour is known to have peaks and slags at different periods in a year the agricultural wage rates used were assumed to be constant throughout the year. This is because job opportunities in mining, logging and petty trading abounds in both districts throughout the year and people easily switch to any of them. Harvesting and processing of palm fruits is also intensively done during parts of the off-farm season. Men usually do the harvesting while women and children gather the produce and transport them to the road side and or home for processing. A lot of labour hiring goes on especially in the Kwaebibirem district during the time of harvesting oil palm. The bulk of the palm fruits are sold to Kwae Mills (for industrial processing) but some oil extraction is also done by artisanal processors who are mainly women. These activities among others make people in both districts relatively busy for most parts of the year. Information was actually collected on wages for different periods of the year and the computed average wage is used as the marginal value product of labour in the study. An alternative could be to value time lost to malaria by using the value of output lost during the episode of the disease.

The average agricultural wage rate per adult man was computed to be ¢1,600.00 (or US $2.32) and that for an adult woman was ¢1,280.00 (or US $1.85). The agricultural wage rate per child

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within the age group 11-17 years was taken to be half the adult male wage. The daily wages at the study areas or in rural areas in general is quite high compared with government approved minimum daily wage. This is because people in rural areas hire their labour on what is popularly termed "by-day" basis and they normally work for shorter hours in a day for a fixed price. When the hourly rate is computed and multiplied by the normal 8 working hours in a day it is mostly found that the rural wage or the agricultural wage rate is higher than government approved daily wage. Albeit the rural labourer does not actually collect the computed wage for a "by-day" job. The computed wage may only be possible if a hired labourer works for two different employers in a day.

Waiting time at orthodox health care facilities were obtained from a time and motion study. Patients irrespective of age and gender normally have to register and go through all other activities sequentially at the facility according to their order of arrival except for a few who jump the queues.

The overall total indirect cost however, was estimated based on the time that economically active patients were absent from their normal activities as a result of the malaria attack. The number of total days lost to production by both patients and their caretakers were valued according to their age and gender. Specific daily wage rates as obtained from the data were multiplied by their corresponding total days lost by the patients. Whereas time lost to malaria by children between 0 and 10 years were not included in the estimation of the indirect cost, effective time lost by their

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caretakers were taken into consideration.

3.5.1 Results of the indirect cost of malaria

The time spent on activities by patients is shown in table 3.3. Approximately three hours are spent on average by a malaria patient in the two districts to seek treatment at health care facilities although there is quite some difference in the average time of seeking care in the two districts. While people in Kwaebibirem district spent about 112 minutes at facility, people in Amansie East spend 250 minutes on average. The large disparity in time between the two districts appears to be due to the comparatively long time spent on consultation and laboratory services in Amansie East (basically Bekwai District Hospital). Generally, more time is spent on laboratory and consultation services than other services. The little time spent on travel to purchase drugs (maximum average of 2 minutes) suggests that people do not on the average travel far from their communities to purchase drugs. Facility time accounts for 86.82% and 90.58% of total time spent on treating malaria in Kwaebibirem and Amansie East districts respectively.

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Table 3.3: Average travel and waiting time to seek malaria treatment at orthodox health care facilities (in minutes).

	AMANSIE EAST	KWAEBIBIREM	COMBINED SAMPLE
Registration	27 (9.78)	13 (10.07)	22 (9.40)
Consultation	77 (27.89)	20 (15.5)	55 (23.5)
Laboratory	113 (40.94)	37 (28.68)	102 (43.59)
Injection	9 (3.26)	16 (12.40)	12 (5.13)
Dispensary	10 (3.62)	15 (11.63)	12 (5.13)
Others	14 (5.07)	11 (8.53)	13 (5.55)
Total time spent at facility	**250 (90.58)**	**112 (86.82)**	**216 (92.31)**
Travel to facility	24 (8.69)	16 (12.40)	17 (7.26)
Travel to purchase drug	2 (0.72)	1 (0.78)	1 (0.03)
Total time spent on treatment	**276 (100)**	**129 (100)**	**234 (100)**
Indirect cost of total time spent on treatment(¢)*	**920**	**430**	**780**
Indirect cost of total time spent on treatment(US $)[a]	**1.33**	**0.62**	**1.13**

Source: Survey data.

Figures in parenthesis are percentages of the total time spent on treatment.

* Conversion factor: Monetary cost was obtained by multiplying the time in hours by ¢200 (two hundred cedis) which was the male labour cost per hour at the study area.

[a]Exchange rate: US$1.00 = ¢690.21 (Sept. 1993 inter-bank average).

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3.6 General components of costs of malaria

The total direct cost of malaria for the sample is estimated at ¢2,014,078.30 or US $ 2,918.07 including cost of treatment both within and outside facilities. With 1614 as the total number of malaria cases in the sample the average direct cost per malaria case was estimated to be ¢1,247.88 or US $1.81 without any reference to severity (see table 3.4). Using the equivalent daily wage of ¢1600.00 or US $2.32 per adult worker, the direct cost per case represent approximately 1 man-day.

Table 3.4: Summary of average costs of malaria in both Amansie East and Kwaebibirem districts (in cedis)

	Cost per case (AMANSIE EAST)	Cost per case (KWAEBIBIREM)	Total cost per case (COMBINED)	Equivalent No. of days lost by total cost per case (approx.)
Direct Cost	1328.21	1157.63	1247.88	1
Indirect Cost/ Opportunity Cost	6191.85	3107.58	4739.53	3
Total Cost	7520.06	4265.20	5987.41	4
Total Cost US.$[a]	10.90	6.18	8.67	

Source: Survey

Sample size: Amansie East =854, Kwaebibirem =760

[a]Exchange rate: US$1.00 = ¢690.21 (Sept. 1993 inter-bank average).

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For the 1614 malaria episodes reported, a total of 8090 productive days were lost as a result of the malaria attacks. Days lost by economically active patients totalled 2895 and that of caretakers were 5195 days. On the average 2 days were lost per case by a caretaker while patients lost 3 days per malaria episode irrespective of severity.

Multiplying the various wage rates according to age and gender by their respective number of days lost to malaria, the value of days lost was estimated at ¢7,649,601.40 or US $11,083.01 which forms 79% of the total cost of malaria in the sample. This gives the indirect cost per malaria case to be ¢4,739.53 or US $6.87. When the direct and the indirect costs were combined the total estimated cost of malaria was ¢9,663,679.70 or US $14,001.07 with ¢5987.41 or US $8.67 as an average cost per malaria case regardless of severity.

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CHAPTER FOUR

THE CHOICE OF MALARIA CARE PROVIDER

4.0 Introduction

Decisions about health care embodied in health care seeking behaviour of households can be analyzed in terms of choice theory. Choice theory assumes that rational decision makers can rank possible alternatives in order of preference, and will always choose the most desirable option given their tastes and relevant constraints imposed on their decision making. One of the objectives of this study is to examine the behaviour of households in the choice of malaria care providers as the choice of provider invariably affects the cost of treatment. This section of the study presents a description of the paths followed by patients in seeking malaria care.

4.1 Health care providers in Ghana

The health care delivery system in Ghana comprise three main providers, namely the orthodox, traditional and spiritual systems. The orthodox health care delivery system is clinic-based and it often uses chemotherapy as a means of curing patients. The government, private practitioners and the missions are the main providers under this system with government owning about 63 percent of hospitals within the sector. Facilities within the government or the public health sector include 46 Ministry of Health general hospitals. Of this, there are 2 teaching, 8 regional and 36 district hospitals; and about 250 rural health centres and posts

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(World Bank, 1989). The government health sector is categorized into four levels of operation based upon the amenities available at the facility. The levels rank from A as the lowest through D. Village or community level facilities classified under rural health centres and posts are graded as level A. The two teaching hospitals are the level D health facilities. Referrals are made from lower facilities to higher ones in the rank (MOH, 1990; Asenso-Okyere, 1992).

The second largest provider of orthodox health care services are the mission health care facilities followed by the private providers. Out of the total bed capacity of 18,600, mission hospitals account for about 30 per cent of them (World Bank,1989). The Catholic Church is by far the largest member of the mission health care service providers under the Christian Health Association of Ghana (CHAG). A common feature of the mission hospitals is that they are mostly situated in remote rural areas. The private sector however operates predominantly in two cities i.e. Accra and Kumasi. There were also some 3,500 drug outlets in the country as at 1985 (World Bank,1989).

The traditional system on the other hand comprise herbalists and fetish priests. Their operations mostly depend upon the use of herbs. The herbalist is someone who is perceived to be very knowledgeable in the use of herbs to cure diseases. Although the fetish priest also uses herbs to cure, he is believed to invoke the spirit of his gods to direct him as to what type of herb to use in curing a particular disease. In addition he is believed to 'drive

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away' evil spirits. Most people who seek care at the fetish priest do so based upon their believe and perceived cause of the disease (Asenso-Okyere, 1992). Spiritualism where disease treatment is invoked through prayers is the third health care system and it is becoming increasingly popular especially among women.

Self-medication which does not involve any consultation is one way of treating malaria. This type of treatment can be effected by either using drugs or herbs and so it depends a lot on the experience of the patient. According to Asenso-Okyere (1992) because of the seriousness people attach to malaria and its endemicity, almost every household in the four communities studied in Ghana is aware of one herbal preparation or another for treating malaria. The herbal preparation range from liquids for drinking, liquids for enema and potions for hot fomentation. The leaves of the nim tree (**Adzadirachta indica**) was noted to be used by many people. A common feature of the traditional system is that most people resort to herbal remedies. A modernised form of the home remedy system is the use of pharmaceuticals for biomedicine or self medication without consultation. These pharmaceuticals are purchased from drug stores and drug peddlars for self administration.

One form of consultation that is becoming popular is describing ones' symptoms to a drug store operator who may be a pharmacist or not and seeking suggestions for drugs to purchase. Through this way the patient avoids the payment of consultation fees and transport costs to health care facilities.

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4.1.2 Underlying reasons for choosing a provider

According to Karl et. al. (1966 cit.), illness behaviour can be defined as "any activity undertaken by a person who considers himself ill for the purpose of getting well". In order to accommodate people such as children and others who may not do anything themselves although some activity could be undertaken on their behalf to get them cured, the above definition is modified a little in this study to be: any activity undertaken by or for a person who considers himself ill or is considered ill for the purpose of curing the disease.

From a qualitative study Asenso-Okyere (1992) noted that people have many reasons in choosing a particular health-care provider when they are sick. Availability within the locality may be an important factor because of transport and other costs. The choice of a health care provider may also depend upon the degree of faith the patient and or his relatives have in the competence of the provider. Perception of the cause of a disease is another factor noted to be considered in selecting a health care provider. A person who is believed to have been cursed, or whose ailment is perceived to originate from supernatural sources is often not taken to orthodox health care centres. Health care in these cases may be sought from spiritualists, herbalists or fetish priests. A patient may decide to visit different providers until a cure is finally obtained.

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4.2 Choice of provider for treating malaria

To treat malaria like any other disease, people would have to choose among alternative treatment resorts including self medication. From previous studies on health care behaviour it is known that people do not always make only one medical treatment choice for an episode of illness (Agyepong, 1991; Asenso-Okyere, 1992). To examine malaria treatment behaviour in selected districts, actions that people took in order to treat the malaria cases reported in this survey were followed progressively to the third stage of action.

Tables 4.1 through 4.4 show proportions of people in different age groups (with the adult group sub-divided by gender) who took different treatment actions at different stages of a malaria episode. The provider choice paths of patients i.e. the switch from provider to provider is also shown and discussed.

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Table 4.1: Choice of provider for treating mild malaria in Amansie East district

Provider	First Provider				Second Provider				Third Provider			
	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (2 yrs)	Child (2-17 yrs)	Adult male	Adult female
Did nothing	1 (1.0)	4 (1.3)	1 (0.7)	2 (0.9)	1 (6.7)	1 (3.7)	1 (6.3)	-	-	-		
Self medicate	31 (32.3)	167 (54.2)	87 (59.2)	111 (48.5)		2 (7.4)		2 (7.7)	-		1 (50)	1 (33.3)
Hospital/Clinic[a]	46 (47.9)	93 (30.2)	38 (25.8)	72 (31.4)	13 (86.7)	24 (88.9)	13 (81.3)	18 (69.2)		1 (100)	1 (50)	2 (66.7)
Drug Store	18 (18.8)	44 (14.3)	21 (14.3)	44 (19.2)	1 (6.7)	-	1 (6.3)	6 (23.1)			-	-
Traditional												
Total	96 (100)	308 (100)	147 (100)	229 (100)	15 (100)	27 (100)	16 (100)	26 (100)	- (100)	1 (100)	2 (100)	3 (100)

Source: Survey data

Figures in parenthesis are percentages of column totals.

[a] Trained orthodox provider.

Table 4.2: Choice of provider for treating severe malaria in Amansie East district

Provider	First Provider				Second Provider				Third Provider			
	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (2 yrs)	Child (2-17 yrs)	Adult male	Adult female
Did nothing					-		1 (20)					
Self medicate	6 (60)	9 (28.1)	7 (43.8)	7 (43.8)		-		-				
Hospital/Clinic[a]	4	20 (40)	8 (62.5)	8 (50)	6 (50	5 (100)	3 (100)	3 (60)	1 (100)			
Drug-store		3 (9.4)	1 (6.2)	1 (6.2)	-		-					
Traditional			-				1 (20)					
Total	15 (100)	27 (100)	16 (100)	26 (100)	6 (100)	5 (100)	3 (100)	5 (100)	1 (100)			

Source: Survey data

Figures in parenthesis are percentages of column totals.

[a] Trained orthodox provider.

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Table 4.3: Choice of provider for treating mild malaria in Kwaebibirem district

Provider	First Provider				Second Provider				Third Provider			
	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (2 yrs)	Child (2-17 yrs)	Adult male	Adult female
Did nothing	-	2 (1.5)	2 (1.6)		-	2 (6.2)	3 (16.7)		-	1 (50)		
Self medicate	26 (76.5)	179 (82.1)	105 (80.2)	97 (78.2)	1 (12.5)	3 (9.4)	9 (47.4)	3 (16.7)			1 (50)	
Hospital/Clinic[a]	8 (23.5)	37 (17)	23 (17.6)	22 (17.7)	7 (87.5)	27 (84.4)	8 (42.1)	12 (66.7)	1 (100)	1 (50)	1 (50)	
Drug-store		2 (0.9)	1 (0.7)	3 (2.4)	-	2 (10.5)						
Total	34 (100)	218 (100)	131 (100)	124 (100)	8 (100)	32 (100)	19 (100)	18 (100)	1 (100)	2 (100)	2 (100)	

Source: Survey data
Figures in parenthesis are percentages of column totals.
[a] Trained orthodox provider.

Table 4.4: Choice of provider for treating severe malaria in Kwaebibirem district

Provider	First Provider				Second Provider				Third Provider			
	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (>2 yrs)	Child (2-17 yrs)	Adult male	Adult female	Baby (2 yrs)	Child (2-17 yrs)	Adult male	Adult female
Did nothing					-	-	1 (3.6)	1 (2.2)		1 (50)	2 (20)	
Self medicate	14 (63.6)	40 (50.6)	37 (58.7)	50 (56.2)		3 (9.7)	3 (10.7)	5 (10.9)		1 (50)	6 (75)	1 (10)
Hospital/Clinic[a]	8 (36.4)	38 (48.1)	25 (39.7)	39 (43.8)	11 (100)	27 (87.1)	25 (89.3)	39 (84.8)	3 (100)		2 (25)	6 (60)
Drug-store		1 (1.3)	1 (1.6)			1 (3.6)	1 (2.2)					
Traditional					-	-					1 (10)	
Total	22 (100)	79 (100)	63 (100)	89 (100)	11 (100)	31 (100)	28 (100)	46 (100)	3 (100)	2 (100)	8 (100)	10 (100)

Source: Survey data
Figures in parenthesis are percentages of column totals.
[a] Trained orthodox provider.

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4.2.1 Choice of first provider

Most of the people started treatment with self medication in the case of mild malaria in both districts except for the under 2 year group in the Amansie East district (see tables 4.1 and 4.3). Visit to hospital/clinic was the second highest remedy by which people started their treatment. Few adults in both districts including children below age two years in Amansie East did nothing to treat themselves or adopt 'wait and see' attitude as described by Agyepong (1991) when they realized that they had contracted mild malaria or fever.

In the case of severe malaria (tables 4.2 and 4.4) everyone took some action initially to treat the disease. Unlike people in Amansie East where a greater percentage of the sick sought care at a hospital or clinic except for the under two years, a larger percentage of people in Kwaebibirem self medicated. Thus, whereas self- medication is a popular choice for only mild fever in Amansie East district, it is practised by many people who even have severe fever in Kwaebibirem district.

4.2.2 Choice of second provider

Majority of the sick who took a second treatment action because they were not cured after the first attempt went to either a hospital or clinic. The percentages for mild malaria cases range between 69.2 per cent and 88.9 per cent in Amansie East district (table 4.1). Apart from the adult male group where more people

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chose to follow-up their first treatment with self medication (47.4 per cent) compared with visit to hospital/clinic (42.1 per cent), most people in Kwaebibirem district (i.e. between 66.7 per cent and 87.5 per cent) followed-up their treatment at hospital/clinic in the case of mild malaria (table 4.3). For severe cases most of the people sought care for the second time at orthodox health care facilities.

4.2.3 Choice of a third provider

Only very few were not cured of the mild malaria after a second treatment action in both districts. In all 11 people, 6 from Amansie East and 5 from Kwaebibirem districts took a third action to treat mild malaria. From Kwaebibirem district 23 persons with severe malaria took a third treatment as against 1 in Amansie East. Most of these people either self medicated or visited hospital/clinic. Few people also did nothing both in the mild as well as the severe cases while a female suffering form severe malaria in Kwaebibirem consulted a traditionalist. It can be concluded that self-medication and visits to orthodox health care facilities are the most common choices made by people who get fever. Traditional health care centres and spiritualists do not seem to be used for treating fevers.

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CHAPTER FIVE

THE DEMAND FOR MALARIA CARE - A MULTINOMIAL LOGIT APPROACH.

5.0 Introduction

Much concern has been expressed about the behaviour of people under the health financing reforms characterising the economy of many developing countries. To understand health care seeking behaviour it is necessary to identify the factors that affect the choice of different health care providers at any point in time. This chapter investigates the variables that are considered in household health care decision making in the choice of health care provider. By the help of such knowledge health financing policies could be properly formulated to achieve set goals.

5.1 Theory of demand

The consumer demand is defined as a schedule of the quantities of a particular commodity a consumer is willing and able to buy as the price of the commodity varies holding all other factors constant (Asenso-Okyere, 1982). The law of demand states that price and quantity varies in opposite direction and this phenomenon is explained in terms of income and substitution effects of a price change based on the utility maximization hypothesis. From empirical findings the substitution effect of an increase in

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price for a specific commodity is always negative. The income effect of a price increase is also generally negative except for few commodities of which consumers buy less when income increases and such commodities are termed "inferior goods". The demand curve for these few exceptional commodities is positively sloped because the positive income effect more than compensates for the negative substitution effect. This phenomenon is generally referred to as the Giffen's paradox after the man who discovered the relation.

Apart from income and price, consumer taste, preferences, age and geographical locations are some of the major factors that determine the level of consumption of a given commodity.

5.1.1 The Consumer

According to consumer theory the individual consumer makes his choices from a commodity bundle in order to obtain the maximum satisfaction subject to his budget constraint. That is, a consumer with a given income, Y makes a choice of quantities q_1, $q_2, \ldots q_n$ from a commodity space with n elements with the view of optimising his satisfaction or utility. The utility approach to the theory of demand therefore specifies the maximization of a utility function

$$U = f(X_1, X_2, \ldots, X_n) \tag{5.1}$$

subject to an income or budget constraint

$$\sum_{i=1}^{n} P_1 X_i = Y \tag{5.2}$$

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where P_i is the price of the ith commodity and Y is total income. The consumer's choice of $X_1,..,X_n$ corresponds to the quantities consistent with the maximization of

$$L = U(X_1 \ldots, X_n) + \lambda(Y - P_1 X_i - \ldots - P_n X_n) \tag{5.3}$$

where λ is a Lagrange multiplier.

Differentiating the Lagrangian with respect to $X_1,..,X_n$ and λ, gives

$$\partial L/\partial X_i = \partial U/\partial X_i - \lambda P_i, \qquad (i = 1 \ldots n) \tag{5.4}$$

and

$$\partial L/\partial \lambda = \sum_i P_1 X_i - Y \tag{5.5}$$

The above equations (5.4) and (5.5) yield the first order conditions or the normal equations when they are equated to zero. Optimal values of X_i and the equilibrium value of λ are obtained upon the assumption that the conditions for global maximum are satisfied. The X_i's are essentially functions of prices (P) and income (Y) as shown below.

$$X_i = f(P_1 \ldots P_n, Y) \tag{5.6}$$

The quantity X purchased of each commodity is expressed as a function of its price, price of other commodities and income; hence the relationships in (5.6) represent a set of demand functions. The demand function for the standard theory are homogeneous of degree

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zero in income and prices.

The necessary conditions as expressed in (5.4) are sufficient if and only if $U(X_1, X_2, \ldots, X_n)$ is twice differentiable, that is it must satisfy the second-order condition of utility maximization. This condition assumes restriction on the marginal rate of substitution and allows the consumer to optimize his or her satisfaction. The second differential of the utility function can be written as a bordered Hessian matrix (bordered with the marginal utilities dU/dX) in the form:

$$\begin{vmatrix} U_{11} & U_{12} & U_1 \\ U_{21} & U_{22} & U_2 \\ U_1 & U_2 & 0 \end{vmatrix} > 0 \qquad (5.7)$$

The diagonal elements (i.e. U_{ii}) are negative and the cross price elasticities of substitutes (U_{ij}) are positive. Also, complementary goods have negative cross price elasticities and independent goods have zero cross price elasticity. The matrix provides a technique for studying the interrelationships among commodities. However, if a large number of commodities are involved, the interrelationships among commodities become complex because there would be too many parameters in the matrix. To overcome this problem, a number of constraints can be imposed on the demand system (see George and King, 1971). The major constraints include homogeneity constraint,

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Engel aggregation, Cournot aggregation, Slutsky or Symmetry condition, and Separability. As a matter of relevance the study will concentrate only on separability concept of demand.

5.1.2 The concept of separability

The concept of separability was introduced independently by Leontief(1967) and Sono (1961). The concept assumes that the set of ($N = \{1, \ldots, n\}$) commodities available to the consumer can be partitioned into s mutually exclusive and collectively exhaustive subsets, $\{N_1, \ldots, N_s\}$, so that the commodities within each subset possess some common characteristics. According to Stroz (1957) the importance of separability assumptions for the consumer allocation problem stems from the fact that, consumption decision can be viewed as occurring in two stages. At the first stage, the consumer allocates income between subsets of commodities. The second stage involves allocation within subsets or commodity groups. This type of hierarchical classification as indicated by Asenso-Okyere (1982) has been contended by many authors (Hassan and Green, 1982; Hassan and Johnson, 1976; George and King, 1971) as an alternative rationalization for aggregation of commodities when data is limited.

Depending on assumptions, several types of separability is included in the literature. Three of these; (i) weak (ii) strong and (iii) Pearce separability as noted by Goldman and Uzawa (1964) are discussed.

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5.1.2.1 Weak separability

This concept implies that a utility function U(X) can be divided into subsets $\{N_1, \ldots, N_s\}$ such that the marginal rate of substitution between two commodities i and j from the same subset I is independent of the quantities of commodities not belonging to subset H (George and King, 1971). Thus

$$\frac{\partial\left(\frac{U_i}{U_j}\right)}{\partial X_k} = 0 \quad \text{for all } i,j \epsilon I \text{ and } k \notin I \tag{5.8}$$

5.1.2.2 Strong separability

The utility function U(X) is termed strongly separable with respect to a partition $\{N_1, \ldots, N_s\}$ if the marginal rate of substitution between two commodities i and j from subsets I and J respectively does not depend upon the quantities of commodities outside of I and J. Thus

$$\frac{\partial\left(\frac{U_i}{U_j}\right)}{\partial X_k} = 0 \quad \text{for all } i \epsilon I,\ j \epsilon J \text{ and } k \notin I \text{ and } J \tag{5.9}$$

5.1.2.3 Pearce-separability

A utility function U(X) is termed Pearce separable with respect to a partition $\{N_1, \ldots, N_s\}$ if the marginal rate of

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substitution between two commodities i and j from the same subset I does not depend upon the quantities of all other commodities including other commodities in the same subset. That is

$$\frac{\partial\left(\frac{U_i}{U_j}\right)}{\partial X_k} = 0 \quad \text{for all } i,j \epsilon I \text{ and } k \notin i \text{ and } j \qquad (5.10)$$

With reference to the theorems of Goldman and Uzawa (1964) it can be deduced that strong separability implies an additive utility function, whereas weak separability, does not. Furthermore, in the case of Pearce-separability, the utility function includes both weak and strong separability concepts which implies that the utility function is separable between groups and additively separable within groups.

One advantage of the concept of separability is that it greatly reduces the number of parameters to be estimated. Johnson, Hassan and Green (1982) for example, have shown that using strong separability there are n+1 parameters to be estimated (where n is number of commodities) as a basis for fully characterizing consumer responses to price and income in such demand systems. For weak separability the required number of parameters is $n+1/2(s^2-s)$ (s is number of commodity group. The various types of separable utility functions imply special conditions which may be used as a non-linear restrictions in the estimation of a complete system of demand equations. The separability restrictions therefore provide a means of greatly reducing the econometric problems associated with demand systems estimation. However, separability restrictions

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imply strong consumption pattern, similarities within and across groups which may not exist.

By the separability concept for instance, Johnson, Hassan and Green (1982) used the concept to study four groups of commodities defined as: durable goods, semi-durable goods, non-durable goods and services. In studying the consumer demand for food commodities George and King (1971) identified 15 separable groups within a list of 49 commodities. Similarly, the separability concept was assumed in this study whereby health care was considered as an identifiable subset of commodity in the consumer basket and demand for the various actors or providers within the health sector was therefore studied.

5.2 Binary Models

Binary choice models are modifications of the linear regression model classified under qualitative response models. Qualitative response models are synonymous with quantal, categorical, qualitative choice or discrete models. They are built to alleviate the difficulties associated with the interpretation of the probabilistic models in which the explanatory variables are categorical or non-continuous in nature. In most empirical works done, suitable modifications of these theories have been used extensively in analyzing and forecasting the behaviour of economic agents in different economic contexts (Schmidt and Strauss,1975; Amemiya, 1985; Li,1975). The existence of different health

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facilities both within the orthodox and the traditional systems with different characteristics provide households with alternatives from which a choice can be made.

Binary choice models usually deal with a choice between two alternatives i.e. a dichotomous framework for example of a 'yes' or 'no' situation and that the choice they make depends on the characteristics of the individual (Judges et.al; 1980). More generally, well specified binary choice models allow predictions to be made from the relationship between a set of attributes describing individuals and the type of choice they make. Similarly, it is also possible to determine the probability that an individual will make a certain choice depending on a given set of attributes about the person. The options available are whether a particular provider is chosen or not and this choice is dichotomous (or binary) in nature.

The purpose of qualitative response models however is to determine the probability that a decision maker, with a given set of attributes makes one choice rather than the alternative. To effectively link thoughts it is necessary to give an overview of the underlying principles of the qualitative (binary) choice models.

5.2.1 The Linear Probability Model

The linear probability model in a regression form is specified as;

$$Y_i = X'_i \beta + e_i \qquad (5.10)$$

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where

Y_i = 1 if the ith decision maker selects the first alternative say a type of health care facility and 0 if the ith decision maker selects the second alternative.

X_i is a vector of regressors; typically, attributes and characteristics of the ith decision maker.

ß is a vector of parameter coefficients, and

e_i is the error term which is an independently and identically distributed random variable with mean zero.

Since Y_i can take on only two values 1 and 0 the probability of the distribution of Y is described by letting P_i = Prob (Y_i=1) and 1-P_i = Prob (Y_i=0) (Pindyck and Rubinfeld,1991). Considering the zero-one nature of the regressand, the linear probability model is interpreted as conditional probability; that is the ith decision maker selects an alternative e.g. a type of health care facility given his or her X's. The predicted value of y_i is interpreted as the estimate of this conditional probability. The parameter vector ß measures the effect of unit changes in the X's on the conditional probability.

Estimating by ordinary least squares [OLS] method yields consistent and unbiased estimates of ß. However, the model has some shortcomings. The variance of the disturbance term is heteroscedastic so that its value depends on ß thus resulting in a

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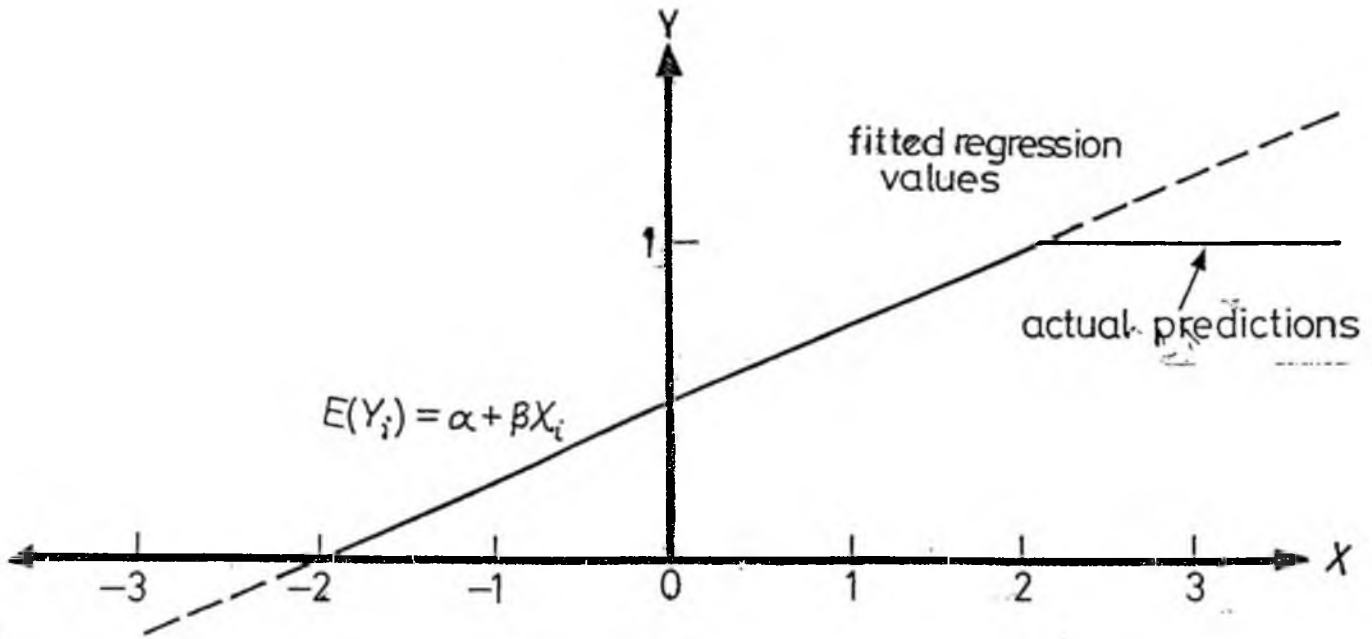
loss of efficiency of the parameter estimates(Goldberger, 1964; Greene, 1990). Because of the heteroscedasticity problem the standard deviation of the OLS parameter estimates are biased and the distribution of the disturbance term is also not normal (Pindyck and Rubinfeld, 1981). The classical statistical tests of significance are therefore not applicable to linear probability models since these tests depend on the normality of the disturbance terms. Also an extensive analysis of the properties of the linear probability models by Aldrich and Nelson (1984) noted that even if $X'\beta$ is constrained between 0 and 1 the formulation allows the estimates to fall outside the (0,1) interval as shown in figure 5.1.

Fig 5·1: Prediction with the linear probability model



Source: Pindyck and Rubinfeld (1991). Econometric Models and Economic Forecasts.

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With regard to the difficulties surrounding the otherwise appealing linear probability model, alternate approaches to analyzing qualitative response models have been specified. The alternative specifications make use of monotonic transformations of the linear probability model by the cumulative distribution function to ensure that the predictions lie in the unit interval for all X's (Goldberger, 1964).

Among the infinitely many transformations that the cumulative distribution function can provide, the probit and the logit transformations will be highlighted here as a matter of interest and relevance to the current study.

5.2.2 The Probit Model

The probit model, is associated with the standard normal cumulative distribution function. Consider the (linear function of regressors) model;

$$Z_i = X'\beta \qquad (5.11)$$

where Z_i is a random variable with probability density function f(Z) and assume Z_i^* is a certain threshold level of Z_i and translates the index Z into empirical decision about alternatives given the individual attributes. Also let the value of y_i be such that;

$$y_i = \begin{cases} 1 \text{ if } Z_i \geq Z_i^* \\ \text{and} \\ 0 \text{ if } Z_i < Z_i^* \end{cases} \qquad (5.12)$$

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Each y_i is thus a function of X's by way of Z. Let f(Z) be the value of the cumulative distribution function at Z such that

$$P\ (\ y_i = 1/Z_i) = P(Z_i^* \leq Z_i) = F(Z) \qquad (5.13)$$

and

$$P\ (\ y_i = 0/Z_i) = P\ (Z_i^* > Z_i) = 1 - F(Z_i) \qquad (5.14)$$

be a transformation of a linear probability model by use of cumulative distribution function f(Z). The probit model assumes that Z_i^* is a standard normal variate such that the probability that Z_i^* is less than or equal to Z_i can be computed from the standard normal cumulative distribution function (Greene 1990). Based on the normal distribution

$$P_i = P_i(y_i = 1) = G(X'\beta) = \int_{-\infty}^{X'\beta} (Z)\ \partial Z \qquad (5.15)$$
$$= u\ (X'\beta)$$

By the monotonic transformation, P_i will lie within the unit interval. P_i represents the probability of an event occurring; in this case the probability of an individual choosing the first alternative. The change in probability P_i with respect to a change in X_i is given by

$$\partial P_i/\partial X_i = (\partial F/\partial Z_i)\ (\partial Z_i/\partial X_i) = f(Z_i)\beta \qquad (5.16)$$

where $f(Z_i)$ represents the value of the standard normal density function associated with each possible value of the underlying index Z.

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5.2.3 The Logit Model

The term, logit analysis derives from the idea of logistic function which came from the early work of Berkson (1944). The method has been refined by Theil (1970) and has thence been referred to in some literature as the Berkson-Theil method(Li, 1975). Logit analysis employs the cell frequency distribution to derive the logit estimate of qualitative model parameters and it is proved to be asymptotically equivalent to the maximum likelihood (ML) estimation. On computational grounds the logit estimation is also found to be more preferable than the Maximum Likelihood (ML) procedure (McFadden, 1974; Amemiya, 1985). The logit probability model which accounts for the heterogeneity associated with linear probability models, is associated with logistic cumulative distribution function of the form;

$$\text{Prob } (Y_i=1) = F(Z_i) = \frac{e^{Z_i}}{1 + e^{Z_i}} \qquad (5.17)$$

The logit model specifically is defined as the natural logarithmic value of odds in favour of a positive response. In other words the odds that an event will occur are given by the ratio of the probability that it will not occur.

The conditional probability P_i is the probability that an individual will make a certain choice given X_i and is specified as;

$$P_i = \frac{1}{1 + e^{-(X'\beta)}} \qquad (5.18)$$

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Letting $X'B = Z$, equation [9] can be estimated by multiplying both sides of the equation by $1 + e^{-z}$ to obtain the relation below. That is;

$$P_i \ (1 + e^{-z}) = 1. \qquad (5.19)$$

Rearranging equation [10] gives

$$P_i \ (e^{-z}) = 1 - P_i \ . \qquad (5.20)$$

Dividing through equation [5.20] by P_i and taking logs of both sides gives the relation specified below which carries the label logit. Thus;

$$Z_i = \log \frac{P_i}{1 - P_i} = X'\beta \qquad (5.21)$$

where

P_i is the conditional probability of a positive response for a household with characteristic X_i, and

β's are the parameters.

The dependent variable in this relation is defined as the logarithm of the odds of choosing an alternative.

According to Li (1975) since the true logit Z_i is not observed the logit estimate $\acute{Z}_i$ based on cell relative frequency is used instead, that is ;

$$\acute{Z}_i = \log \frac{f_i}{1 - f_i} = \log \frac{P_i}{1 - P_i} + u_i \qquad (5.22)$$

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where

f_i is the observed relative frequency in the cell i and

u_i is the error term.

The estimated effects in the logit model are linear in the parameters but non-linear in probability due to the logistic transformation (Goldberger, 1964), In addition to the fact that the probability implied by the logit model can never exceed unity, interaction effects are much less inherent in the logit model than in the ordinary least squares model (Li,1975).

As indicated by Pindyck and Rubinfeld (1991) both the logistic and probit formulations are quite similar. The only difference between them is shown in figure 5.2 where the logistic graph has slightly flatter tails. The logistic distribution is shown to resemble the t-distribution with seven degrees of freedom. Although the logistic function is similar to the cumulative normal function it is easier to use computationally. The logit model is therefore often used as a substitute for the probit model. Another important appeal of the logit model highlighted by Pindyck and Rubinfeld (1991) is that it transforms the problem of predicting probabilities within a (0,1) interval to the problem of predicting the odds of an event's occurring within the range of the real line.

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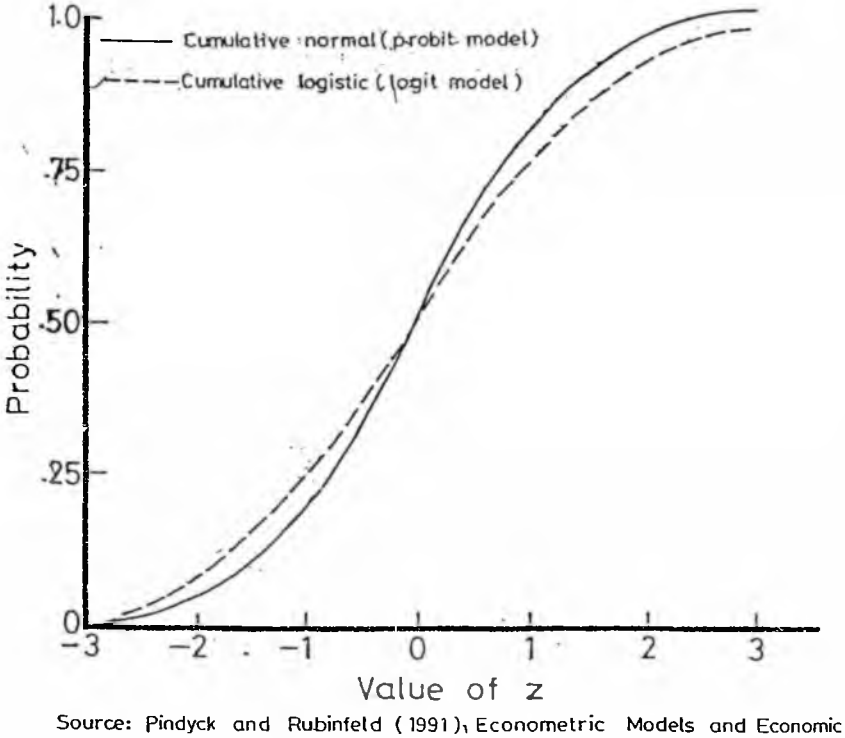
Fig. 5.1: Comparison of logit and probit cumulative distributions.



Source: Pindyck and Rubinfeld (1991), Econometric Models and Economic Forecasts.

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5.2.4 The multi-nomial logit model.

With some modification the results of the univariate dichotomous model typically apply to the multi-response models. Instead of the 'yes' or 'no' alternatives facing the decision maker, for example, whether he consumes or does not consume health care services, the decision maker can also be faced with the problem of choosing from among k alternatives where k represents different types of health care service providers. In each instance all choices are mutually exclusive. That is the "either or" choice model has been transformed into a range of options among which the decision maker can choose. The dependent variable y_i for such multi-nomial or multi-response models takes k values where j = 1, 2, ...k. The dependent variable then equals k if the ith decision maker selects the kth alternative. Similar to the binary choice model the multi-response model is specified as

$$P(y_i = j) = F_{ij} (X'\beta) \qquad (5.23)$$

where i = 1,2,...n; j = 2,3,....k and X and ß represent vectors of independent variables (or regressors) and unknown parameters, respectively. The explanatory factors include the attributes of the alternatives as well as characteristics of the decision makers. The subscripts i and j denote the ith decision maker and the jth alternative, respectively. Consequently, the selection of the jth alternative represents the action of drawing from a multi-nomial distribution with probabilities $P_1 \ldots P_n$.

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The multinomial logit model via Nerlove and Press (1973), and Schmidt and Strauss (1975) mostly applies to data that are individual-specific (Greene, 1990). For example if there is a choice variable (say health care provider) of n options (e.g orthodox, traditional, etc.) open to an individual and the data for each individual in a sample contains information on all the options then the model for the choice of health care provider is specified as

$$P(y_i = j) = \frac{e^{\beta_j' X_i}}{\Sigma^n_{j=0} e^{\beta_j' X_i}} \tag{5.24}$$

Greene (1990), pointed out that the model has an indeterminacy such that for any $\beta_j^* = \beta_j + q$ for any non-zero vector q, an

identical set of probabilities result because all the terms involving q drop out. A suggested normalization is to assume that $\beta_0 = 0$ such that the probabilities are therefore

$$P(y_i = j) = \frac{e^{\beta_j' X_i}}{1 + \Sigma^n_{j=0} e^{\beta_k' X_i}} \tag{5.25}$$

and

$$P(y_i = 0) = \frac{1}{1 + \Sigma^k_{k=0} e^{\beta_k' X_i}} \tag{5.27}$$

By differentiating equation (5.23), the marginal effects of the regressors on the probabilities are obtained from an expression

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such as;

$$\partial P_j / \partial X_i = P_j [\beta_j - \Sigma_k P_k \beta_k] \qquad (5.28)$$

which can also be computed from the parameter estimates(Greene, 1990; Pindyck and Rubinfeld, 1981). For example, given the J log-odds ratio to be

$$\ln \frac{P_{ij}}{P_{i0}} = \beta_j' X \qquad (5.29)$$

and assuming there is a normalization on any probability k, the odds ratio will be

$$\ln \left[\frac{P_{ij}}{P_{ik}} \right] = X_i' [\beta_j - \beta_k] \qquad (5.30)$$

where the parameters $[\beta_j - \beta_k]$ denote the marginal effect. The relation also allows possible pairing and prediction of relative probability that an individual with given characteristics is more likely to choose alternative j other than k.

For notational simplicity let the subscript i designating individual observations be dropped. In this case, P_j (where $j = 1...J$) indicates the probability that the jth choice will be made. The equation (5.28) presumes that the logarithm of the odds of one choice relative to a second choice is a linear function of the attribute X. For n such equations the odds of one is associated with the remaining equations in the sense that the system must be constrained so that the sum of the individual probabilities equal one (Pindyck and Rubinfeld, 1981).

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As in the linear probability model, it is necessary to estimate each equation separately for the fact that the choice of logit form forces constraints on the model which reduces the number of parameters. For example, in the system of equations in the model represented as

$$\log \frac{P_2}{P_1} = \beta_{21}X \; ; \quad \log \frac{P_3}{P_1} = \beta_{31}X \text{ and } \log \frac{P_3}{P_2} = \beta_{32}X$$

it can be shown that

$$\log \frac{P_3}{P_2} = \log \frac{P_3}{P_1} + \log \frac{P_1}{P_2} = \log \frac{P_3}{P_1} - \log \frac{P_2}{P_1}$$

$$= (\beta_{31} - \beta_{21})X. \qquad (5.31)$$

From the point of view of estimation, Greene(1990) noted that it is useful that the odds ratio, P_j / P_k, does not depend on the other choices because of the independence of the disturbances in the original model. Although this is not very attractive from a behavioural point of view, the estimation of the multinomial logit model is straight forward. The multinomial logit model can be estimated by the maximum likelihood method which is a generalization of that for the binomial probit and logit models (Schmidt and Strauss, 1975; Pindyck and Rubinfeld, 1981; Greene, 1990). It should also be noted that the logistic transformation allows linearity and much less interaction effect than the ordinary least squares models.

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5.3 Specification and estimation of the malaria care demand function

In order to make a meaningful progress in financing modern health care in low income countries, a good understanding of the health care seeking behaviour of people in terms of demand for malaria care becomes very crucial.

The health care seeking behaviour of people can be translated into demand model because the choice and subsequent utilization of a health care facility by consumers could be likened to their revealed demand for the service. Akin et al (1986) proposed that consumers are assumed to maximize a utility function over a vector of purchased medical services and a composite of all other goods subject to their incomes. The outcomes predicted as a result of this maximization process are that consumers' choice of health care provider is determined by a number of exogenous socio-economic variables and the economic costs associated with the consumption of health care services. It can be hypothesized that consumers make choices depending on the impact or the influence of the socio-economic factors associated with the options available to them. Essentially, the multinomial logit function used is given by:

$$\ln (P_j/P_o) = \Sigma^j_{k=0} \beta_{jk} X_{jk} + \gamma_j Z \qquad (5.32)$$

where P_j is the probability of choosing a provider, $k=0...j$

X_{jk} is composite of independent variables that vary by facility eg facility price, proximity, travel and

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waiting time

Z is a vector of socio-economic variables with regard to malaria patients and their households

β_{jk}, γ are coefficients.

P_o is the default probability for normalization and it becomes a default option for not seeking care at a facility with coefficients normalized to zero. In such a case own elasticity of the probability of selecting j with respect to any of the exogenous variables could be calculated (ie k=j). It should be noted that normalization could be done on any other probability k (where $j \neq k$). The odds ratio, $\ln P_{ij}/P_{ik} = X_i'(\beta_j - \beta_k)$ could then be used to calculate the marginal effects or cross elasticities with respect to the exogenous variables.

From previous studies it was noted that the natural logarithm of the odds in favour of a household (as a decision making unit) in choosing a particular health care provider (public, mission, private or traditional) is a function of income, transport cost to facility, cost of drugs and other user charges, opportunity cost of travel time and the opportunity cost of waiting time at the facility (Akin et al, 1986; Van der Gaag et al, 1988). In addition, personal or household characteristics such as occupation, gender, education, family size and household assets were also hypothesed to influence household choice of health care providers.

In line with the above assumptions a system of demand equations in which the choice of health care service providers is a function of exogenous time and cash prices and other socio-

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economic variables is summarized in a reduced form as shown below

$$Y_i = f\ (P_i\ T_r\ D\ W_t\ Q\ Z) \qquad (5.33)$$

Y_i = type of facility, e.g. government, mission etc

P_i = facility price(i.e.lumpsum charge per episode of malaria)

T_r = travel time to facility in hours

D = distance to facility in km

W_t = total waiting time at facility

Q = dummy for provision of drugs at facility (proxy for quality of facility; yes=1, no=0)

Z = composite of household and individual socio-economic variables(such as age, household income, respondent's level of education, and severity of the disease among others).

The model is a modification of that used by Akin et. al. (1986) and Van der Gaag et. al. (1988). It is assumed that health care service providers or health care facilities form a set of mutually exclusive variables which represent the dependent variable. Separability is invoked whereby the demand for health service (malaria care in this case) is assumed not to be affected by the demand for other commodities or services. Such an assumption is possible if it is considered that it is the desire of people to live and so they will allocate some money to take care of their health. However, within the health care delivery system they will make the necessary adjustments to choose the provider that satisfy their expectations given the constraints facing them.

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Table 5.1: Variable description

Facility-specific variables	
Price:-	Actual fees paid per malaria case (in cedis) at facility
Travel time:-	Travel time in hours from the home of patient to a health care facility
Waiting time:-	Total time spent at a health care facility to seek malaria care
Distance:-	Distance in kilometres from the resident community of patient to a provider
Drugs provision:-	Whether patients were given drugs at facility (yes=1, no=0)
Individual and household characteristics	
Age:-	Age of patient in years
Ethnicity:-	Ethnic origin (Akan=1, non-Akan=0)
Religion:-	Religion of patient (christian=1, non-christian=0)
Respondents' education:-	Years of formal schooling of the respondent
Household expenditure:-	The annual household per capita expenditure as a proxy for income
Severity:-	Perceived severity of malaria (mild=1, severe=0)
Gender:-	Gender of patient (male=1, female=0)
Survey district:-	Whether the patient is in Amansie East district or in the Kwaebibirem district(Amansie East=1, Kwaebibirem=0)

Unlike the Akin et. al. model, specific variables representing monetary and time prices for seeking malaria care at alternative facilities were not included in this model. This limitation makes it impossible to calculate cross-price elasticities for the various providers.

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5.4 Determinants of choice between health care providers:

The relationship between the choice of these facilities and their respective characteristics in addition to the attributes of people who make the choice were determined by the multi-nomial logit technique. The model allowed the measure of the effect of time, money and other exogenous variables on the choice of alternate health care providers.

The coefficients of variables indicate how changes in each of the variables affect households utility and represent the effect of these factors on choice of provider. The signs of the coefficients show the direction of the propensity of households in choosing a provider relative to an alternate provider. A negative coefficient on a variable for example indicates that an increase in that variable will decrease the probability of selecting a provider relative to the other alternative (Akins et al, undated).

5.4.1. Self medication and government/community providers

As shown in table 5.2 in most cases an increase in facility price appears to make households more inclined to choose orthodox health care facilities. Facility price and district or location of respondents are negative and statistically very significant in the relation that compares the choice of self medication with government/community providers of malaria care. The direction of the signs on the coefficients with regard to the providers indicate that households are more likely to seek care at government or

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community health care facilities rather than self medicate if there is an increment in cost of self medication. Government health care facilities are more likely to be used instead of self medication if they are located near the consumers. There is also significant difference between the two districts in terms of choice of the two providers. For example, households in Kwaebibirem district are more likely to self medicate than those in Amansie East district which tends to support the finding of the choice of a provider summarized in chapter 4.

Although not significant, an increase in travel time to seek health care will lead to the adoption of more self-medication. As per capita income increases, people tend to self medicate more when they get malaria. One startling result is that as the distance to seek health care increases people prefer to government clinics to self-medication. It is plausible that clinics that are far away are perceived to offer high quality service and so are well patronised.

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Table:5.2 Multi-nomial logit results for the combined districts. (figures in parentheses are t -stats).

	logS/G	logS/P	logS/D	logP/G	logD/G	logD/p
Facility Price	-1.3744	-3.3943	-0.0535	0.0874	-0.8572	-1.7999
	(26.0380)***	(6.1367)***	(0.3802)	(2.0386)*		(4.8360)**
(7.8093)***						
Travel time to facility	2.6803	0.1249	0.1871	0.4050	-1.1828	-2.2282
	(1.3355)	(0.0000)	(0.0000)	(13.6350)***	(0.9156)	(1.6290)
Waiting time at facility	-139.7574	-254.1402	-25.7555	-0.0476	-2.0679	-3.0253
	(0.0526)	(0.0028)	(0.0000)	(0.6427)		(29.1971)***
(22.5073)**						
Given drugs at facility	1.3434	1.7649		0.0991	0.3296	0.1279
(Yes=1, otherwise=0)	(0.0000)	(0.0000)		(2.2069)*	(7.4095)***	(0.6525)
Distance to facility	-2.2599	1.1682	8.0784	-0.3129	0.7983	0.5018
	(2.0025)*	(0.0028)	(0.00000	(9.0676)***	(0.9989	(0.5234)
Ethnicity; (Akan=1 otherwise=0)	-3.6273	-2.1001	-3.9176	0.0037	-0.2030	0.0103
	(0.0000)	(0.0004)	(0.0000)	(0.0041)	(2.4184)*	(0.0069)
Religion; (christian=1 otherwise=0)	0.0105	-4.3544	-0.2276	-0.0528	-0.0242	0.1203
	(0.0077)	(0.0020)	(2.6793)*	(0.9005)	(0.0586)	(0.8648)
Age	0.0851	0.3311	0.0148	-0.0998	0.0686	0.2864
	(0.6763)	(0.7160)	(0.0483)	(2.8437)*	(0.6300)	(3.4385)**
Household per capita income	0.0593	0.5393	0.0803	0.0229	0.0642	0.3190
	(1.1366)	(0.6453)	(2.7784)*	(0.1399)	(0.5258)	
(4.9306)**						
Respondent's years of education	0.0161	0.0769	0.0109	0.0229	0.0642	-0.1815
	(0.0214)	(0.0309)	(0.0229)	(6.4000)***	(2.3647)*	(1.6746)
Severity (severe=0 mild=1)	0.0301	-0.0178	-0.1353	0.0106	0.1745	0.2297
	(0.0542)	(0.0019)	(1.1537)	(0.0292)	(1.9264)	(2.0526)*
Gender (female=0 male=1)	-0.0738	0.6826	0.0065	0.1098	-0.0251	-0.1908
	(0.5248)	(1.4095)	(0.0092)	(3.8394)**	(0.0957)	(2.2195)*
District (Amansie East=1,	-0.7855	-0.0931	-6.9461	-0.1866	0.2606	0.6869
Kwaebibirem=0)	(18.9881)***	(0.0495)	(0.0000)	(7.4405)***	(4.3745)**	(20.4208)***

Source: Survey data.
*** Significant at α = 0.01 ** Significant at α 0.05 * Significant at α =0.10

Where S = probability of self-medication (consulting no provider for prescription)
D = probability of visiting drug store for malaria prescription
G = probability of seeking malaria care at government/community health care facility
P = probability of seeking malaria care at private or mission health care facility.

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5.4.2. Self medication and private/mission providers

Decision concerning choice of treating malaria at private or mission facilities as against self medication depends mostly on the treatment cost at these facilities. Results indicate that, majority of households would switch from self-medication to private/mission providers for malaria treatment if there should be an increase in the cost of treatment at these facilities. Private and mission clinics have been charging full cost fees and many people associate high quality with the services they provide. A higher price may be presumed to be higher quality.

5.4.3. Self medication and drug store.

Religion appears to influence household decision with regard to choice between these two providers. Christians according to the result prefer to go to private/mission facilities as compared with drug stores more than non-christians. In addition to religion, household per capita income is also significant at the 10 per cent level. As income increases people tend to do self-medication than to consult a drug store operator.

5.4.4. Private/mission and government/community providers

These categories of providers are both orthodox. From table 5.2, the most important factors for choice of either of these facilities include; travel time to facility, proximity and

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respondent or the head of the household's years of education. These factors are all statistically significant at one per cent level. Government/community facilities are chosen mostly because of shorter travel time otherwise households would prefer to use private or mission facilities. Similarly, government or community facilities would be used if they are cited very close to the people.

The number of years of education that a household head had also affects health care treatment choice decision. Results from table 5.2 indicated that longer years of education of a household head is a positive factor for selecting a private or mission health care facility for treatment.

As revealed by the district factor, there is locational difference in the choice of either private/mission and government/community facilities. For example more educated heads of households from Amansie East district would prefer government/community facilities while the same category of households in Kwaebibirem district would prefer private/mission facilities. The finding actually, portrays the perceived strength of mission and government facilities in both districts. By the status of amenities, the district government hospital in Amansie East is perceived to be the best provider of health care services among others in the district and the same view is held about the St. Dominic mission hospital in Kwaebibirem district.

Facility price and availability of drugs at facility are significant at 10 per cent level. When treatment charges and

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availability of drugs are considered in selecting malaria care provider, the propensity to choose private/mission facility is higher. The observation on price factor may be because people are used to paying fees at private/mission facilities. Gender and age are also important in the private versus government malaria care provider choice decision equation. Males according to the results have more propensity to choose private/mission facilities for treatment. Children are also more likely to be sent to government facilities than adults. As people grow older they tend to attend government facilities instead of private/mission facilities. However, when compared with drug stores, older people tend to choose them over government clinics for malaria consultation.

5.4.5. Drug store and government/community providers.

Waiting time and availability of drugs have much influence on choice of the above providers. People are sure of drugs at drug stores and therefore more inclined to seek treatment there instead of government facilities. The sign on the coefficient however, indicate that increase in price of drugs and longer waiting time at drug stores would lead to a shift in demand of treatment services from drug stores to government/community health care providers. Although the sample comprise Akan majority, it was observed that people of Akan origin are more likely to visit drug stores to seek malaria treatment than other ethnic groups. Heads of households who have more years of education were also found to

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prefer consultations at drug stores than government/community facilities in treating malaria. The two districts also vary in view of the choice between these providers.

5.4.6. Drug store and private/mission providers

The major factors determining household choice in this relation are facility price, waiting time for treatment, age of the sick, income and district affiliation. With regard to facility price and waiting time it can be deduced that many people seek health care currently from drug stores or chemical shops because of the relatively cheaper cost of seeking care and shorter waiting time at this facility. Both waiting time and facility price are significant at 1% level of significance.

From the results, children suffering from malaria are more likely to be sent for consultation at private and or mission facilities than being sent to a drug store. Another important factor in the decision of choice between drug store operators and private/mission health care providers is household per capita income. As shown in table 5.2 households with higher per capita income have higher propensity to seek care at drug stores.

Significant differences also exist in behaviour of people in the two districts with regard to choice between drug stores and private/mission facilities. More people will seek malaria care at private/mission facility as opposed to drug store consultations in Kwaebibirem district than Amansie East district. This is not

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surprising since St. Dominic Catholic Hospital in Kwaebibirem district is attended by patients from all over the district.

Severe malaria tends to be sent to private/mission facilities as compared with drug store consultation. Significant gender differences were also observed. Males are more inclined to seek malaria treatment at private/mission facilities than drug stores.

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CHAPTER SIX

SUMMARY, POLICY IMPLICATIONS AND CONCLUSION

6.0 Introduction

This study was set up to calculate the cost of malaria care in Ghana to investigate the estimate the behaviour of people towards malaria care in terms of a choice model in a multinomial logit framework. Data for the study was obtained from administering a structured questionnaire to 1300 households in two districts in two regions of Ghana.

This chapter is devoted to a summary of the major findings of the study and a discussion of the conclusions that can be drawn from these findings. The presentation is done in three sections. The first section is devoted to a summary of major findings while the second covers the policy implications for financing health care, and the last part presents conclusions and recommendations of the study.

The results must be interpreted with caution since the cases of malaria considered were self reported. It may include other fevers. The one year recall period used in the study may also affect the values reported.

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6.1 Summary of results

6.1.1 Costs

The general average cost per case of malaria for the combined sample was estimated to be ¢5987.41 or US $8.67. Of this cost ¢1247.88 or US $1.81 represent the direct cost of treatment and ¢4739.53 or US $6.87 represent indirect costs. On the average 5 days are lost to the disease in terms of patient and caretaker time.

Drugs were one of the major specific items on which households spend money to treat malaria. The proportion of drug costs in total malaria treatment costs in general range between 37.2 per cent and 67.9 per cent in the two districts. Consultation and laboratory services were among the activities on which patients spent most time in seeking care at orthodox facilities.

It was found that most households obtained drugs around their communities without travelling. However, travel cost for consultation is the second highest expenditure made by households in treating malaria.

6.1.2 Health care seeking behaviour

Analysis of the actual behaviour in terms of choice of provider to treat malaria however, showed that the first treatment attempt by most people as revealed in the survey was self medication. This behaviour does not depend on age or severity of the disease. Upon the failure of the first treatment most people

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switched from self medication to an orthodox provider. Interestingly all those who had to take a third action to treat an episode resorted to self medication again.

6.1.3 Impact of socio-economic factors on choice of malaria care provider

The major factors determining household choice of malaria care providers are facility price, waiting time for treatment, age of the sick, income and district affiliation. With regard to facility price and waiting time it can be deduced that many people seek health care currently from consulting at drug stores or chemical shops because of the relatively cheaper cost of doing so and the shorter waiting time at these stores. Travel time to facility, proximity and head of the household's years of education are very important to decision making with regard to choice between orthodox facilities.

6.2 Implications for policy

Facility price stands out as a very important factor in the choice of health care service provider. Because of the price self medication has been on the ascendancy. This has implications for the correct diagnosis of disease and therefore the administering of the right treatment. The increase in self medication is also due to the perception that quality at orthodox facilities is low as many

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of them do not have drugs and prescribers spend very little time with them in the consulting room. It was obvious that patients would travel long distances and pay higher fees to seek malaria care if they were sure the quality was good. At least this was the case for St. Domonic's Catholic Hospital in Akwatia in Kwaebibirem district. This implies that the cost sharing scheme should go along with improvements in the services provided.

One aspect of the high cost of seeking treatment is that many people would delay seeking care until the disease becomes severe. That is, they would consult orthodox health care providers after home remedies have failed to cure the disease.

The knowledge that agricultural households have seasonal flow of income suggests that many of them have difficulty in raising sufficient funds to support a member to promptly seek malaria care at orthodox health care facilities at the onset of the disease. Support from extended families which used to reduce the shock of emergency health needs have now dwindled. The consequence of this is that the period of delay in seeking effective malaria/fever treatment has been extending as people spend some time to raise the needed funds. By such behaviour the World Health Organisation's (WHO) recommendation of controlling malaria through prompt and effective treatment will be in jeopardy.

Apart from the prolonged suffering of the sick when households initially resort to treatment which are comparatively ineffective, more days are also lost to production by both patients and their caretakers. Although the direct impact of malaria morbidity on

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agricultural output is not clearly documented in the literature at the moment the disease has far reaching consequences for society as a whole. As noted by Asenso-Okyere (1994) the chances of schooling of most children is bleak if a breadwinner dies. The frequent withdrawal of children from school either because they are sick of malaria or for them to substitute for a task of a sick household member could cause them to be disinterested in schooling or lead to low academic standards. As already indicated, malaria morbidity and mortality are associated with low productivity and a fall in output. Malaria is therefore linked to poverty in a vicious cycle and thereby making it more difficult for households to afford treatment charges at reputable health care facilities.

The observations on household malaria treatment seeking behaviour and determinants of choice of provider suggest that malaria control programmes could be successful if malaria or health education programmes are vigorously pursued jointly with poverty reduction programmes.

It was also found that the nearer health care facilities are to people the better the chances are that they would use them. It is therefore suggested that future plans for health care development should consider citing health care facilities close to the people.

Long waiting time at most government orthodox health care facilities was also found to be have a negative influence on facility utilization. Health facilities should therefore expedite the way they perform their duties, especially in government

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facilities so that patients do not spend long times waiting for treatment.

6.3 Conclusion

The high cost of malaria treatment at ¢1,247.88 or US $1.81 appears to deter many rural households from promptly seeking care at orthodox health care facilities. This is evident in the importance attached to facility treatment prices before households select their malaria care providers. Although other socio-economic factors such as long waiting times at facility, proximity and household head's level of education were statistically significant for the various demand models, it can be inferred that income promotional activities could improve health care seeking behaviour and health in general in rural communities.

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