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**THE ECONOMIC BURDEN OF 'MALARIA' MORBIDITY ON HOUSEHOLDS  
IN MTOKO DISTRICT OF NORTH - EASTERN ZIMBABWE.**

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**A dissertation submitted to the faculty of Health Sciences of the University of Cape  
Town, in partial fulfillment of the Masters degree in Health Economics.**

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### **Declaration**

While fully acknowledging information from other sources, I do hereby declare that, this research paper is my own original work and has not been submitted to any other university.

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**SHINGIRAI DAVID CHANDIWANA**

## Abstract

This thesis presents the findings of a research on the economic burden of malaria morbidity to rural households in Mtoko district of North-East Zimbabwe. The main objective of this study was to ascertain the household level impacts of direct costs (medical costs, consultation costs, transport costs and other related costs) and indirect costs (lost productive time by malaria sufferers whilst sick, lost time by caretakers whilst caring for the sick) due to malaria sickness. A cross sectional study with both descriptive and analytical features was carried out and the main finding from the research was that the economic costs of seeking malaria care were regressive. In other words the poor were using a higher percentage of their income whilst seeking malaria care. In addition, access to care was very limited for the poor as they either could not afford to access the care because of prohibitive costs or they were geographically too far away from sources of care to easily access it. Furthermore, indirect costs were far higher than direct costs as they constituted a greater percentage of total malaria costs. It was concluded that measures meant to exempt the poor from paying for malaria treatment and care were needed to limit the economic burden of malaria morbidity on poor households. The need to ensure that cheap affordable malaria drugs were available to the affected rural people is imperative.

### **Dedication**

To my family members for giving me all the support I needed. Without them I might not have achieved a lot in my life up to this day. Special dedications go to my late father and sister, Naboth and Medline Nyasha Chandiwana. May their souls rest peace and I will miss them forever.

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University of Cape Town

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### **List of Abbreviations**

AIDS	Acquired Immune Deficiency Syndrome
GDP	Gross Domestic Product
LOS	Level Of Significance
MCL	Marginal Cost of Labour
MOH	Ministry of Health
NGO	Non Governmental Organisation
OPD	Out Patient Department
SES	Socio Economic Status
SPSS	Statistical Package for Social Science
TB	Tuberculosis
US\$	United States dollar
WHO	World Health Organisation
Z\$	Zimbabwean dollar

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## 1 Introduction

*“Where malaria prospers most, human societies have prospered least. The global distribution of per capita domestic product shows a striking correlation between malaria and poverty, and malaria-endemic countries also have lower rates of economic growth. There are multiple channels by which malaria impedes development, including effects on fertility, population growth, saving and investment, worker productivity, absenteeism, premature mortality and medical costs”. (Sachs & Malaney 2002)*

This chapter gives the background to the research thesis including the justification for doing the study. It concludes by summarising the chapters to be covered in the rest of the thesis.

### 1.1 Background

Malaria is one of the leading killer diseases in sub Saharan Africa and it is a serious public health problem today in more than 90 countries inhabited by 400 million people (Institute of Medicine 1996). In addition, the disease is estimated to cause up to 500 million clinical cases and 2.7 million deaths each year. Every 30 seconds, a child somewhere in the world dies of malaria (Sachs & Malaney, 2002).

Of major concern is the fact that the disease has been affecting the poor who have neither the knowledge to know what they are suffering from nor the financial resources to seek treatment. This leads to a lot of suffering and death from what could otherwise be an avoidable disease.

Of late the malaria parasite has become resistant to some old drugs making it even more difficult for the poor African population to easily recover from illness (Southern Africa malaria Control 1998). It has further been argued that malaria is the primary cause of poverty in Africa and the human suffering and economic burden has reached unacceptable levels (Sachs & Malaney 2002). In fact the economic impact of this disease has become a cause for major concern. The health of a nation is of primary importance to social and economic development. Within Southern Africa, malaria is the main impediment to socio-economic development and an important cause of poverty (Southern Africa malaria Control 1998). As long as the disease's costs are not quantified and prevention activities and education campaigns intensified, the disease will remain a key obstacle to economic development in Africa in general and Zimbabwe in particular.

## **1.2 Research Question**

The main research question to be answered in this study is whether or not malaria morbidity imposes an economic burden on households due to direct costs like medical and consultation costs and lost productive time which translates into indirect costs. Thus the study will identify and quantify the direct and indirect costs of malaria treatment to households with different socio-economic backgrounds and the proportion of their household income spent in paying for malaria related costs. The direct and indirect costs will be compared to the incomes of the households to ascertain whether these costs place an economic burden on households by taking up a large proportion of the household's income at the expense of other demanding priorities in the household.

Direct costs in this study will be defined to include direct payments for drugs, consultation and transport charges to and from health facilities and hospitalization costs (Shepard et al. 1991). Indirect costs will include costs measuring the value of time lost to malaria morbidity i.e. time lost in traveling to a health care facility, time lost whilst sick with malaria, and time lost by a caretaker looking after the malaria patient (Shepard et al, 1991).

The study will explore alternative financing mechanisms for malaria prevention and treatment as a policy option. It will also investigate the ways of making sure that health care is easily accessible to the general population.

### **1.3 Justification**

This study seeks to determine the costs incurred by households on malaria treatment during the peak malaria transmission season. The analysis of the costs (if any) of malaria on poor households is important because it provides a basis with which cost burden to households can be ascertained.

By exploring whether malaria is affecting households, the study may provide validation for any future intervention activities if proved to be necessary by the findings of study.

The need to investigate the economic burden of malaria on households has also been necessitated by the increase in HIV/AIDS infections in the Zimbabwe. About 27% of adult Zimbabweans are HIV positive (Southern Africa malaria Control, 1998) and the virus greatly diminishes the immune system of many people making them susceptible to a host of infections including malaria. When more people get sick with malaria because of diminished immune systems, the economic burden of such sickness may become a problem to households.

It is also important to measure the costs of malaria purely on humanitarian grounds alone. The study will provide evidence of the burden of malaria on households. A lot of studies in developing countries assess the economic impact only at national or regional level. Very few have assessed the economic impact at household level which is this study's main aim. This will ultimately add to the body of research in this area which is greatly in need of further research.

## **1.4 Study Aims/Objectives**

The aim of the study is to evaluate the direct and indirect costs of malaria to households in Mtoko district, Zimbabwe.

The objectives are:

- a) To measure the direct household costs of malaria treatment e.g. hospital fees, consultation, transport and drug costs.
- b) To measure and quantify the indirect household costs of malaria in terms of forgone productive time whilst ill, seeking treatment and caring for the sick.
- c) To determine the proportion of households' income spent on malaria treatment and prevention.
- d) To consider the Implications for policy development about malaria management and control in the district.

## **1.5 Overview of Dissertation Structure**

Chapter two will detail the malaria situation globally, in Africa and in Zimbabwe. The same chapter will also highlight literature on the micro-economic and macro-economic impact of malaria and then describes the definitions of direct and indirect costs. Also this chapter explains the theoretical concepts of direct and indirect costs and the methods of estimating them. Chapter three covers the conceptual framework for estimating direct and indirect costs. Chapter four then describes the methods used in the study including limitations and ethical issues. In chapter five the results of the study are outlined and then chapter six presents a discussion of various findings from the study. Finally chapter seven contains conclusions and recommendations based on the study findings and it then concludes with suggestions for future research in the area.

## **2 Economic Burden of illness in General to Households**

This section outlines the major research work which has been pioneered in this area of economic impact of illness studies. The chapter will begin by reviewing the literature on the rationale of classifying a certain percentage of expenditure on health care as catastrophic. A brief overview of the debate around catastrophic health expenditures is outlined, followed by a detailed review of illness studies especially for TB and HIV/AIDS. It is important to highlight the discussion around catastrophic expenditures as the thresholds for what constitutes catastrophic expenditures differs from country to country and study to study.

It is also important to critically look at the cost of illnesses like HIV/AIDS and TB mainly because these are the diseases which are common in developing countries and can potentially result in economic burden on households as they take time to be cured or are not curable at all. Thus the time that the sick households' members spend unproductive is very long and may stretch until death. In addition TB and HIV/AIDS are closely related to malaria as malaria may be more lethal to HIV/AIDS and TB sufferers.

After the review of other illnesses in general, the discussion will focus more on the economic impact of malaria on households as this is the disease under study. A comparison of the economic impact of illness in general and malaria will be done based on the available literature. The chapter will continue to discuss the literature relating to the methodological approaches which can be used to estimate costs in such a study. The pros and cons of each methodology will be clearly outlined and justification for using one

of the methods in this study will be given. A summary of key issues from the literature will be given as a conclusion to the chapter.

## **2.1 Overview of Catastrophic Expenditure Debate.**

Before embarking on reviewing literature on the costs of illnesses to households, it is worthwhile to discuss briefly the debate about what constitutes catastrophic costs to households. This is so because different studies use different thresholds as to what constitutes catastrophic expenditure for a household. There has been ongoing debate on what constitutes catastrophic expenditures in health and the World Health Organisation defines catastrophic expenditures as any disbursements which are more than or equal to 40% of a household's non subsistence income i.e. income available after basic needs have been met. (Xu et al 2005). In most studies, a threshold of 5% to 20% of total income has been defined as catastrophic to the household. Many have in the past assumed that any health related expenditure above 10% of household income is considered catastrophic (Russell 2003).

Health economists have not agreed on the universal threshold which should be considered catastrophic and this is because expenditure or costs differ from country to country and thus the use of a universal threshold will ignore the obvious differences in socio-economic settings between different countries. In most poor countries, a low percentage of household income being channeled towards health care costs will be considered catastrophic to the household whilst in developed countries such expenditures may be negligible. For example in a world wide study done by Xu et al, (2005) where the World Health Organisation's definition of catastrophic expenditure was used (40% of non subsistence income), the United Kingdom had only 0.04% of households experiencing catastrophic expenditure whilst Vietnam had 10.45% of households facing catastrophic expenditures.

However it should be noted that catastrophic health expenditure is not always synonymous with high health care costs. A large bill for an operation for example is not catastrophic if the household does not shoulder the full cost either because the service is subsidised or when it's being covered by insurance. With this in mind it seems households who have to make out of pocket payments for health care are the most at risk of incurring catastrophic expenditures. These households are more prominent in developing countries including Zimbabwe where social insurance systems are not yet developed and thus households are consistently exposed to unexpected out of pocket health care costs.

In this study catastrophic health care expenditures will be regarded as any health expenditures over and above 10% of household net income. This percentage was chosen after taking into account the fact that in poor resource settings like Zimbabwe, even when a small percentage of income is channelled towards health expenditure it has significant economic implications for the household's ability to meet other demanding needs. Other studies have also proved that low income households can easily be at risk of catastrophic health expenditure even when they use low percentage of their income. In Georgia and Thailand it was shown that even a low percentage of household income being channelled towards health care costs can be considered catastrophic. In Georgia, 19% of households seeking care had to borrow money or sell personal items to pay for care and 16% were unable to afford medications prescribed (Xu et al 2003).

In Thailand, the poor have been reported to be more likely to have to pay for health care from their household income than the rich which when combined with their lower incomes places these people at higher risk of catastrophic health payments. (Xu et al 2003). However literature has shown that most health care expenditures tend to be below 10% of total income on average. The least percentage was in Paraguay where health care expenditures averaged 2.5% whilst in Guatemala the costs averaged 16%. Other countries like South Africa and Burkina Faso averaged 4.9% and 6.2% respectively (McIntyre 2005).

Thus although there is no agreed threshold which should be considered catastrophic, studies may have to use their own subjective judgements to arrive at what they may term catastrophic expenditure. Only when a universally acceptable threshold is established will researchers resort to that standard.

## **2.2 Direct Costs of illness in General to Households**

This section will cover the costs of illness in general to households and will provide a brief overview of direct costs of illnesses to households.

### **2.2.1 Overview of Direct Costs of illness to Households**

Direct costs are generally defined as expenditures on prevention and treatment of illness by households and health services (Chima et al 2003). However in this study, the researcher will focus on direct costs by households only as costs incurred by health service providers are beyond the scope of this study.

The economic impact of illness on households has been documented in several studies done around the world. General illness can have a considerable economic impact on the household because it brings with it costs which need to be covered by either household income, savings or borrowings at a time when the household is least able to generate enough income due to lost production because of sick household members.

Direct costs of illness in general were quite considerable from previous studies done especially for poor households. In a study done in Sri Lanka, Russell (2003) found that a minor increase in health expenditure due to household member sickness forced households to borrow, sell valuable household goods and reduce basic household meals. However, despite this finding, it was also evident in the literature that the direct cost burdens on households are determined mainly by the types of illness and the source of treatment people choose when seeking treatment.

Diseases like HIV/AIDS are likely to be more costly in terms of treating opportunistic infections as compared to malaria. In addition those who seek care in private medical facilities are more likely to incur higher direct costs in terms of consultation fees, drug costs and hospital stay costs as compared to public facility users (Russell, 2003). Thus direct costs would vary considerably from household to household depending on the type of disease suffered by a household member and the chosen treatment option.

Hospitalisation can inflict result in substantial costs on households. In a study in Bangladesh, it was found that although about 52% of households spent about 50% of their monthly income on the costs of delivery, 21% spent 50-100% of their income and about 27% spent between 1 and 8 times their monthly income on hospitalization (Nahar & Costello 1998). In the same study it was found that drugs contributed 39% of direct costs of normal delivery and 55% of direct costs for caesarian section deliveries. In countries where delivery of babies results in hospital fees, giving birth can result in significant financial consequences for households (McIntyre & Thiede 2003). In India drugs constituted 63% of costs for treating lymphatic filariasis (Babu et al 2002)

Other direct costs of illness which can potentially be high but are usually ignored are the costs of nutritious food for a sick person including their accommodation. For example in India these costs were found to be as high as 18% for chronic lymphatic filariasis (Babu et al 2002). In addition, unofficial fees have been found to be a common way used by health personnel to earn extra income at the expense of the patient yet they are ignored in many studies. In Bulgaria, unofficial fees in the form of gifts were equivalent to 1.5% of average monthly salary or 75% of minimum monthly salary whilst cash payments were equivalent to 4.4% and 21% respectively (Balabanova & Mckee 2002). Another study in Bangladesh revealed that unofficial fees at public health facilities were 12 times more than official payments (McIntyre & Thiede 2003). Although high income earners make high unofficial payments in absolute terms, the poor actually pay far more if analysis is done as a percentage of income. The poor were paying unofficial fees of as much as 72%

of average monthly income whilst the middle to high income households paid 43% and 32% respectively (Killingsworth et al 1999).

However, direct cost burdens were lower for those illnesses which were frequent but not life threatening as most households preferred to use public facilities. Specifically cost burdens for such illnesses were about 2% of household income (Russell 2003). However higher cost burdens were noted in Uganda and Guatemala for illnesses requiring routine treatment and this was attributed to local epidemiological factors. Thus the literature suggests that the burden of disease is context specific hence varying considerably from country to country and from rural to urban setting depending on accessibility to care, presence or absence of user fees and the dominant disease in that country.

Another substantial direct cost which is not documented extensively in the literature is unofficial payments. It was found that patients were making informal payments when getting treatment thereby worsening their cost burdens (WHO 2000). Informal payments were considered as those payments made to health personnel in return for preference for health services.

### **2.2.2 Economic Effect of Direct Costs of ill Health on Poor Households**

An interesting finding in the literature is that cost burdens of illness are regressive. Although the poor pay less in terms of actual expenditure due to various factors, they pay more as a percentage of their monthly or annual income as compared to higher income earners. In a study done in Vietnam, total household cost burden was 7.1% of income, but when the results were analysed by income quartiles, it was found that the lower income group's costs were 19.4% of income and only 3.9% for the higher income group (Ensor and San, 1996). Similar results were also found in Thailand where direct cost for the higher income group were only 2.1% of income yet a massive 21.2% of household income for the lower income group. Such type of cost burdens are suicidal to poor

households as they are not able to cope with day to day activities requiring financial resources due to sickness to a household member (Ensor and San, 1996).

Hospitalisation costs in China constituted about 59% of net annual household income for the poorest households, 18% for the middle income households and only 8% for the high income households (Wilkes et al 1997). The greater economic burden of illness on poor households in this study was not only attributable to lower income levels but also to low coverage of insurance amongst these households, exposing them to frequent and unplanned out of pocket expenditures.

This analysis brings another dimension to the economic burden of illness analysis: that the economic burden of illness is dependent on the initial household resource endowment before a member gets sick. Those households with higher incomes, hence higher savings, are better able to cope with illness than households with a lower income (Worrall et al, 2002). The economic burden on low income households is a saddening and sobering thought.

### **2.2.3 Direct Costs of Tuberculosis to Households**

The direct costs of TB are higher when compared with other infectious diseases. This is so because TB takes a long time to treat. Research has indicated that TB has a high cost burden as mean household spending in general ranged from US\$50.00 to US\$100.00. (Russell 2003). The fact that TB has a longer treatment span than malaria for example, means that the direct cost burden of the disease in terms of drug costs, consultation etc are very high, and may exert a catastrophic economic burden on households especially the poor.

Generally the costs of TB are mainly borne by individuals in most countries. For example a study done in Uganda showed that 70% of the costs of TB were shouldered by the individual patients or their immediate family members (Saunderson, 1995).

It has also been revealed that most TB patients consulted traditional healers before finally seeking care from a formal health system. In a study in Malawi on TB patients, researchers found that 40% had consulted and received four weeks' care from a traditional healer before seeking regular medical care (Brouwer et al, 1998). In other settings the cost of treatment before seeking help from formal health institutions was considerable. In Bangladesh, Croft & Croft, (1998) found that patients were spending on average about US\$ 130 before reaching a TB clinic. This translates to about 20% of the annual income of an average Bangladesh household. By contrast, patients in India use a lot of private facilities and thus direct costs of diagnosis and successful treatment averaged US\$ 100 to US\$150, more than half of the annual income of a daily wage labourer (WHO, 1997).

The fact is that TB patients undergo several health encounters before diagnosis and the centralised nature of TB treatment in most developing countries around the world results in higher non medical costs (Russell 2003). Specifically in some studies, TB took away between 8% - 20% of annual household income and in some instances more than 100% of monthly household income in direct treatment costs (Russell 2003). Thus with households spending 8% to 20% of annual income on direct treatment costs, such spending is economically crippling as it exerts an enormous economic burden on the household leaving it with little or nothing to cover other household related expenditures.

Direct costs of treatment were also high in Thailand because of the extensive use of x-rays as a diagnostic tool, prescription of expensive nutritional supplements and collusion among providers (Panathia et al, 1997). In addition patients had a tendency of shopping around for a diagnosis and the delay in treatment resulted in high mortality and increased transmission of infection (Panathia et al, 1997). Severe morbidity obviously leads to an increase in the cost of treatment.

#### 2.2.4 Poverty and Tuberculosis

The main factors of the susceptibility to TB are malnutrition, crowding, poor air circulation and sanitation – all associated with poverty. A vicious cycle is normally established whereby poor people are malnourished and live in crowded, unhygienic conditions, then TB flourishes. Most of the time, these people receive inadequate health care and treatment that, if received at all, is often inconsistent or partial. This can result in death which worsens poverty especially if those who die were bread winners for the family. In any case the poor are less likely to seek treatment and receive care when ill, exacerbating the negative impacts of the disease.

It had been established that the poor are less likely to be educated and as such may not see the real need to seek treatment. For example among people suffering from chest symptoms (TB) in India, only 64% of those who were not educated sought treatment, compared to 80% of high school graduates. The poor are also two to three times more likely than other income groups to self medicate (Panathia, Almedia & Kochi, 1997). This self medication is likely to increase the chances of drug-resistant strains of TB emerging, further increasing the negative impacts on the poor and the risks to others in society.

However other studies have revealed that TB is not only prevalent amongst the poor. In Thailand, they found that the majority of patients were not poor: 23% were poor, 29% had income below the national average but above poverty and 48% had income above the average (Croft and Croft et, 1998). While the estimates may be skewed by the lower probability of the poor to seek treatment, they surely indicate that TB is not necessarily concentrated within the lowest income strata.

### **2.2.5 The Mortality and Morbidity Burden of Tuberculosis**

It was estimated that there were 7.96 million new cases of TB worldwide and 16.2 million prevalent cases. TB is the largest single infectious cause of death among adults in the world accounting for about 2 million deaths per year (Dye et al, 1999). It is believed that TB is the cause of 7% of all deaths in developing countries Murray (1991). People who live with undetected active TB have the potential to infect between 10 and 15 every year (WHO, 1998a).

TB is closely associated with HIV/AIDS. It is believed that 105 000 to 210 000 new cases of TB occur in sub-Saharan Africa because of HIV/AIDS – 8% to 16% of all cases (Murray et al, 1993). In fact WHO had estimated that by 2000, HIV infection would cause an additional 1.5 million cases of TB annually. (Murray et al, 1993) forecasted a 10% increase in deaths from TB between 1990 and 2015.

### **2.2.6 Tuberculosis and Women**

Literature has also revealed that women tend to suffer more productivity losses due to TB than men. A study by the World Bank, WHO, and Harvard University showed that TB caused an annual loss of 8.7 million healthy years of life among women 15 to 44 years of age (WHO, 1998b). Another study in Nepal revealed that the delay before receiving treatment for women was twice that for men (Smith, 1994). Reasons for such findings were that women have a lot of household duties and childcare responsibilities and in certain societies they do not make the decision to go and seek care no matter how sick they are (Okojie, 1990). Because of the sickness of a woman, households actually suffer a double loss. There is loss of earnings outside the household and additional losses due to the reduction of activities that women routinely perform in the household. The value of activities such as cooking, cleaning and childcare are rarely considered in most studies that attempt to estimate the costs of TB even though they may be considerable. In India

for example female TB patients reported a 50% reduction in household work and only one-third said that they were able to attend to the needs of their children (Ramachandran et al, 1997)

### **2.2.7 Direct Costs of HIV/AIDS to Households**

With regards to HIV/AIDS, the direct cost burdens were very high as compared to other diseases. This is so because of the fact that HIV/AIDS is not curable resulting in continuous cost burdens until death. Of particular note is that estimating direct costs of HIV/AIDS is complex because the distribution of health care costs shifts dramatically as the disease advances (Dodds et al, 2000). Early stages of the illness are characterised by a relatively high proportion of drugs, primary and community care, and outpatient visits, while later stages are marked by longer in-patient hospital stays (Dodds et al, 2000).

A study in Tanzania revealed that direct costs of treatment for someone living with HIV/AIDS during a six month period is about 64% of per capita household income for the same period (Tibajuka, 1997). In another study done in the Ivory Coast, it was shown that households affected by HIV/AIDS had half the income of non-affected households (Fredriksson et al, 2005). This was caused not only by the loss of income due to illness but also because other household members had to divert time and effort away from other income generating activities (Bechu N (1998).

In Chad, Wyss, (2004) indicated that households with an HIV/AIDS affected member incurred on average US\$46.20 per month on medication compared to non-affected households where the cost was only US\$2.50 per month (Wyss, 2004). In addition transport expenses averaged US\$10.90 per month for the HIV/AIDS affected household whereas transport costs were only US\$0.70 on average for the non affected households (Wyss, 2004). In total, direct costs of HIV/AIDS on households were US\$82.80 compared to only US\$4.30 for the non affected households. This study clearly proves that HIV/AIDS can cause considerable economic burden to households.

In addition, a study in South Africa showed that poor household coping with an HIV/AIDS sick member were reducing spending on necessities even further. The most likely expenses to be cut were clothing (21%), electricity (16%) and other services (9%). Declining incomes forced about 6% of households to reduce the amount they spent on food and almost half of the households reported having insufficient food at times (Henry et al 2002).

In another study in South Africa by Booysen et al, (2003), it was found that affected households allocated more of their resources to food, health care and rent, and less to education, clothing, personal items and durables. HIV/AIDS affected households also spent less on food – between 70% and 80% of the expenditure in non-affected households. In addition affected households saved approximately 40% less than non-affected households on a monthly basis. Affected households had higher levels of debt than non-affected households. A larger percentage of affected households had used savings in the previous six months and 78% of the households that used savings were affected by illness or death compared to 9% of non-affected households (Booyesen et al 2003).

A similar trend was also found in Chad where households with an HIV/AIDS case spent nearly half of their budget on health (46%), 28% for food and 4% for clothing. In comparison non affected households spent 40% of their budget on food, 14% on health and 11% on clothes (Wyss et al 2001). Clearly, these results show that HIV/AIDS takes up a larger percentage of household income at the expense of other household needs like clothes and food. Thus the combined loss of productive time due to HIV/AIDS push affected households deeper into poverty. According to a study in the Ivory Coast, health care expenses rose by 400% when a family member had AIDS (Fredriksson et al 2005).

In a study done in Kinshasa, Davachi, (1988), found that direct costs related to HIV/AIDS illness were equivalent to about eleven months's salary of an average earner in that city. In fact direct costs of HIV/AIDS were found to be economically crippling for

the average household taking up as much 50% to 100% of annual income, (Davichi 1988). In a study done in South India, it was found that direct costs of HIV/AIDS illness increase with advancing stage of disease and household income (Palanigounder, n.d).

An American study estimated that the direct health care costs per person from HIV infection until the development of AIDS was US\$ 50 000, and from AIDS development to death about US\$69 000, for a total lifetime cost from time of infection to death of US\$119 000 (Palanigounder, n.d).

In a multi country study done in Burkina Faso, Rwanda and Uganda it was concluded that HIV/AIDS has reversed the progress in poverty reduction and it is in fact increasing the percentage of people living in extreme poverty from 45% in 2000 to 51% in 2015 (Fredriksson et al 2005). In Botswana income for the poorest quarter of households is expected to fall by 13%. Income earners in these households are expected to take on an average of four more dependents because of HIV/AIDS (Fredriksson et al 2005).

An HIV/AIDS sufferer in Rwanda is 36 times more likely to use hard pressed outpatient health services than the general population, and annual health care expenditures for HIV/AIDS patients are 21 times greater than for the general population (Dodds et al, 2000). A World Bank analysis of 80 countries estimated that a 15% HIV prevalence rate reduced per capita GDP growth by 1% worldwide.

These statistics clearly show that HIV/AIDS imposes an enormous burden on households in particular and economies in general. It's even more worrying when you consider the fact that the bulk of the HIV and AIDS burden is still lying ahead in most developing countries. This is because, even though new diagnoses are declining, the cumulative total of AIDS cases continues to rise as existing cases turn into AIDS (Dodds et al 2000).

### **2.3 Indirect Costs of illness in General to Households.**

Indirect costs are mainly a result of lost productive time due to sickness. In the literature, indirect costs of illness varied depending on the severity of the illness, from mild to serious, type of disease and gender. Generally the literature revealed that indirect costs are higher than direct costs irrespective of type of illness and country although there are some exceptions in studies where direct costs were far higher than indirect costs. (Russell, 2003). In Burkina Faso, indirect costs of illness in general constituted 73% of total costs (Russell, 2003). In addition, India and Tanzania had high indirect costs of illnesses in general with India having 26% and Tanzania 80% of annual income respectively (Wyss et al 2001).

However the ratios of direct to indirect costs vary depending on the methodology used to calculate indirect costs. For example in Nigeria the ratio was as low as 0.4 whilst in Rwanda it was as high as 3.6 (McIntyre & Thiede 2003).

In terms of gender, research has proved that women are the greatest losers in terms of lost productivity time due to illness. In Burkina Faso a study showed that in seasons of limited agricultural activity, women have 5.7 hours of productive work per day on average compared to 3.8 for men, while there is a lower differential between men and women (6.8 and 6.6 hours per day respectively) during the season of agricultural activity (Sauerborn et al 1996).

#### **2.3.1 Lost Time and Indirect Costs of Tuberculosis to Households**

The indirect costs which arise due to patient's inability to work are very substantial with regards to TB. In Thailand, 20% of patients confirmed that they experienced a decrease in income due to either the patient's or caregiver's limited ability to work (Kamolratanakul et al 1999).

Furthermore in India, the average number of days lost due to TB were 83 days: 48 days before treatment and 35 during treatment (Rajeswari et al 1999). In Zambia, before commencing TB treatment 46% of patients and 30% of caregivers were absent from work due to the illness, and 31% of patients had to stop work completely, missing an average of 48 days work (Needham et al 1998). In Tanzania, time lost from work due to TB was estimated to be the equivalent of one person per household (74% of patient working capacity, 29% of caregiver working capacity) over the duration of the illness, which could be from four to 12 months (Wyss et al 2001). All this literature reveals that the indirect cost burden of illness is enormous for households though specific burdens would vary from country to country and from one disease to another.

In general, earnings lost from TB sickness or death is higher than direct costs of treatment. For example, 70% of the costs to patients in rural Uganda are from lost time and this is mainly due to loss of work or reduction in productivity (WHO, 2000). Still in Uganda another study showed that 80% of wage earners had stopped work because of disease and 95% of subsistence farmers reported that production had decreased because of their reduced capacity to work (Saunderson, 1995). The average time lost from normal activities was 9.5 months; the average income lost from inability to work was US\$ 161.

In South Africa lost income was even higher: an average of US\$272 (Floyd et al, 1997). In India households lost 15% of their annual income through being unproductive (Ramachandran et al, 1997). Most of these indirect cost estimates consistently underestimate the real costs to households as they ignore the adverse impacts on the health and education of the family members, cost of sub optimal land use, the value of lost leisure, and the pain and suffering associated with TB (WHO, 2000).

### **2.3.2 Regressivity of Tuberculosis Costs on Poor Households**

In terms of the burden of TB on different income groups, it was evident in Thailand that incomes were reduced by 5% in the low income group, 2.3% in the middle income group and 3.3% for the higher income category. This illustrates a point mentioned earlier that health care costs (in this case TB) are regressive as they burden poor households far much more than they do to well up households. (Russell 2003).

To support this notion further, in Vietnam participants indicated that lost income was a major cost of TB and that poor people had to work all the time and could not afford to go for treatment for fear of losing their jobs (Lonnroth, 2001). This is so because poor people are more likely to be employed in junior positions at work and thus possibilities of going on sick leave are minimal hence the need to continue working. Even if they manage to take sick leave, this is usually unpaid leave and the lost income is unsustainable as they cannot afford to lose it in the first place. With this in mind the indirect cost burden of illnesses on poor households cannot be overemphasised.

### **2.3.3 Lost time and Indirect Costs of HIV/AIDS to Households**

With regards to HIV/AIDS, very few studies have documented the indirect costs of HIV/AIDS. This may be due to the fact that HIV/AIDS is a complicated condition and it is difficult to ascertain those who are HIV positive and suffering from opportunistic infections without clinical diagnosis. Furthermore the stigma associated with HIV/AIDS makes it extremely difficult to identify a sample of participants for study. Nevertheless HIV/AIDS is a disease which takes a long time from time of infection to death and the resources to collect data over such long periods of time are simply not available.

Despite all that, it is a well known fact that indirect costs of HIV/AIDS are quite substantial considering the fact that HIV/AIDS is a long term illness and patients can live

for a long time with limited abilities to be productive. This is especially true when patients reach the full blown AIDS stage where they experience a lot of opportunistic conditions which are life threatening.

In Thailand, 35% of households experiencing an HIV/AIDS illness felt some impact on agriculture, ultimately resulting in 48% reduction in family income (Pitayanon, 1997). In addition, it has been estimated that in Burkina Faso, 20% of rural families have reduced their agricultural workload or even abandoned their farms because of AIDS. In Ethiopia, AIDS affected households were found to spend 11 – 16 hours per week performing agricultural work, compared to an average of 33 hours for non- affected households. The financial burden of death can be also be considerable with some families in South Africa spending three times the total household monthly income on a funeral (Fredriksson et al 2005).

In Chad, time loses due to HIV/AIDS were on average 15.8 days compared to only 2.1 days for non-affected households. In addition to the time loss of the ill person, members of the family spent time caring for the patient (Wyss et al 2004). In fact household members of AIDS patients had to provide assistance at an average of 8.3 days per month thus abandoning their daily activities or occupations. In sharp contrast non-affected household members only lost about 0.4 days caring for the sick.

From a gender perspective, women lose more productive time when they are sick (McIntyre & Thiede 2003). For example a study of HIV/AIDS patients showed that men lost an average of 2,376 working hours (or 297 days) over a period of 18 months whilst women lost 3,432 hours (or 429 days) of productive time (Rugalema, 1998). The main cause of this finding was that women tend to work longer hours than men and the time is even more when household chores are included (McIntyre & Thiede 2003).

### **2.3.4 Regressivity of HIV/AIDS Costs on Poor Households**

Studies also show that the poor spend a high percentage of the income towards HIV/AIDS treatment and care. One study showed that the burden of HIV/AIDS sickness was highest on the low income households. Specifically, 82% of low income households in general faced enormous economic burden due to HIV/AIDS illness compared with only 28% of high income households (Palanigounder, n.d).

## **2.4 Economic Burden of Malaria to Households**

This section will discuss the economic burden of malaria specifically. However in order to fully appreciate the economic burden of malaria, it is critical that one firstly analyses the geographical distribution and epidemiology of the disease around the world and later specifically in Zimbabwe.

### **2.4.1 Geographical Distribution of malaria in the World.**

Globally malaria is most prevalent in tropical regions which stretch across five continents. Of these continents, Africa alone accounts for 90% of the malaria disease burden mainly because of the rapid movements of populations into malaria endemic regions, changing agricultural practices including building of dams and irrigation schemes, the weakening of public health systems in some poor African countries and more speculatively, the changing climatic patterns notably global warming (Sachs & Malaney, 2002).

Furthermore Africa is a host to one of the main vector mosquitoes, the anopheles gambiae, with a tendency towards human biting. The malaria parasite is transmitted to the female anopheles mosquito from an infected individual when it takes a blood meal.

The parasite must go through a life cycle change before it can become infectious to other people and the time for the life cycle change increases with a decline in temperature. In fact when temperatures fall below 16 degrees centigrade, the malaria parasite ceases development completely (Southern Africa malaria Control, 1998).

This explains why in temperate regions where temperatures are generally low most of the time, the eradication of malaria has been a success. With these factors in mind it has been estimated that in the absence of effective intervention, malaria cases in tropical regions especially in Africa will double in the next 20 years (Sachs & Malaney 2002).

#### **2.4.2 Malaria in Zimbabwe.**

Zimbabwe is a Southern African country with a tropical climate (hot wet summers and mild dry winters). This climate is thus conducive for the rapid multiplication of mosquitoes in the country. About 97% of all malaria cases in Zimbabwe are caused by *Plasmodium falciparum* which is considered the most virulent of all malaria parasites (Sachs & Malaney 2002).

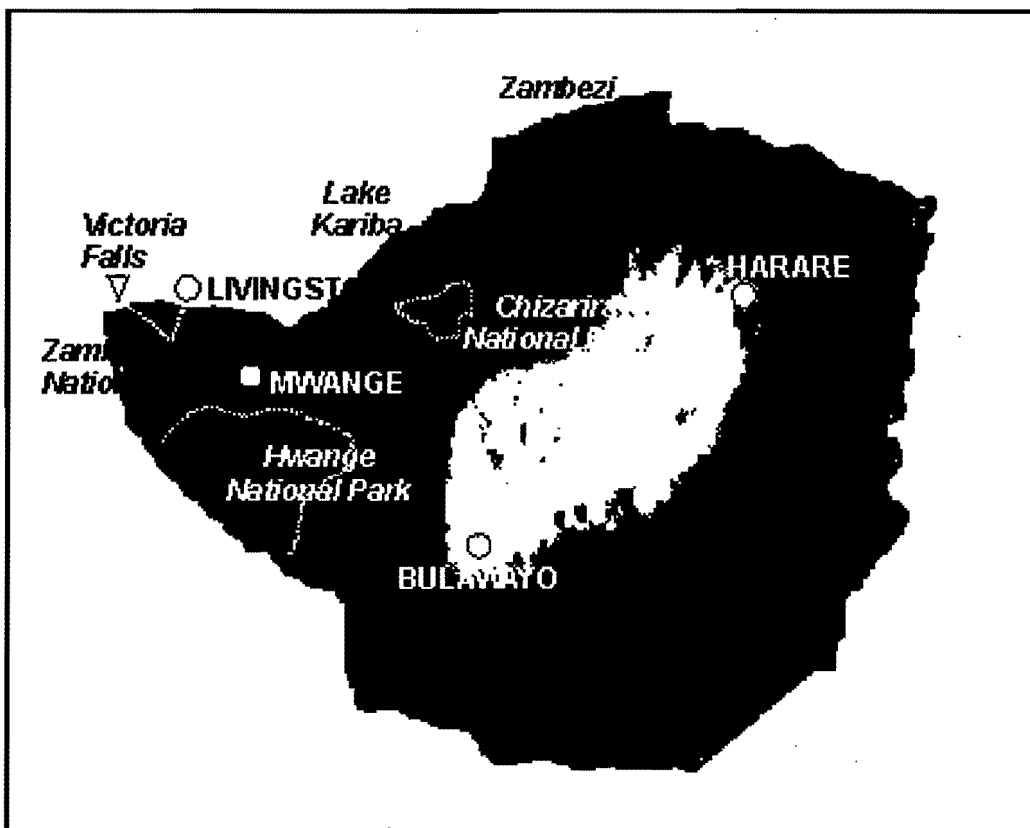
In 2000, the clinical malaria incidence rate was 139 per 1000 population in the general population whilst in Mtoko district (area under study), the malaria incidence was 274 per 1000 (Zimbabwe National Health profile 2000). Malaria is the major cause of maternal deaths in Zimbabwe constituting about 16.7% of all maternal deaths (Zimbabwe National Health profile 2000).

Despite several measures put in place in Zimbabwe to control malaria, its incidence has increased from 71.5/1000 in 1994 to 139/1000 in 1998. In 1995 alone 720 000 clinical malaria OPD cases were recorded in the whole country. This figure rose rapidly in 1996 by over 130% to about 1.7 million cases. In 1999 the clinical malaria Outpatient Department cases rose further to 1.8 million (Zimbabwe National Health Profile 1999). In fact it is estimated that between nine to thirteen thousand people die of malaria every year in Zimbabwe and that the disease has cost the country between 0.8 to 1.9% in lost

productivity as a percentage of GDP (Southern Africa malaria Control 1998). The possible reasons for this increase range from poor quality of care, poor treatment seeking behaviour, drug resistance and possibly the changing epidemiology of other infections particularly HIV/AIDS (Southern Africa malaria Control 1998). This presents a major challenge to the country as a whole in terms of ensuring that there is effective malaria control.

The map (Figure 1) shows the malaria endemic zones of the country.

**Figure 1: General malaria Distribution in Zimbabwe.**



**Source: Zimbabwe National Health Profile 1999**

The shaded area represents high malaria prevalence whilst the white area represents low prevalence. This map acts as a guide to the geographical malaria distribution in Zimbabwe. There are areas which are more malaria prone than others, the most notable ones being the Kariba area in the North and the North-Eastern part of the country, which

includes Mtoko district. Also the Southern and Western parts of the country have high malaria prevalence.

About 50% of the country's population lives in malaria endemic areas and the total number of households living in malaria endemic areas is approximately 1.3 million (Zimbabwe National Health Profile, 1999). As the map shows, two thirds of the country is malaria endemic, bringing the total population at risk to 5.9 million.

In view of the above facts, malaria remains one of the major public health problems in Zimbabwe especially at household level where the economic impact is felt most. Households have to shoulder the costs associated with the disease especially in the face of government - led health reforms which have seen most consumers having to pay for their health care costs.

#### **2.4.3 Relationship Between malaria Infection and Poverty**

The burden of malaria is greatest among the world's poorest countries. While only 0.2% of global malaria deaths are found in the world's richest population quintile, 57.9% of global malaria deaths are concentrated among the world's poorest population quintile (Worrall, 2002). Similarly, when the burden is measured as disability-adjusted life years (DALYS), 58% of the total global burden due to malaria is concentrated among the poorest 20% of the global population, while only 0.2% of total global DALYs are lost by the richest global 20% (Gwatkin & Guillot, 2000)

In Africa, most poor people live in the rural areas where they often embark on agricultural activities exposing them to the malaria vector which breeds well in wet, humid and warm areas. In addition most poor people have little or no knowledge about malaria and as such do not take the necessary precautions to minimise the disease. For example in rural Tanzania under five mortality due to malaria was 39% higher in the poorest socio-economic groups than the richest (Africa malaria Report, 2003).

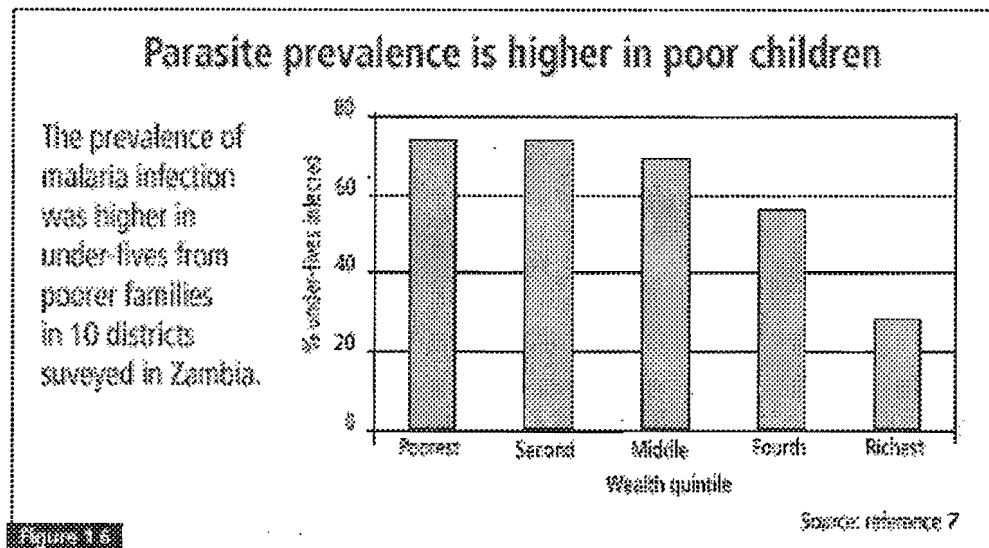
In a study done in Nigeria, it was concluded that malaria imposes a greater burden on the poor than on the rich. The study revealed that individuals with a mean income of below N3000 per day (less than US\$ 1 per day) were less likely to perceive malaria as a preventable disease, more likely to report having fever presently, and suffered significantly more bouts of malaria per month when compared with individuals earning greater than N3000 per day (more than 1US\$ per day) (Chestrad, 2000).

The higher malaria morbidity and mortality among the poor also relates to their inability to take preventive measures or to seek early diagnosis and treatment. Besides, poor people tend to live on a very sub-standard diet, making their bodies more susceptible to disease attacks.

#### **2.4.4 Relationship Between Poverty and malaria Infection in Children**

As Figure 2 shows, a survey in Zambia also found a higher prevalence of malaria infection among the poorest child population groups. The reasoning was that poor populations live in dwellings that offer little protection against mosquitoes and are less able to afford treated bed nets and neither are they able to afford effective malaria treatment (Africa malaria Report 2003).

**Figure 2: The Relationship Between Child malaria Sufferers and Poverty in Zambia**



**Source: Africa malaria Report 2003.**

A study in Gambia which used assets and housing construction materials to measure socio-economic status (SES) examined the prevalence of parasitaemia in children from families of different socio-economic status. The study found that prevalence of parasitaemia declined significantly with increasing socio-economic status (Clarke et al 2001). In rural Kenya, Shulman et al, (2001) also used assets as a proxy to socio-economic status to study pregnant women. The SES calculation also included ethnicity and literacy levels. The study showed the heightened presence of placental malaria among one particular ethnic group, as well as in women of lower SES and low body mass index (BMI).

Other studies also analysed the link between location (rural versus urban) and malaria transmission. It was generally concluded that rural households may be associated with increased malaria risk due to epidemiological and socio-economic reasons. Urban residence on the other hand may be accompanied by potentially protective socio-economic factors against malaria risk such as education and income (Rashed et al, 2000).

Certain types of housing characteristics have a bearing on the likelihood of malaria transmission. Greater exposure to the outdoors (lack of windows or screens, for example), may increase contact between an individual and the mosquito vector. Similarly, the presence of particular structural features that limit contact with the mosquito vector are likely to reduce infection. Housing that places individuals at increased risk of malaria infection is utilised more frequently by those in lower socio-economic strata than those in higher socio-economic strata. In Sri Lanka for example, Gamage-Mendis et al (1991) even argued that the housing type is a more important determinant of variability in malaria risk than the socio-economic differences that accompany it.

#### **2.4.5 The Relationship Between Poverty and malaria Prevention**

Literature also revealed that in terms of preventive measures, there was a positive correlation between preventive expenditure and income. A study in Malawi by Ettling (1994) revealed that prevention was positively correlated with income. About 10% of all households and only 4% of the very low income households reported expenditure on malaria prevention in the previous month. Estimated preventive expenditure for all households was estimated to be US\$ 2.55 taking up 0.9% of the low status households' income and 0.5% of the low to high income households' income.

Ettling, (1994) also found that the use of preventive measures was mainly being done by those of higher socio-economic status. Specifically preventive measures like coils were being used more by the high income households compared to low income households (67% and 16% respectively) as were bednets (31% and 10% respectively). In India a study on preventive measures by hospital staff showed that lower level staff like nurses and domestic staff were far less likely to use methods like repellents and anti-malarials than medical students and doctors (Rajasekhar & Nandakumar, 2000). Basing on some of these results, it seems the poor suffer a greater burden of preventive expenditure in terms of the share of total household expenditure and its opportunity cost (Worrall et al 2002).

In a study in Malawi, Ziba et al (1994) found that an increase in household income and levels of education of men was strongly correlated with the use of malaria prevention methods. Another study in Uganda found that non-net users (likely to be poorer) were more likely to use traditional medicine for malaria prevention and treatment of episodes, and less likely to undergo blood slide examination than net users (Nuwaha, 2001)

However, it is argued that analysing preventive expenditure in this way may be flawed as expenditure may be intended to minimise or eliminate nuisance biting rather than malaria prevention (Worrall et al, 2002). The extent to which households spend towards preventive measures may be determined by the level of nuisance biting they face during the mosquito breeding season.

#### **2.4.6 Direct Costs of malaria to Households**

The direct costs of malaria, similar to the direct costs of illnesses in general are high to households as revealed by many studies done on the direct costs of malaria. Although the methods used to measure these costs differ from study to study and from country to country, the main conclusion that the economic burden of these costs is substantial, especially for those poor households, was common in many studies. However it is critical to mention that the exact direct costs differ from location to location due to epidemiological factors such as prevalence of different malaria species and immunity levels and socio-economic factors such as income levels, accessibility and illness related beliefs (Chima et al 2003).

In general it has been found that monthly per capita expenditure on malaria related treatment ranged from \$0.41 to \$3.88 per person and between \$1.88 and \$26 per household in Africa (Chima et al 2003).

Amongst the poorest countries of sub Saharan Africa, households have been found to spend between \$2 and \$25 on malaria treatment and between \$0.20 and \$15 on

prevention each month (Leighton and Foster, 1993). In addition (Ettling et al, 1994) concluded that direct cost of seeking treatment was \$0.21 per child case and \$0.63 for adults. Furthermore empirical evidence shows that the cost of drugs often contributes a sizeable share of direct malaria costs to households.

In the same study it was found that transport costs accounted for 14% of the direct costs of malaria in Ghana and in another study in Sri Lanka transport costs accounted for 22% (Attanayake et al 2000). Still in Sri Lanka, results showed that on average households incurred US\$ 1.55 for treatment per patient and this included special foods, treatment costs, travel allowance for the patient and traveling allowance for the accompanying person (Attanayake et al. 2000). A similar study done in Nigeria found that mean costs of treatment ranged from US\$2.30 to US\$5.00 per month (Onwujekwe et al. 2000). Shepherd et al (1991) concluded in 1987 that a case of malaria in Rwanda cost US\$9.84 with US\$1.84 being direct costs.

Ettling et al, (1994) found that treatment costs for very poor households amounted to 28% of annual household income but for the wealthy households, it was only 2% of income despite similar expenditure. This finding highlights the argument that direct costs of malaria, just like direct costs of other illnesses in general, are regressive: The poor pay a lot as a percentage of their income.

Studies done on the economic burden of malaria also showed that expenditure levels on direct cost components such as prevention, were strongly affected by per capita income. In Malawi it was proved that only 4% of low income households spent money on malaria prevention as opposed to 16% of other households that were better off economically.

#### **2.4.7 Indirect Costs of malaria to Households**

This section will cover the different types of indirect costs incurred by households when ill with malaria and when seeking care. The studies done on indirect costs had varying

results on their impact on households most probably due to the different methods used to calculate these costs.

#### **2.4.7.1 Lost Time**

In India, Bhombore, et al, (1952) estimated that households with malaria cleared only 40% as much land for crops as similar households without malaria. This means that malaria causes production losses especially to rural households where labour is an important input in farming. In a study done in Nigeria, it was found that person days were lost by 75% of malaria sufferers with the mean ranging from 4 days to as many as 9 days.

#### **2.4.7.2 Costs of Lost Productive Time**

In a study done in Malawi, Ettlign et al (1994) estimated the indirect costs of malaria on the basis of days of work lost to be \$2.31 for Malawi households. Similarly in Colombia, Bonilla and Rodriguez (1993) found that a third of the cost of illness was accounted for by the costs of the treatment alone (direct costs) and the remainder by time lost by the patient and the caretaker representing indirect costs.

Shepherd et al (1991) concluded that a case of malaria in Rwanda cost US\$9.84 with US\$8.01 being indirect cost. This was equivalent to 12 days of output. It was predicted that by 1995, the average indirect cost of a malaria case would rise to US\$16.40 due to increasing severity and chloroquine resistance in Rwanda, Burkina Faso and Congo.

In per capita terms the cost of a malaria case in Nigeria was US\$2.88 per capita of which US\$2.25 per capita represents the indirect costs of productive time lost to malaria morbidity in adults and to care for the sick children, and the cost of lifetime earnings due to premature death (Leighton and Foster (1993)).

#### **2.4.8 Indirect costs of malaria to school children**

Research done in Ghana showed that malaria also has an effect on education for children. Colbourne (1955) for example found that school absenteeism due to malaria sickness was about 5 days per child per year among primary school students in Accra, Ghana. Furthermore, a study done in the Solomon Islands found that on average each child lost 5.3 days of school each year and this translated into a loss of US\$ 108, 966 of the country's investment in education (Kere et al. 1993). These studies serve to show that malaria also has an impact on those going to school.

In Kenya, primary school children were considered to have an average of four episodes of malaria per year and missed five school days per episode amounting to 20 school days missed per child per year and 11% out of Kenya's 186 day school year. For secondary school children it was eight days lost per year or 4.3% of a school year. In the case of Nigeria, school days missed were different in urban and rural areas but the time loss varied between 3 to 12 days per year or 2 to 6% of the school year (Leighton & Foster 1993).

#### **2.5 Methodological Approaches to Estimating Household Cost Burdens**

There are several methods which can be used to estimate the economic costs of malaria sickness. Estimating direct costs is usually straightforward as it involves summing up all the costs the household incurred to cure and prevent malaria. When cost data is collected in a particular year, it is even easier as there is no need to convert costs to constant prices for analysis. Cost data in most studies seem to have been calculated basing on reported costs over the last two or four weeks and therefore do not reveal the variations in disease burden and economic impact throughout the year (Chima et al 2003). Despite these methodological challenges, direct costs are less complex to quantify compared to indirect costs.

With indirect costs, the estimation is more complex as it involves lots of assumptions and calculations which might be very subjective. This explains why researchers have come up with different results depending on the method they used to value indirect costs and the assumptions they made to arrive at those costs. There are several methods which may be used to derive indirect costs, notably the wage rate method, the production function method and the friction cost method. The researcher will highlight all the methodologies but will dwell more on the wage rate method as it was the method used to derive indirect costs in this study.

### **2.5.1 The Wage Rate Method**

The first approach to estimating indirect costs is the wage rate method. This method arose from the human capital approach which regards investment in health improvement as akin to investment in physical assets, where benefits are measured in increased output in the economy. Thus the value of labour is measured by the wage rate which that labour receives in a particular occupation. In other words the cost of time is measured as the sum of the opportunity cost of time forgone by the sick individual due to illness and the opportunity cost of a healthy household member's time spent treating or attending to the sick member or accompanying them to treatment (Chima et al 2003). Most studies on malaria have used this approach basing their estimates on the amount of time lost by the sick person (or the care-taker).

Sauerborn et al (1996) used the wage rate method in assessing the time cost of illness. The time cost was defined as the sum of the opportunity cost of wages forgone by the sick individual due to illness, and the opportunity costs of healthy household members' time spent on treating or attending to the sick person or accompanying them for treatment. Sauerborn et al. (1996) equated the opportunity cost of time with the marginal cost of labour, approximated by the price of hired labour.

The economic concept of marginal cost of labour (MCL) is a technique to measure the opportunity cost of time. It is defined as the extra cost of labour which is incurred or

required to produce an extra unit of output. In rural areas, labour tends to be a valuable input to production and MCL can be approximated by the shadow wage rate (Sauerborn et al 1996). A shadow wage rate is normally used when official wage rates cannot be determined or if they are difficult to ascertain.

A shadow wage approximates the costs of labour in a particular occupation assuming the full operation of the labour market forces resulting in more accurate estimates than those of the distorted official wage. Official wages may be incorrect because they will not reflect the true value of labour in that economy. This is because they are not ascertained by the labour market forces of demand and supply to determine the price of labour. This is so because the market for labour will be distorted as in the case with rural areas and thus such official wages will certainly not reflect the true cost of labour. A shadow wage is calculated first by ascertaining the actual wage which rural productive people (in this case) should be paid for the occupations they are engaged in and the current wages they are receiving. An average wage is then calculated by adding the current wage people are earning with what they are supposed to earn and dividing by two. The resultant wage is the shadow wage rate.

### **2.5.2 The Production Function Method**

Another method of valuing lost output is the production function method and it mainly involves the use of a Cobb-Douglas production function. This method has been used by Audibert (1986) who estimated the relationship between health status and agricultural non-wage peasant production using a generalised production function and data in a meso-endemic malarious area of Cameroon. However, this method in general has not been used in most of the previous economic impact of illness studies because it applies most to labour in formal occupations, earning monthly incomes.

This method is more prone to manipulation by researchers, as different researchers may come up with different production functions to calculate their costs (Malaney, 2003). Thus, cost calculations from such a method are difficult to compare as they vary from

study to study. Also, researchers using this method are tempted to extrapolate their results into the future giving uncertain and often exaggerated labour cost estimates.

### **2.5.3 The Friction Cost Method**

This is a method used to measure indirect costs, taking into account the prevailing level of unemployment and the labour reserves within organizations and the economy as a whole.

Koopmanschap and van Ineveld (1995) argue that whilst sickness may cause losses in production, this loss will generally be confined to the period needed to adapt to the changed situation. Expected production losses due to illness may be much smaller than potential losses because processes within the firm and the labour market will lead to replacement of sick persons, after a period of adaptation, reducing the production loss substantially.

The friction cost method is therefore more accurate in measuring actual production losses but its main drawback is that it requires a lot of economic data and in most cases such data is not available or non-existent. In addition, the friction cost method is more applicable when analysing economic loss in business entities where the labour market is well developed and large. Besides, the method also ignores the severity of disease and the epidemiological differences in different people e.g. immunity levels of individuals.

### **2.5.4 Limitations of the Estimation Methodologies**

Generally the fact that all these methods calculate the cost of uncomplicated malaria based on febrile illness is a drawback. Other febrile illnesses are regarded as malaria, thus overestimating the true malaria costs. For example, Leighton and Foster found that the estimated economic burden in Kenya was reduced by over half when the number of reported 'malaria' episodes was restricted to the 40% of suspected cases which are on

average confirmed when laboratory tests are done (Chima et al 2003). This then means that the cost burdens of uncomplicated malaria are overestimated whilst those for severe malaria are underestimated. Severe malaria brings with it other complications like anemia, epileptic seizures and poor infant development among other things. All these are ignored when calculating the costs of severe malaria.

Over and above that, it has been proved that estimating the costs of severe malaria is often very difficult. This is because severe malaria is very rare in real life. Snow (1999) estimate that in areas of stable endemicity, there would be approximately 1 clinical attack of malaria per child aged 0-4 years, 0.25 per child aged 5-14 years and 0.4 per adult per annum. Combining these statistics with an estimated 3% of all attacks being severe one would expect under ten severe cases in a given month in a household survey of 6000 people, a number too small to estimate costs (Chima et al 2003).

In addition, most severe cases are not reported as malaria in most African countries. In fact, most severe cases are attributed to supernatural intervention such as spirit possession. All these cases are thus excluded from the cost calculations because they are not reported although they contribute significantly to the total costs households encounter.

The methods above are also criticised for ignoring the fact that time lost during sickness might not necessarily lead to production losses as the sick individual could sacrifice his/her leisure time to make up for the lost sick time. Alternatively, an unemployed family member might take up the place of the sick member meaning that the marginal product (and the opportunity cost) of the lost days could be small or zero and the same level of production could occur with or without the sick member present on that day (Leighton and Foster 2003)

## **2.6 Debate on Using Expenditure as a Proxy to Income**

The generally accepted methods of approximating household welfare are through the use of data on household income or expenditure. Several studies have used household expenditure as a proxy to estimating income such as Akazili (2000). The main problem with using expenditure is that it tends to overestimate the true household income. Many households may increase expenditure not necessarily because their incomes have risen but because they may have been granted a loan from different sources.

In this situation, the use of expenditure as a proxy to income results in an overestimation of household income. In any case it has been observed that the purchase of certain consumer durables could generate unusually high expenditures at a certain point in time in an income earning month. For example the purchase of a stove may increase household expenditure for that particular period. When data is collected during that particular period expenditures will be high and if they are used as a proxy to income, an overestimate is likely to be the result (Worrall, E et al 2002).

In addition, high expenditure is not synonymous with high household incomes. For example a household may be able to spend a lot of resources on luxury goods like clothes mainly because they have access to credit which they can pay off at a later stage. Using such expenditure figures as proxies to income will grossly overestimate the household's current income (Worrall, E et al 2002).

In any case, expenditure data is prone to fluctuations as households tend to spend more at certain events or times of the year, for example during the festive season or when there is a wedding in the family. At times invited guests, family and friends make contributions towards the expenses of the event and this tends to increase expenditures considerably. If household data is then collected during a period encompassing such unusual

expenditures, then household income will be overestimated through the income proxy (Deaton, 1997).

Another school of thought in the literature argues that household expenditure data are preferable if a longitudinal study is being carried out since they are subject to less fluctuations than household income, and therefore a better measure of permanent income (Worrall, E et al 2002). This is because households tend to smooth expenditure in anticipation of lumpy income (Deaton, 1997). This reasoning only applies when income measurements are being done over a long period (longitudinal studies) and therefore does not apply to studies collecting income data over 2 weeks or 1 month (cross sectional studies) as the time period is too short to result in smoothed income data over time.

However, using expenditure data as a proxy for income has its own advantages. The first advantage is that expenditure data is far easier to get and more reliable than self reported income. Many people in developing countries are reluctant to reveal their true income for one reason or the other and using income figures from respondents will tend to underestimate or overestimate the true income for households depending on the circumstances (WHO, 2000). A study done in Sri Lanka (Attanayake et al, 2000) found that respondents were reluctant to reveal their incomes assuming that the survey results might adversely affect their receiving of government income support. Some other respondents who were not income receivers seemed to think that the survey results might be used in the future to determine income support, so they tended to underestimate income. High income receivers attempted to hide their incomes due to fears of getting caught by income tax (Attanayake et al 2000). Thus in general the collection of expenditure is far easier and more reliable especially in developing countries like Zimbabwe. In any case in the developing world where the informal sector is large, it is difficult for most people to provide accurate income estimates.

## 2.7 Summary of Key Issues Arising From the Literature

There are several key issues arising from the literature that will be summarised in this section. The literature showed that on average, direct costs to households were higher if they utilised private health facilities compared to public health facilities.

In addition, indirect costs were always higher than direct costs and the percentage difference between direct and indirect costs was dependent upon the method used to calculate the indirect costs.

Medicine costs were highlighted as contributing a sizeable share of direct costs and transport costs were also substantial as a percentage of total direct costs. Unofficial fees, although widely ignored can be a big problem for those who access health care.

Another interesting finding established in the literature is that cost burdens are regressive. The poor often pay a lot more as a percentage of their income compared to the rich households. There was also some evidence to suggest that richer households are more likely to use anti-malarials to which there is less parasite resistance.

The literature also revealed that costs of illness were highly dependent on the type of illness. Chronic conditions like diabetes and long duration illnesses like TB and HIV/AIDS were found to be more depleting to the household resources because of the constant care required for these diseases.

The definition of what constitutes catastrophic expenditures is still the subject of debate with different thresholds of between 5% to as much as 40% of household income being

used. Linked with this is the fact that a high percentage of household income going towards health care expenditures does not automatically result in catastrophic expenditures.

Lastly, women in general were more affected in terms of lost time and indirect costs than men.

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## CHAPTER THREE - CONCEPTUAL FRAMEWORK

### 3 Introduction

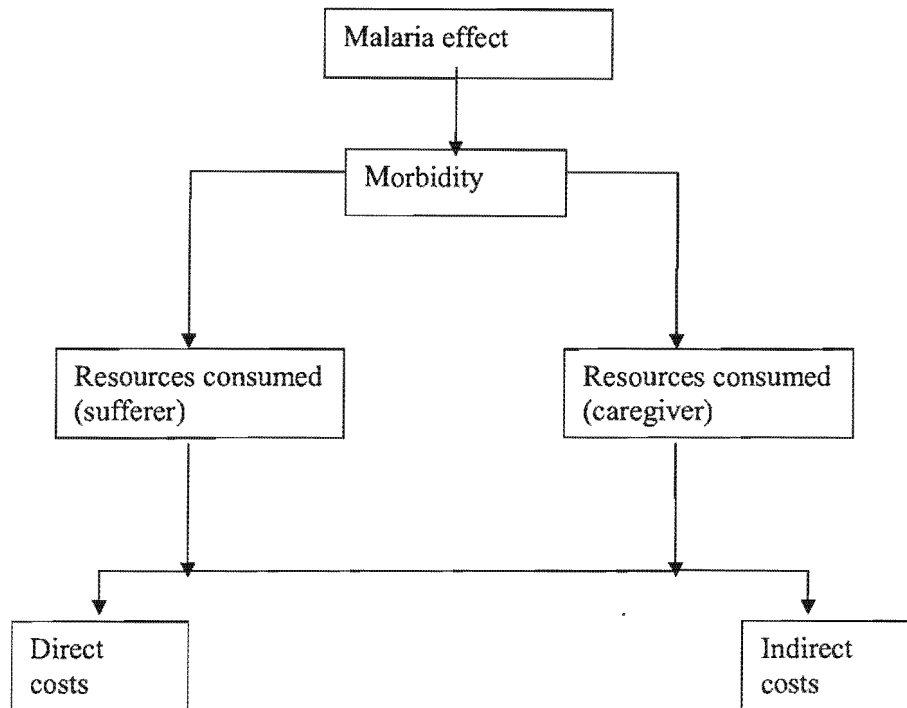
This chapter outlines the framework which was used to analyse the direct and indirect costs in this thesis and it focuses on analysis at the household level.

#### 3.1 Framework for Estimating Economic Burden

The framework used in this study was first developed and used by Shepard et al. (1991). However the full Shepard model includes the costs resulting from mortality and intangible costs which were excluded in this study because they were beyond its scope.

To understand the framework better, it is imperative to appreciate how direct and indirect costs of malaria arise. This is illustrated in Figure 3.

**Figure 3: Economic Burden of malaria.**



**(Cd)**

**Cd** = f (cost of drugs, diagnostic charges, transportation costs, special diet costs, other user charges)

**Cid** = g (opportunity cost of waiting & travel time and loss of productive time for both sufferer and caretaker)

**(Cid)**

**Adapted: Shepard et al. (1991)**

As Figure 3 shows, malaria morbidity results in resources being consumed to cover direct and indirect costs of sickness. However resources are not only consumed by the malaria sufferer alone. The caretaker also incurs costs related to transport if accompanying the sick member for treatment, buying special foods for the sick person etc. In addition the caregiver may also lose productive time whilst caring for the sick malaria patient, resulting in indirect costs. Asenso-Okyere (1992) in a study in Ghana, and Attanayake et

al (2000) for the study done in Sri Lanka used this overall direct and indirect cost framework to analyse the costs of illness in the two countries.

### **3.1.1 Direct Costs**

In this study, direct costs were regarded as out-of-pocket expenditures on malaria treatment and were limited to expenditures on medicines, transport, and hospital stay and consultation fees incurred by the malaria sufferer and caretaker. Thus total direct costs were ascertained by adding up all the direct expenditures incurred by the malaria sufferers and the caretaker in the study. Other calculations like the average cost per household and mean direct cost per case were calculated using the total direct costs. Analysis of costs was done according to malaria severity, socio economic status, age and literacy levels among other variables.

Although inflation is fairly volatile in Zimbabwe, all costs were not deflated because they were collected within four weeks, making the effect of inflation negligible. In other words, the fact that the study was cross sectional makes it justifiable not to deflate costs which were reported.

### **3.1.2 Indirect Costs**

Indirect costs in this study were limited to costs of lost time whilst going to seek care, lost productive time whilst sick and lost productive time for the caretaker whilst looking after the sick member including time lost accompanying the sick member to a health care facility.

**Table 1: Methods of Valuing Time.**

Type of productivity cost	Method of valuing time	Unit of value	Method of data collection
Lost time whilst sick and whilst seeking treatment by sufferer	Average wage per day multiplied by the total number of days lost	Cost per malaria sufferer	Wage levels for different occupations for the sufferers were collected and estimated.
Lost time for caregiver whilst caring for sick member and accompanying him/her to seek care.	Average wage per day multiplied by the total number of days lost	Cost per caregiver	Wage levels for different occupations for the caregivers collected and estimated
Lost time for school age children due to illness	Half of average wage of adult in the occupation the school age child is involved e.g. farming.	Cost per school age child	Wage levels for adults were halved to represent that for school age children in the same occupation

As indicated in Table 1, the total costs of time lost were derived by using estimates of the time lost, multiplied by the average wage in each and every occupation the respondents were involved in. The value of a day's work was estimated by using the estimated average wage rate for the malaria sufferer which was derived by asking the malaria sufferer or the most knowledgeable member of the household how much on average the sick member earns in the occupation they are involved in. This information was then used

to calculate the average wage of each occupation. The derived average wage was then used to calculate the value of lost time for each malaria sufferer.

A similar methodology was used in valuing the lost time for employed caretakers and the relevant averages applicable to caretakers were also used. Thus these estimates were used as a proxy for the costs of the labour and reflected a fairly true picture of the costs of labour for the malaria sufferer and the caretaker. A comparison of the derived average wages was done with other average rural wages in other African countries and they were consistent e.g. the study in rural Burkina Faso by Sauerborn et al, (1996). In other words the derived wage was not too high or too low when compared to derived wages in other parts of Africa. Limitations of this methodology are discussed in the methodology section.

### **3.2 Justification for Using the Framework**

The researcher felt that this framework was plausible as it enabled him to quantify direct and indirect costs. In the event that the malaria sufferer could not give wage estimates for some reason, the most knowledgeable household member was asked to estimate how much the sick member was earning per day in the work they did. This was done assuming that the most influential and knowledgeable member of the household would be aware of the sick member's earnings.

In addition, this study was conducted in a rural area where the labour market is distorted and so the true cost of labour cannot be easily ascertained as the labour market is almost non-existent. In this scenario, the value of labour can only be ascertained by asking the sick members how much they were earning in whatever occupation they were involved in. No standard income levels exist in rural areas for different occupations and as such the use of the average rate was unavoidable. Most studies including Asenso-Okyere (1992) in her study in Ghana and Attanayake et al (2000) in the study in Sri Lanka used average wages in their cost analysis.

The cost of labour for both sufferers and caretakers was elicited per day instead of per month because the researcher felt that soliciting incomes on a daily basis for both the malaria sufferers and the caretaker would result in more accurate cost results. This is so because most respondents tend to incorrectly report their incomes when they are asked how much they earn per month. Attanayake et al (2000) found that most people tend to underestimate their true incomes in the belief that the study results might be used in future to determine income support grants.

Other households may believe that their incomes would be used for tax purposes in the future. In fact it is Zimbabwe's tax policy that if an individual is engaging in any activity which generates financial resources of a certain level, then they are liable to taxation. All these factors prompted this researcher to devise alternative ways of getting income figures which are as accurate as possible hence asking earnings per day and not on monthly basis. This was done in the hope of increasing the accuracy of cost information.

The researcher would extrapolate these daily earnings to monthly incomes for use in the analysis. The main limitation though with this method is that it assumes that the sufferer works every day of the month. However in rural settings individuals may decide not to work and therefore the method may overestimate indirect costs due to lost productivity time. More limitations of the methodology are discussed in the methodology section.

#### 4 Overview of the chapter

This chapter outlines the methods which were used in conducting the research namely the data collection methods, sampling technique, sample size calculation, study area, the survey instrument used and the type of study undertaken.

##### 4.1 Estimating Techniques and Key Assumptions Made

It was assumed that those participants who reported suffering from malaria may have suffered from the disease although the possibility of other febrile illnesses could not be completely ruled out. In addition, the researcher also made the standard assumption that the work days lost due to malaria result in productive losses for the household. In other words, because of malaria, production is lower than it would have been in the absence of the illness.

However, this assumption should be taken with caution as the sickness of a household member may not automatically lead to production losses to the household. For example if the household member got sick during the dry season when there is little or no farming, the household may lose little or nothing if the main occupation for the sufferer is farming. In addition labour replacement may occur resulting in little or no production losses to the households.

Furthermore, the working age group was considered to be between 18 and 60 years of age. Those below 12 years and above 60 years were considered unproductive for analyses' sake. Those between 12 and 17 years could earn half the income of adults in a particular occupation if they did work. School going children were assumed to be earning

nothing. This is consistent with other literature e.g. Asenso-Okyere et al, (1997) and Akazili, (2000) used the same cut off points for the age.

The average wage used to estimate the cost of lost time was assumed to be the same for both men and women in this study. This wage was calculated after adding up all the reported earnings of the malaria sufferers either by the sufferers themselves or the most knowledgeable person in the household. If the malaria sufferer was able to respond to the questionnaire, then they would give the relevant answers. It was only in those instances when the sufferer could not speak for themselves that the most knowledgeable member of the household would answer on their behalf.

The collected earnings data was then divided according to the occupations of the sufferers and the caretakers. The main occupations identified in this study were a formal job, farming, food processing, craft making and housework. After these categorizations, the average wage rates for each and every major occupation was calculated by adding up all the reported daily wages and dividing by the number of respondents who indicated that occupation. These average wages were then used to calculate the indirect costs of malaria to the household. The costs of caretakers were calculated in a similar fashion described above. However, the values of those doing subsistence agriculture were not fully included. Only if they were selling any surplus from their subsistence farming was it included in the analysis. The drawbacks of not fully including subsistence farming are highlighted at the end of the chapter.

## **4.2 Key definitions for malaria**

In this study, mild malaria was defined as that sickness state whereby the person can still walk and do some of his/her normal duties like cooking but is not able to do more demanding duties like working in the fields or carrying heavy goods. On the other hand, severe malaria was described as that sickness stage when the person cannot even walk and do any physical activity and sometimes might require the help of a caregiver to do basic activities like eating and walking.

The classification of whether a person has suffered from severe or mild malaria was based on what the respondents said and there was no clinical diagnosis of the disease but there was reliance on the perceived understanding of the community about what malaria is. In other words the study was concerned with what malaria is as reported by the respondents and not as measured by the presence of parasites in the blood. The probability of interviewing the right people who had truly suffered malaria was considered to be high as the study area is a malaria endemic area and every year a lot of people are treated for the disease (Ministry of Health, 1998). It was important to ask the respondents about malaria and not its symptoms because symptoms can easily be confused with other febrile illnesses, thereby decreasing the accuracy of identifying the true malaria cases.

#### **4.3 Other Key Definitions and Methodological Issues**

A household was defined as people who live together and share all socio-economic amenities at their disposal. A recall period of 1 month was used for the purposes of collecting cost and income data. In addition, respondents were asked to recall their malaria related costs which occurred in the past month and expenditures on certain household amenities which were used as a proxy for income. The same recall period of 1 month was also used to identify those who had suffered malaria sickness.

This recall period was used by other researchers in other economic impact studies like the Ghana studies by Asenso-Okyere et al, (1997) and Akazili (2000) and the Sri Lanka study by Attanayake et al, (2000). In addition this recall period was chosen because it was realistic in terms of information needed from respondents. The researcher acknowledges the fact that a longer recall period would increase the chances of recall bias as most rural people do not keep records of their day to day costs. More discussion on the recall period used is outlined at the end of this chapter.

However, in view of the time the study was done, it was necessary to use a 1 month recall period. Data collection occurred in December and it's the month with the festive period when people spend more than their normal monthly expenditures. Collecting data for two weeks only would have resulted in highly biased expenditures as that coincided with the festive period. Collecting information over a 1 month period (the whole of December) ensured a more smooth and realistic income and expenditure data.

All the costs of the study were presented in both Zimbabwe and US dollars. This conversion was done using the average black market US\$ rate prevailing in December 2003 and the rate was 1US\$ = Z\$ 5 500.00. This is so because the black market exchange reflected the true value of the Zimbabwean currency. The use of the official exchange rate would have grossly overestimated the incomes and costs of malaria on households in Zimbabwe in United States dollar terms. The US dollar conversion was to enable costs to be internationally comparable and also to help other readers who are not familiar with the country of study's currency to fully appreciate the costs. Besides, the conversion will help comparison of costs with those of similar studies done around the world.

#### **4.4 Study Area**

Mtoko is a district in the North - East of Zimbabwe and is in one of the most malaria endemic regions in the country. The hot and humid climate characteristic of the area makes it prone to malaria especially during the rainy season from October to March. Coupled with this is the fact that there has been massive movement of people into this area since the year 2000 when the fast track land resettlement programme was launched by the Zimbabwean government. This has seen a lot of people staying in that malaria endemic area yet there are no government prevention programmes and as such the disease has posed a serious economic burden to the settled households. Furthermore, the place is remote and accessibility is fairly limited making it difficult for government control initiatives like residual spraying to be implemented effectively. This ultimately means that the burden of malaria may be great because of the lack of government

preventive measures as households are unable to invest in preventive measures like bednets and insecticides.

## **4.5 Survey Methods**

This section describes in detail the process of training data collectors, the sampling method used and the data collection itself, especially how the respondents were selected

### **4.5.1 Training of Fieldworkers and Review of the Survey Instrument**

The original survey instrument was prepared in English and was later translated into Shona, the local language of Mtoko District. This enabled pre-testing during the training period. A total of six interviewers (three males and three females) were recruited from the University of Zimbabwe's Social Sciences Faculty. All of them were doing their final year of study and most importantly were from Mtoko district. This meant that they were familiar with much of the study area.

After the recruitment, interviewers were called to a small workshop and were informed of the objectives and expected outcomes of the research. After this, participants were given two questionnaires, one in English and one in Shona which had been translated by a hired translator so that they could read and compare the two and then take notes on each and every question in terms of its simplicity, clarity, cultural appropriateness etc. Similarities and differences were discussed until all the participants had a common understanding of the questionnaire.

The researcher, as the main facilitator, gave a detailed orientation on how to approach rural communities before, during and after the interviews. Data collectors were also advised to understand fully the meaning of each question so that they could ask the questions without constantly referring to the questionnaire as this may make the respondents lose interest. Participants were also taught how to redirect a respondent who

might be diverting his/her response in a clever way without embarrassing or angering the respondent.

The importance of making sure that all answers in the questionnaire were complete before leaving the household was emphasized. After this, participants were put into pairs and were instructed to practice the questionnaire with one participant acting as the interviewer and the other as the respondent. Each of them was asked to note any difficulties arising out of the process and thereafter the points raised were discussed and clarified. At that point, participants were also told of the need to minimise time wastage by simply completing questions which could be done by direct observation e.g. type of roofing at a homestead.

After this, participants were warned of the importance of informed consent and the relevant procedures to be carried to get the consent of the participant. All the above procedures ensured that the data was reliable and valid for statistical analysis.

#### 4.5.2 Sample Size

This was determined using the following formula:

$$N = z^2 (p \times q) / L.O.S$$

Z = probability level which is assumed to be 1.96

(p x q) is the variance in the population i.e. those who had malaria and those who did not.

L.O.S = Level of significance.

$$N = (1.96)^2 \frac{(0.75 \times 0.25)}{(0.05)^2}$$

$$n = 286$$

Thus, the statistical sample size was 286 but a sample size of 300 participants was finally decided upon as a cautionary over sampling so that the extra questionnaires could replace those that may be lost or damaged during transportation. This sample size was arrived at

after considering the resource constraints to the study. Besides, it was statistically proven that the sample was representative of the whole district. After the data collection, a total of 281 correctly completed questionnaires were used. This is so because about 19 of the 300 questionnaires were spoilt, incomplete or containing contradictory data to the extent that they had to be discarded. Reasons for such occurrences ranged from participants abandoning interviews midway, failure to remember meaningful information required for the study and general refusals to participate.

#### **4.5.3 Sampling Technique for the Households**

The researcher firstly reviewed the geographical map of Mtoko district showing administrative units or villages. These administrative units or villages were assumed to represent clusters across the whole district. Thus the researcher mapped out the number of clusters and then divided them into east, west, north and south situated clusters. This was done to ensure that the whole sample was representative of the district. After that, the researcher randomly selected almost equal clusters from each and every area mentioned earlier. For example, the researcher would pick say four clusters from the east, three from the north and five from the south etc. The number of clusters picked was mainly dependent on the population densities in the areas and accessibility of the areas according to the district map. Those areas which were completely inaccessible were unfortunately left out. In addition, those areas too far away from the other major centres were left out because of resource constraints.

The fact that some areas which were inaccessible were left out may result in a bias in the cost estimates. This is so because these areas are normally furthest away from basic public services like clinics and so the people who stay there are most likely to incur higher transport costs on average than people staying in other less remote areas. More limitations are discussed at the end of this chapter.

After randomly selecting the clusters, the researcher then used systematic sampling from those clusters to come up with the final sample of households. This involved assigning

households in the clusters some codes from the list given by the local district administrator. Considering the fact that the sample size was supposed to be 300 for all the four main geographical zones, proportional allocation was used to determine the number of households to be interviewed per area. Thus the eastern area which had the highest total number of households contributed 100 households to the sample. The second largest population density was in the northern area and so that area contributed 80 households out of the calculated sample of 300. The same procedure was followed for the western and southern areas to come up with the total sample of 300. The following table summarises how the systematic sampling was done for the four main areas.

**Table 2: Sample Distribution**

Type of area/s	Approximate total households in the areas	Calculation of the Nth number	Nth number for the systematic sampling
Eastern area	654	654/100	7
Northern area	423	423/80	5
Western area	378	378/65	6
Southern area	359	359/55	7

Thus interviews in the eastern area were to be done for every seventh household beginning from the starting household. However the initial house to start with was chosen randomly and it was any number between 1 and 7 for the eastern side and between 1 and 5 in the northern area and so on.

Within each area, the sampling would start roughly at the centre of the area and the major directions (north, east, west, and south) were used. The starting household in each and every direction was again randomly picked between say 1 and 7 or 1 and 6 depending on the calculated nth number. Interviewers would then start counting houses in that general direction using accessible routes like footpaths and major roads. However, a household could only be included in the sample if they confirmed that there was at least a member

who had suffered malaria in the last one month. If a sampled household had no malaria sufferer, then the neighbour of the sampled household was chosen as a replacement.

In the event that there were say four people who had suffered from malaria in one household then the interviewer would pick the sufferer who had their first letter of their name earliest on the alphabet. For example, if there were three people who suffered malaria namely: Charles, David and Peter, then Charles would be chosen for the interview. Data collectors were thoroughly trained on how to carry out the above procedure. These procedures were followed until the required sample size was achieved.

#### **4.5.4 Data Collection Methods**

A structured questionnaire was used to collect data from participants (see appendix 1). This questionnaire was an amalgamation of some questions which had been used by other researchers such as Asenso Okyere & Dzator, (1997) & Akazili (2000) in similar studies, and so had been tried and tested in real household survey research.

Before the instrument could be taken into the field, it was piloted in an area near Harare to check for consistencies in responses. It should be mentioned at this point in time that the questionnaire was piloted in an area which had the closest characteristics to the actual study area (Mtoko). However those characteristics were not exactly the same as Mtoko, for example the malaria prevalence in this area was marginally lower than in Mtoko. Despite this drawback, useful information from the pilot was incorporated into the instrument.

The instrument was made short and to the point to ensure that quality data was collected. However, the short questionnaire has disadvantages when collecting expenditure data because a lot of information is needed to come up with accurate expenditure estimates. Ideally expenditure data should be collected over a period of time so that any fluctuations are captured and not by a short questionnaire. But due to resource and time constraints to data collection, this could not be done.

Before the interview, occupants of each and every household were briefed on the objectives of the study after which written consent was requested to interview them (see appendix 2). Respondents were also informed that the information they were giving was going to be kept confidential and would not be used for any other purpose except for the research only. They were also informed that they could decline the interviews if they so wished as participation was entirely voluntary. After all these explanations, a total of nine respondents refused to participate for various reasons.

A recall period of 1 month was used in this study mainly because the data was collected in the month of December where household expenditures are likely to be unusually high at the end of the month because of the festive season. It was thus imperative to collect data for the whole month in order to capture all the fluctuations in that particular month (a period of low expenditure at the beginning of the month and a period of unusually high expenditure at the end of the month). The limitations of using a 1 month recall period are discussed at the end of this chapter.

Priority was given to the malaria sufferer to respond to the questionnaire. Only if the malaria sufferer was not able to respond because of ill health or if the sufferer was a child did the data collector question the most knowledgeable person in the household. Data collectors were instructed to collect all the information needed for the study and to be patient with participants.

In addition, data collectors were encouraged to ask for any receipts or invoices indicating the costs incurred by the household for example to buy groceries so that they could verify the costs themselves and at the same time minimise recall bias resulting from participants trying to remember the costs they had incurred in the past month. However if respondents did not have any evidence of costs incurred, they were encouraged to recall them as accurately as they could.

Data collectors were encouraged to move around with more than enough questionnaires just in case some of them got spoilt or a participant refused to complete the interview. At the end of each day of data collection, data collectors would meet with the researcher and a supervisor to find how many questionnaires had been completed, any problems encountered and how to solve those problems.

Generally the interview process took fairly long because data collectors were instructed to give as much room as possible to the participants to do their day to day chores whilst they responded to the interview questions. This ensured a high success rate as participants did not feel too restricted to carry on with their duties whilst the interviews were in progress.

#### **4.5.5 The survey instrument**

The questionnaire had three broad categories with the first part relating to socio-economic and demographic characteristics of a particular household. Variables like sex, age, occupation, and marital status were all solicited in this section.

The second part involved the direct and indirect malaria costs. The direct costs included consultation fees, transport costs for both malaria sufferer and caregiver, drug costs, inpatient costs at clinics or hospitals and the indirect costs were mainly production time lost due to sickness, travel and time lost by caregivers whilst caring for the sick household members.

Unfortunately, the questionnaire did not capture information on consumption of household's own production. It was designed on the assumption that those engaging in farming were mainly doing it for income generating purposes and so the value of subsistence agriculture was not included.

Finally the last part involved household expenditures as a general proxy for household income. Expenditures items included were those on clothing, health care, education, food

among other expenditure items. It also included the debts incurred by households and how they were financing malaria treatment and prevention. At the end of the chapter, a discussion on how household debt was solicited from participants and the use of expenditure as a proxy to income provided.

#### **4.6 Data Analysis**

The first step in the data analysis process was to enter the data into a spreadsheet, in this case Microsoft Excel. This was done manually by two data capture clerks recruited for that purpose. Whilst this process was happening, the researcher was carrying out quality control by randomly checking the entered data against the original data on the questionnaire.

After the data had been entered correctly into the spreadsheet, data cleaning took place. This involved checking for errors not captured in the quality control process during entering. After this the data was then exported into SPSS statistical software package for descriptive, analytical and inferential analysis. However most of the costing analysis was done in Excel.

In the analysis, consumption expenditure of households was used as a proxy for household income. Using this data households were divided into income quartiles and this was mainly done to facilitate the comparison of malaria related costs across households of different socio economic status.

## **4.7 Estimating economic costs of malaria**

In this section the methods of estimating the costs of malaria are discussed.

### **4.7.1 Direct costs**

Direct costs both in theory and in practice are fairly easy to measure. In this study the costs were for consultation, transport, drugs, and hospital fees for those who were admitted, and any other out-of-pocket expenditures incurred by the household. These expenditures were self – reported on each item by the respondents and then summed to come up with the total direct costs of malaria.

### **4.7.2 Household Debt**

As part of the estimation of the vulnerability of households to health care costs, information on debt was also elicited from households. This was done by asking households whether they had borrowed money from anyone or any financial institution in the past month. The drawbacks of gathering debt information in such a way are discussed under the limitations of the study section at the end of this chapter.

### **4.7.3 Indirect costs due to productive losses**

Indirect costs were more difficult to measure mainly because of the need to quantify major variables like lost time for leisure and production. The indirect costs were mainly due to time lost when sick, caring for the sick or traveling to a health centre to seek treatment. Time lost from all those activities was collected and the occupations of the particular sufferers and caregivers noted. Average wage levels were derived from the

different reported wages which sufferers and caregivers were earning in their respective occupations. Please refer to the conceptual framework for more detail on deriving indirect costs.

#### **4.8 Ethical issues**

Participant's information was held confidentially. Firstly consent was sought from the district health officer and the community leaders after briefing them about the objectives of the study. From time during the data collection process, the district health officer and the community leaders were informed of progress made. Informed consent was sought from participants before data collection began (see appendix 2) and data collection would only begin after they had indicated they had fully understood the objectives of the research. Participants were allowed to withdraw at any time of the study if they so wished. Individuals still had the right of withdrawal and refusal even after the consent of the leaders.

It was explained clearly to potential participants that they should not expect any form of financial compensation by participating in the study. However, the researcher ensured that basic information on the prevention of malaria was availed to them, including basic precautions to avoid mosquito bites e.g. wearing clothing which cover much of their bodies before sleeping and closing all windows before dusk.

Interviews were conducted in the mother language of participants to make sure that all participants were sure of the responses they were giving and an expert translator did the translations of the questionnaires into the local language.

## **4.9 Limitations of the study**

This section will highlight the limitations of the study especially in terms of the methodologies used.

### **4.9.1 Use of 1 month Recall Period**

The use of a one month recall period might have caused recall bias in the data supplied by households as some may not have remembered accurately the actual expenses they incurred during that whole month. There is debate on the recall period to be used in studies. Some studies have used two weeks whilst others have used one month.

There are obvious advantages and disadvantages of using either of the two methods. Firstly, by using a recall period of 2 weeks, recall bias is bound to be reduced dramatically as more people can easily recall their expenditures. However, a shorter recall period may not capture the variation in expenditure patterns over a month where households tend to spend more at the end of the month when they have just received incomes than during the middle of the month. On the other hand, a recall period of one month increases the likelihood of recall bias but also ensures a smoothed expenditure pattern for the whole month including the fluctuations. The selection of which recall period to use depends on the subjective judgement of the researcher and the circumstances under which the data is being collected. But as mentioned above, both recall periods have their advantages and disadvantages.

### **4.9.2 Limitations of the Method Used to Estimate Indirect Costs**

The wage rate method which derives its basics from the human capital approach has several drawbacks. Household survey data has shown conclusively that when an adult is

ill within the household, there is a significant amount of labour substitution with other adults or children taking on parts of the labour burden (Malaney, 2003). This potential for labour substitution crucially affects whether or not the loss of time is translated into lost output. This then makes it difficult to calculate the true extent to which productivity is lost. The wage rate method used in this study does not take into account the potential for labour substitution leading to less than expected productive losses. Thus, with the use of the wage rate method the study definitely overestimated the true productive losses to households.

The wage rate method also ignores the effect of unemployment on the demand for labour. Normally, the economics of labour indicate that if there is a short supply of labour then wages should increase because labour demand will be outstripping supply. However this only applies in situations of little or no unemployment. The reasoning will be that if a lot of productive people get sick then they create a labour shortage which cannot be filled without an increase in wages as the supply will be less than the available demand. (Malaney, 2003). However, in rural areas especially in developing countries there is a lot of unemployment or underemployment, a reduction in labour supply can be easily be replaced by other household members without a real loss in productivity. In any case rural people tend to multi-task in their day to day productive activities to the extent that labour specialisation is almost non-existent. For example the sickness of a household member who was predominantly involved in farming can lead to him/her being replaced easily by his/her family members without loss of productivity. In other words, in situations of underemployment or unemployment, labour substitution may be feasible without any loss of output (Chima et al, 2003).

In addition, the wage rate method does not value the time of those who do "housework" although sickness to such people represents significant loss in productivity. This type of group is also prominent in rural areas resulting in the labour of such people not being valued as lost productivity to the household. In fact, the wage rate method does not value any form of informal work earnings to the extent that it generally underestimates the lost productivity from those doing informal work or "housework". Furthermore, leisure time

is valued at zero, because it is assumed that no productivity is lost by those using leisure time to attend to clinic appointments. In addition, the costs of pain and suffering from sickness are not captured in the indirect cost estimations despite the fact that these costs present a real cost.

The fact that the wage rate method multiplies the average wage for a patient by the number of days they were sick or unproductive results in an overestimation of indirect costs. The implicit assumption that if a person does not work for 10 days they would have lost productive time for those full 10 days is not very accurate when applied to rural settings. This is because in rural areas people, do not work the full working hours every day. They may just work for three days in a week and so to assume that if they were sick for 10 days they would have lost the 10 full working days only results in an overestimation of indirect costs of malaria. In any case these people may not even work during weekends and may attend to other community obligations at any time without any notice. For example the death of a neighbour may result in instant suspension of productive work and this is not taken into account in the wage rate method of estimating indirect costs.

#### **4.9.3 Valuing Labour by Age and Gender in Rural Settings**

The valuing of labour by age and gender is also inaccurate especially in rural settings where children and women tend to work more than men in terms of housework and other informal jobs in the household. By undervaluing the labour of children and women, the wage rate method consistently underestimates the production losses of two of the most vulnerable groups in society – women and children. Thus, the wage rate method underestimates the productive losses of women and children.

The main advantage of this method though is the fact that it is easy to apply when information on wages are available. Losses in productivity are derived from the possible earnings lost by that individual.

#### **4.9.4 Limited Data Collection Due to Inaccessible Areas**

The study did not go to the remote areas of the district because of resource constraints. These areas would require more time and effort to collect data and these resources were not available to the researcher. The major drawback of not using the data from the remote areas is that costs like those related to transport are underestimated. This is so because most health centres in rural areas are located in fairly accessible areas and this is mainly done to facilitate the easy distribution of clinic stocks like medicines, gloves, syringes etc from the government. Those living in remote areas simply have to travel long distances to the health centres, thus incurring more than average transport costs and possibility higher lost productive time. Chances of self medicating and visiting traditional and faith healers may be high and so the malaria disease burden is expected to be higher. By excluding them from the analysis, direct and indirect costs of malaria may have been underestimated.

#### **4.9.5 General Use of Averages in Cost Calculations**

The method of determining indirect costs which was highlighted in the study generally conceals large variations in individual household circumstances. This is a characteristic inherent in studies of this nature where most methodologies tend to calculate averages in terms of lost time and the resultant costs. This brings in results which are generalisable across the sample disregarding individual household characteristics. For example, a household which may be at the top range of the lowest income quartile might be considered as experiencing catastrophic costs/expenditures which are characteristic of low income households yet in reality the household may not be in such a bad position as an individual entity.

In addition, outliers in the data may skew the resulting averages resulting in an under or overestimation of cost and other related calculations. For example if there are fifteen

households in the sample with far higher than average salaries, the average cost calculations will be inflated because those high figures from the fifteen households will increase the mean calculations in the study. Chima et al, (2003) has advocated for the use of the mode in some instances although it does not tell us much about the average costs critical in this type of analysis.

#### **4.9.6 Subsistence Household Consumption**

The study did not value household consumption of own production. In other words, those engaged in subsistence agriculture were not valued in terms of their consumption. In the study those households engaging in subsistence agriculture may have also sold surplus produce thus earning income. However, the method used underestimates productive losses by not valuing subsistence consumption in the indirect costs calculation. Literature has shown that valuing subsistence production is difficult and a standard measure of such consumption is still to be developed or agreed upon (Worrall, 2003). In any case, the inherent nature of the human capital approach is that it does not capture the value of household subsistence production, neither does it capture the costs of pain and suffering in patients. Because of the flaws of the method used, the value of subsistence consumption and the costs of suffering and pain were not measured in this study.

#### **4.9.7 Use of Undiagnosed malaria Data**

The fact that the study used undiagnosed malaria may have resulted in the overestimation of the actual malaria burden as other febrile illnesses may have been included in the malaria burden calculations. Brinkman & Brinkman (1991) estimated that approximately 40% of fever can be attributed to malaria in Africa, though this figure varies across transmission zones. With these malaria estimates in mind the study most likely overestimated the economic burden of malaria to households.

#### **4.9.8 Household Debt**

In terms of debt incurred by households, the data collection instrument did not specify whether the households were borrowing money to finance malaria treatment or the borrowed money was for both malaria treatment and other household needs. This means that the level of debt attributed to malaria sickness may have been overestimated because of the way debt information was solicited. Of course since the area has high malaria prevalence one would assume that a sizeable portion of the borrowing will be for malaria related ailments. However, there is a real possibility that the amount of household debt attributed to malaria might have been overestimated as some households may have borrowed the money for other needs not necessarily malaria related.

#### **4.9.9 Data Collection in the month of December**

The fact that expenditure data was collected during the month of December when general household expenditure is high because of the festive season also resulted in an overestimation of household income. This is so because the household expenditures for the month of December were used as a proxy to income. More detailed discussion on the limitation of using December as a data collection month is outlined in the literature review.

## 5 Introduction

This chapter unveils the study results beginning with the descriptive statistics, followed by the estimated direct, lost time and indirect costs of malaria on households. It should be noted that the findings may show higher figures than an annual average in some analysis mainly because of the time the data was collected – during the rainy season and during the month of December when malaria was high and expenditure levels high as well.

### 5.1 Socio demographic and economic characteristics

**Table 3: Age**

Age	Frequency	Percent
0 -- 11	39	13.90%
12-- 17	27	9.60%
18 – 60	200	71.20%
> 60	15	5.30%
<b>Total</b>	<b>281</b>	<b>100%</b>

As Table 3 shows, the age distribution in the sample was divided into four major earning categories. The 0 to 11 years constituted by about 13.90% of the sample. The highest percentage was amongst the economically active age group of 18 to 60 years and they constituted 71.20% of the sample. The least number of participants were in the over 60 age group and they only constituted 5.3% of the sample. The data compares well with national data where the 0-14 years age group constituted 37.9%, 15 – 64 years, 58.40% and the over 65 years – 3.7% (Youth Development Network 2005). However the national

estimates used different age ranges from this study and therefore a direct comparison is not feasible.

### 5.1.1 Gender

The survey further showed that there were more female respondents than males. Specifically women who participated in the study constituted 54.40% of the sample and the difference of 45.60% were males.

### 5.1.2 Marital status

In the study it was found that most participants were either single or married with those who were married constituting 48.40% of the respondents whilst 38.40% were single. There were a reasonable number of respondents who were widowed and these constituted 8.2% of the sample with the remainder of about 5% being made up of those who were divorced, never married and separated.

**Table 4: Marital Status**

Marital Status	Frequency	Percent
Single	108	38.40%
Married	136	48.40%
Widowed	23	8.20%
Divorced	6	2.10%
Never married	3	1.10%
Separated	5	1.80%
Total	281	100%

### 5.1.3 Literacy levels

Interestingly the research revealed that most of the participants were fairly educated with about 48.80% of the whole sample having reached secondary school. Those who had just completed primary education constituted 26.70% of the whole sample with about 8.9% having not gone to school at all. Those who had attained tertiary level had a low percentage of 13.50%. The general high levels of literacy may be attributed to the fact that the country has a high national literacy level of around 85% (UNDP, 2003) and so the chances of sampling fairly educated people even in rural areas was high. Table 5 below summarises the frequencies discussed.

**Table 5: Education level**

Education levels	Frequency	Percent
None	25	8.90%
Primary	75	26.70%
Secondary	137	48.80%
Tertiary	38	13.50%
Other	6	2.10%
Total	281	100%

### 5.1.4 Source of energy

The research revealed that 51.60% of households had access to electricity whilst 40.90% used wood as a source of energy for cooking and lighting. The remaining 8% reported using gas, paraffin and other sources of energy. The fact that electricity use was high may be attributed to high ownership of solar panels which are a source of solar electricity. However the questionnaire did not distinguish between those who used hydro-electricity and solar electricity.

**Table 6: Sources of Energy**

Sources of energy	Frequency	Percent
Electricity	145	51.60%
Wood	115	40.90%
Gas	5	1.80%
Parrafin	15	5.30%
Other	1	0.40%
Total	281	100%

### 5.1.5 Average Household Expenditure and Debt.

The average monthly expenditure per household which was used as a proxy to income was US\$ 125.07 and average household debt was US\$ 12.07 respectively. Expenditures were generally high because of the Christmas festivities in December. More discussion on the high expenditures is given under the methodology chapter. Table 7 summarises the average incomes and debts of households.

**Table 7: Average household income and debt**

Description	in Z\$	in US\$
Average household debt	68,247.33	12.40
Average household monthly expenditure	687,886.33	125.07

## 5.2 Malaria Prevention and Treatment

This section analyses the malaria preventive measures adopted by households.

### 5.2.1 Type of Preventive Measures

The study revealed that more than half of the households were using preventive measures to reduce the chances of getting infected with malaria. Table 8 summaries the main preventive measures mentioned by respondents.

**Table 8: Preventive Measures**

Types of preventive measures	Frequency	Percent
Buy mosquito nets	74	38.1
Insecticide spraying	36	18.6
Repellents	56	28.9
Other	28	14.4
Total	194	100

Out of the 281 respondents about 69% indicated that they were instituting preventive measures to combat malaria in the future with the remainder of 31% confirming that they were not doing anything to deal with the disease (see Table 8). Out of the 194 who indicated implementing preventive measures, 38.10% said that they were using mosquito nets and 28.90% were using mosquito repellents. In addition, 18.60% were using insecticide spraying as a way of mitigating the effects of mosquitoes whilst 14.40% indicated using other measures of preventing malaria such as wearing clothes which cover much of the body and taking anti-malarial pills.

### 5.2.2 Income Levels and Preventive Measures

There was an interesting relationship between income levels and the ability and willingness to implement preventive measures.

**Table 9: Preventive Measures by Income Quartiles (% of households in each quartile taking or not taking preventive measures)**

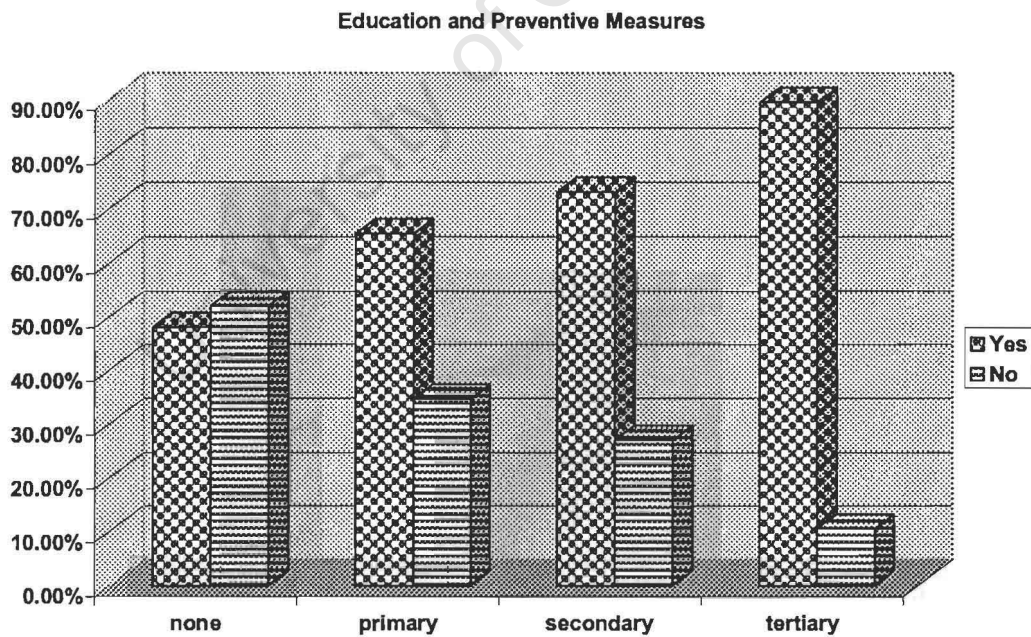
	Yes	No	Total
	Lowest Quartile	22 31.40%	48 68.60%
2nd Quartile	54 76.10%	17 23.90%	71 100.00%
3rd Quartile	59 83.10%	12 16.90%	71 100.00%
Highest Quartile	61 88.40%	8 11.60%	69 100.00%
Total	196 69.80%	85 30.20%	281 100.00%

As Table 9 shows, the percentage of those households who instituted preventive measures increased with increasing economic status. Only 31.40% of household in the lowest quartile (poor households) took preventive measures to minimise malaria infection whilst 68.60% did not do anything. However the picture changes if you compare those who instituted preventive measures in the 4<sup>th</sup> quartile which represents the rich households. Specifically 88.40% of respondents in this category indicated that they took some preventive measures in the past month to minimise malaria infection whilst only 11.60% of respondents in that high income category did not do anything.

### 5.2.3 Education and Preventive Measures

The data revealed that there was a positive relationship between education levels of household members and the ability or willingness to implement preventive measures. In other words as the education levels increased, the percentage of households instituting preventive measures also increased dramatically. In Figure 4, the percentage of respondents who indicated instituting preventive measures was 48% for those who did not have any education and as the education levels increased, so did the percentage of those implementing preventive measures. At the highest level of education (tertiary), 89.50% of respondents in that group instituted preventive measures to only 10.50% who did not.

Figure 4: Education and Preventive Measures



### 5.3 Malaria Severity

This section will discuss issues related to malaria severity.

#### 5.3.1 Malaria Severity

As shown in Table 10, about 60.10% of the respondents indicated that they had suffered severe malaria and about 39.10% reported having suffered mild malaria. The remainder of about 0.7% were not sure of the state of malaria they suffered.

**Table 10: State of malaria**

Types of malaria	Frequency	Percent
Severe	169	60.10%
Mild	110	39.10%
Dont know	2	0.70%
Total	281	100%

#### 5.3.2 Age and malaria severity

As Table 11 indicates, there were 64.10% severe malaria sufferers and 33.30% mild sufferers in the 0 to 11 years age group. In the 12 to 17 year age range, there were 70.40% severe malaria sufferers and 29.60% mild sufferers. The 18 to 60 year age group had 57.50% severe sufferers and 42.00% mild sufferers respectively. Lastly the over 60 years age group had 66.70% severe malaria sufferers and 33.30% mild sufferers.

**Table 11: Age and malaria Severity (percentage distribution of severity in each age group)**

Age and severity				Total
	Severa	Mild	Don't know	
0 -- 11	25	13	1	39
	64.10%	33.30%	2.60%	100.00%
12--17	19	8	—	27
	70.40%	29.60%	—	100.00%
18--60	115	84	1	200
	57.50%	42.00%	0.50%	100.00%
> 60	10	5	—	15
	66.70%	33.30%	—	100.00%
Total	169	110	2	281
	60.10%	39.10%	0.70%	100.00%

### 5.3.3 Income and malaria Severity

Table 12 shows the severity of malaria cases by income levels. Those households in the lowest quartile (low income) had 71.40% of their members suffering from severe malaria whilst 28.60% suffered from mild malaria. The percentages of those suffering from severe and mild malaria changes as one goes up the income quartiles i.e. from the lowest to the highest quartile (high income) where 58.00% suffered severe malaria compared to 40.60% who suffered mild malaria. Thus as the income levels increased, the percentage of severe sufferers decreased.

**Table 12: Income and malaria Severity (% in each income quartile suffering from severe or mild malaria)**

	Severe	Mild	Don't know	Total
	Lowest Quartile	50 71.40%	20 28.60%	
2nd Quartile	38 53.50%	32 45.10%	1 1.40%	71 100.00%
3rd Quartile	41 57.70%	30 42.30%		71 100.00%
Highest Quartile	40 58.00%	28 40.60%	1 1.40%	69 100.00%
Total	169 60.10%	110 39.10%	2 0.70%	281 100.00%

#### 5.3.4 Malaria Severity and Household Debt

There was a positive correlation between household debt and malaria severity. Table 13 shows that many households with a severe malaria sufferer had also borrowed money from diverse sources in the past month. In fact 42.60% of severe malaria sufferers had also borrowed money in the past month whilst 55.60% did not borrow anything. However 35.50% of mild malaria sufferers borrowed money in the past month compared to 61.80% who did not borrow.

**Table 13: Malaria Severity and Household Debt (% in each severity category who did or did not borrow money)**

	Did you borrow money in the past month?			Total
	Yes	No	Don't know	
Severe	72	94	3	169
	42.60%	55.60%	1.80%	100.00%
Mild	39	68	3	110
	35.50%	61.80%	2.70%	100.00%
Don't know	_____	1	1	2
	_____	50.00%	50.00%	100.00%
Total	111	163	7	281
	39.50%	58.00%	2.50%	100.00%

#### 5.4 Treatment Seeking Behaviour

This section will briefly detail the treatment seeking behaviour of the respondents in the study.

##### 5.4.1 Source of Treatment

As shown in Table 14, when seeking treatment most of the respondents said they went to a public hospital or clinic and this was shown by the fact that 75.4% of the respondents went to seek treatment from a public hospital or clinic. Nearly 16% of respondents indicated that they sought treatment from private health facilities. However 2.5% of the respondents indicated that they used a drug seller or a faith healer with 6.40% saying that they used other means of treatment not mentioned in the given options and this may include those who did not attempt to seek treatment at all.

**Table 14: Source of treatment**

Type of facility	Frequency	Percent
Public clinic	33	11.70%
Public hospital	179	63.70%
Private facility	44	15.70%
Drug seller	4	1.40%
Faith healer	3	1.10%
Other	18	6.40%
Total	281	100%

The fact that almost two thirds of the respondents had used a public hospital might reveal that most people are now by-passing clinics and going straight to hospitals because of lack of faith in the lower levels of the health care system especially in view of the acute shortage of medicines in the smaller health centres like clinics.

#### **5.4.2 Malaria Severity and Source of Medicine**

As Table 15 shows, most severe malaria sufferers (73.40%) went to public health facilities to purchase drugs whilst the remainder of 26.60% went to private facilities, pharmacies, traditional healers and drug sellers respectively. In sharp contrast only 49.10% of mild malaria patients went to public health facilities whilst 24.50% and 16.40% of patients went to private facilities and pharmacies respectively.

**Table 15: Malaria Severity and Source of Medicine (% distribution between sources of care by severity category)**

	Public Hospital	Public Clinic	Drug Seller	Private Facility	Pharmacy	Traditional Healer	Other	Total
<b>Severe</b>	80	44	9	18	16	2		169
	47.33%	26.03%	5.30%	10.70%	9.50%	1.20%		100.00%
<b>Mild</b>	39	15	6	27	18	3	2	110
	35.45%	13.63%	5.50%	24.50%	16.40%	2.70%	1.80%	100.00%
<b>Don't know</b>	1		1					2
	50.00%		50.00%					100.00%
<b>Total</b>	120	59	16	45	34	5	2	281
	42.70%	21.00%	5.70%	16.00%	12.10%	1.80%	0.70%	100.00%

#### 5.4.3 Source of Treatment and Income Quartiles

There was an inverse relationship between income levels and the sources of treatment. The number of respondents using public health facilities gradually fell as the income levels increased. As Table 16 shows, 92.80% of households in the low income category (lowest quartile) used either a public clinic or public hospital for malaria treatment whilst the remainder accessed a private facility, drug sellers etc. However in the highest quartile which constitutes the high income households, 60.80% of households used a public clinic or hospital with 29.00% using private facilities. Based on these results the inference is that those who are poor were mostly utilising public facilities whilst those with higher incomes were using a combination of both public and private facilities.

**Table 16: Source of Treatment and Income Quartiles (% distribution between sources of care by income quartile)**

	Public Clinic	Public Hospital	Private Facility	Drug Seller	Faith Healer	Other	Total
Lowest Quartile	11	54	2	1	1	1	70
	15.70%	77.10%	2.90%	1.40%	1.40%	1.40%	100.00%
2nd Quartile	9	47	6	1	1	7	71
	12.70%	66.20%	8.50%	1.40%	1.40%	9.90%	100.00%
3rd Quartile	6	43	16	2	1	3	71
	8.50%	60.60%	22.50%	2.80%	1.40%	4.20%	100.00%
Highest Quartile	7	35	20			7	69
	10.10%	50.70%	29.00%			10.10%	100.00%
Total	33	179	44	4	3	18	281
	11.70%	63.70%	15.70%	1.40%	1.10%	6.40%	100.00%

#### 5.4.4 Means of Seeking Care

As was expected (Table 17), most of the people who sought care went on foot to health centres. About 65.50% indicated that they went to a health centre on foot and this was expected as most people in rural areas do not own any means of transport. Besides it is generally difficult to find a car for hire in rural areas. About 12.10% however managed to use a car to take them to a health centre with 13.50% indicating that they used a wheelbarrow to take the sick person to a health facility.

**Table 17: Means of seeking care**

Means of seeking care	Frequency	Percent
On foot	184	65.50%
Bicycle	7	2.50%
Hired car	34	12.10%
Wheelbarrow	38	13.50%
Cart	2	0.70%
Other	16	5.70%
Total	281	100%

#### **5.4.5 Average Time Taken to Seek Care**

The average time taken by respondents to go and seek care and then come back was calculated in hours. As shown in Table 18, the highest number of hours lost were for those who used wheelbarrows and carts as they spent 49.81 and 49.50 hours respectively. Those who either walked or used bicycles lost about half the time that those using wheel burrows and carts lost. Those using a hired vehicle lost the least time which was on average about 1.76 hours.

**Table 18: Average Time Taken to Seek Care**

Type of Transport	Average time lost to seek care in hours
On foot	21.84
Bicycle	21.57
Hired Car	1.76
Wheebarrow	49.81
Cart	49.50
Other	17.12

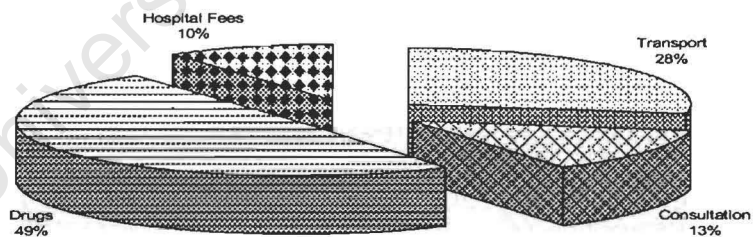
## 5.5 Direct costs of malaria

This section will explore the distribution of direct costs amongst the main components of direct costs namely: transport costs, outpatient consultation fees, hospitalisation fees and drug costs. These costs were also analysed in terms of severe and mild malaria.

### 5.5.1 Direct Costs for Severe malaria

Analysis of severe malaria costs alone showed that drug costs were the highest (49%) in severe malaria sufferers. Transport costs for both the malaria sufferer and the caretaker constituted about 28% of total costs followed by outpatient consultation fees at 13% of total costs. Inpatient hospital fees constituted 10% of total costs. The description above is summarized in the pie chart in Figure 5.

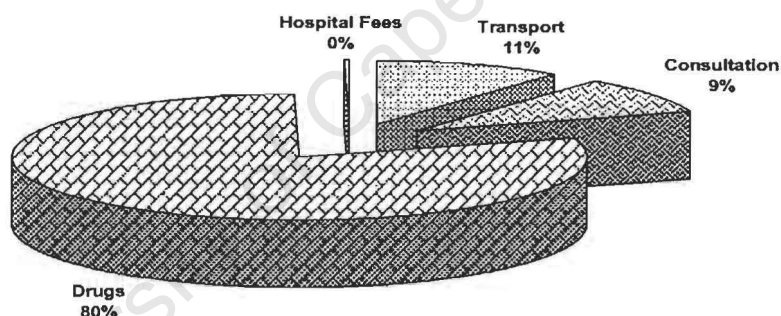
**Figure 5: Components of Direct Costs of Severe malaria**



### 5.5.2 Direct costs for Mild malaria

For those who suffered mild malaria, drugs constituted far more than half of their direct costs (80%). Transport costs followed with 11% and consultation last at 9%. There were no inpatient hospital fees as the mild malaria sufferers could be easily treated without the patient being hospitalised.

Figure 6: Distribution of Direct Costs of Mild malaria

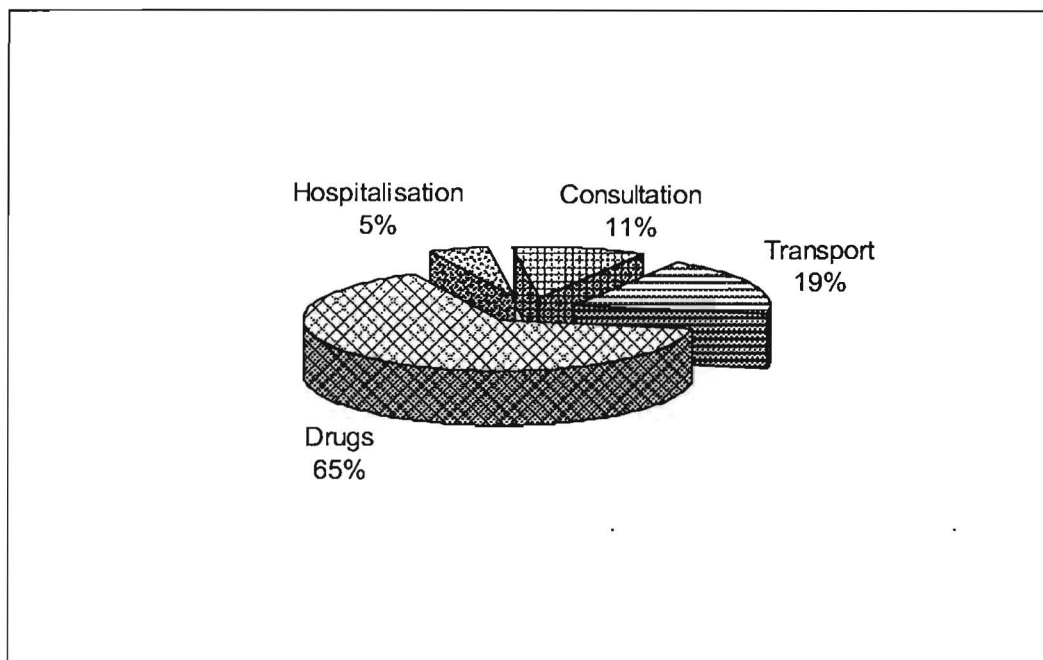


### 5.5.3 Total direct Costs of Severe and Mild malaria

Drug costs accounted for the biggest percentage of the direct costs of both severe and mild malaria, contributing about 65% of total direct costs. In addition total transport costs were also significant contributing 19% of total direct costs. Outpatient consultation fees were third highest contributing 11% of total direct costs. Inpatient hospital fees contributed the least percentage of only 5%.

Figure 7 below summaries the discussed percentages.

**Figure 7: Components of Total Direct Costs of malaria Care.**



## 5.6 Average direct costs

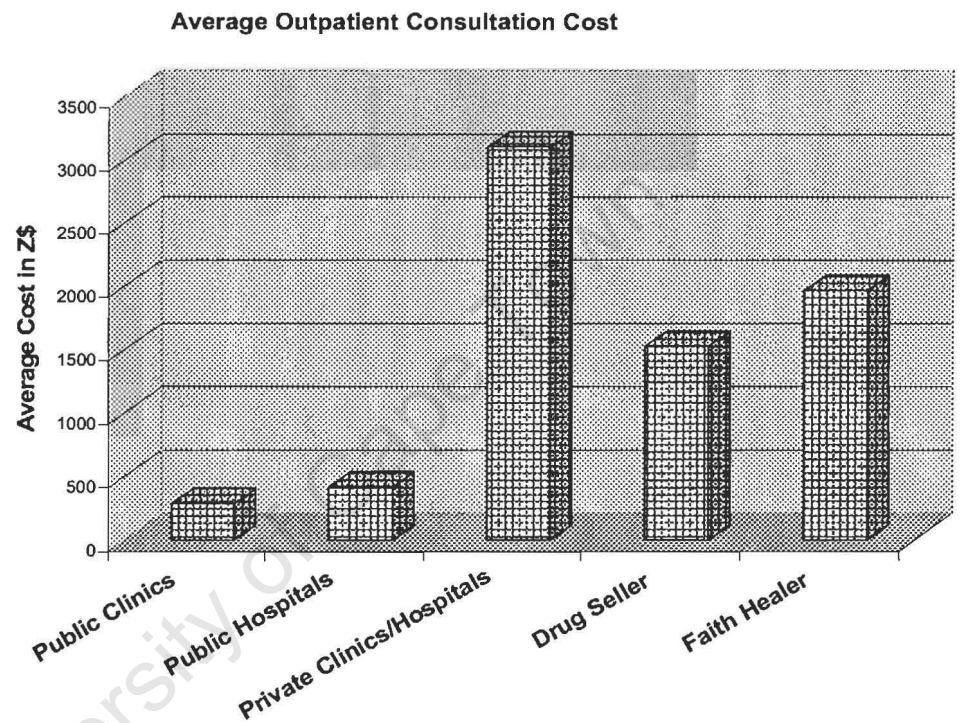
This section will cover the average direct costs for outpatient consultation and drugs. In addition it will also analyse the average total direct costs of mild and severe malaria.

### 5.6.1 Average Outpatient Consultation Costs by Source of Treatment

The average costs for outpatient consultation fees varied dramatically from facility to facility. The cheapest consultation costs were in public clinics where the average cost was Z\$286.00. The most expensive consultation fees were charged in private facilities with an

average of Z\$ 3108.00. It should also be noted that faith healers were charging the second highest consultation fees after private facilities. The average consultation fee charged by faith healers was Z\$1967.00. Figure 8 gives more details.

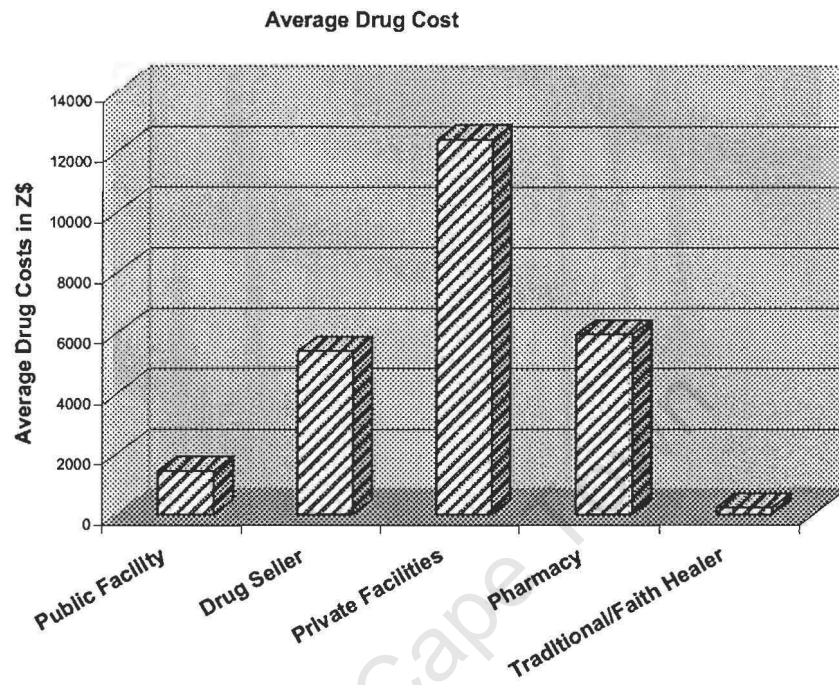
**Figure 8: Average Costs of Outpatient Consultation**



### 5.6.2 Average Medicine Costs

The highest cost for medicines were in private facilities (Z\$12 411.00) whilst the lowest cost was charged by traditional healers or faith healers (Z\$221.00). Pharmacies and drug sellers had a similar average price of Z\$ 5971.00 and Z\$ 5409.00 respectively. Public facilities had an average drug cost of Z\$1454.00. Figure 9 gives a graphical depiction of the average drug costs for the different drug sources.

**Figure 9: Average Drug Costs**



### 5.6.3 Average Costs per Severe malaria Case

The study showed that there were 169 severe malaria sufferers and thus the following calculations are based on that number. As shown in the Table 19, the highest cost per severe malaria case was drugs at 74 US cents followed by transport costs at 42 US cents. The average total direct cost per malaria case was US\$1.51 respectively.

**Table 19: Average costs per severe malaria case**

Severe Malaria			
Type of direct cost	Total costs	Average cost per malaria case (Z\$)	Average cost per malaria case (US\$)
Transport costs	389,732.00	2,306.11	0.42
Consultation costs	189,559.00	1,121.65	0.20
Drug costs	688,012.00	4,071.08	0.74
Hospitalisation costs	137,289.00	812.36	0.15
<b>Total costs</b>	<b>1,404,592.00</b>	<b>8,311.20</b>	<b>1.51</b>

#### 5.6.4 Average Costs per Mild malaria Case.

There were 110 mild malaria sufferers and the highest average cost per mild malaria case were drug costs at 67 US cents whilst hospitalization costs were negligible. The total average cost of mild malaria case was 83 US cents. Table 20 summarises the average costs for mild malaria.

**Table 20: Average costs per mild malaria case**

Mild Malaria			
Type of direct cost	Total costs	Average cost per malaria case (Z\$)	Average cost per malaria case (US\$)
Transport costs	53,834.00	489.40	0.09
Consultation costs	46,989.00	427.17	0.08
Drug costs	402,732.00	3,661.20	0.67
Hospitalisation costs	912.00	8.29	0.00
<b>Total costs</b>	<b>504,467.00</b>	<b>4,586.06</b>	<b>0.83</b>

#### 5.6.5 Average Total Costs Per malaria Case (Severe and Mild).

The main direct costs measured in this study were transport costs, consultation costs, hospital fees and drug costs. The average direct cost of malaria irrespective of whether it

was severe or mild was US\$ 1.24. This cost combines the average costs of mild malaria and those of severe malaria.

### 5.6.6 Sources of finance for Treatment

As shown in Table 21, the major source of finance to pay for treatment costs was household income and was mentioned by 75.6% of the respondents followed by the use of household savings with 17.3%. Only 6.27% were selling assets to finance the costs of treatment.

**Table 21: Source of Finance for Treatment**

Income sources	Frequency	Percent
Household income	205	75.64%
Household savings	47	17.33%
Selling assets	17	6.27%
Other	2	0.76%
Total	271	100.00%

### 5.7 The Association Between Household Debt and Income Levels

As shown in Table 22, the percentage of households borrowing funds decreased as the income levels of the household went up. In the lowest quartile (low income households) the percentage of households who borrowed was 42.90% compared to 54.30% who did not. However the percentage of borrowers in the highest quartile (high income) was only 26.10% compared to 69.60% of households who did not borrow.

**Table 22: Household debt by Income Quartiles**

	Did you borrow money in the past month?			Total
	Yes	No	Don't know	
Lowest Quartile	30	38	2	70
	42.90%	54.30%	2.90%	100.00%
2nd Quartile	34	35	2	71
	47.90%	49.30%	2.80%	100.00%
3rd Quartile	29	42	—	71
	40.80%	59.20%	—	100.00%
Highest Quartile	18	48	3	69
	26.10%	69.60%	4.30%	100.00%
Total	111	163	7	281
	39.50%	58.00%	2.50%	100.00%

Thus Table 22 indicates that as the income levels decreased the percentage of households who had borrowed funds increased. However the results should be interpreted with caution because borrowing in this instance was not just for malaria treatment and care but it was borrowing in general. Although in most instances the borrowing may have been used to finance malaria treatment activities it may well have been used to finance other household needs not necessarily related to malaria treatment and care.

## **5.8 Lost Productive Time due to malaria**

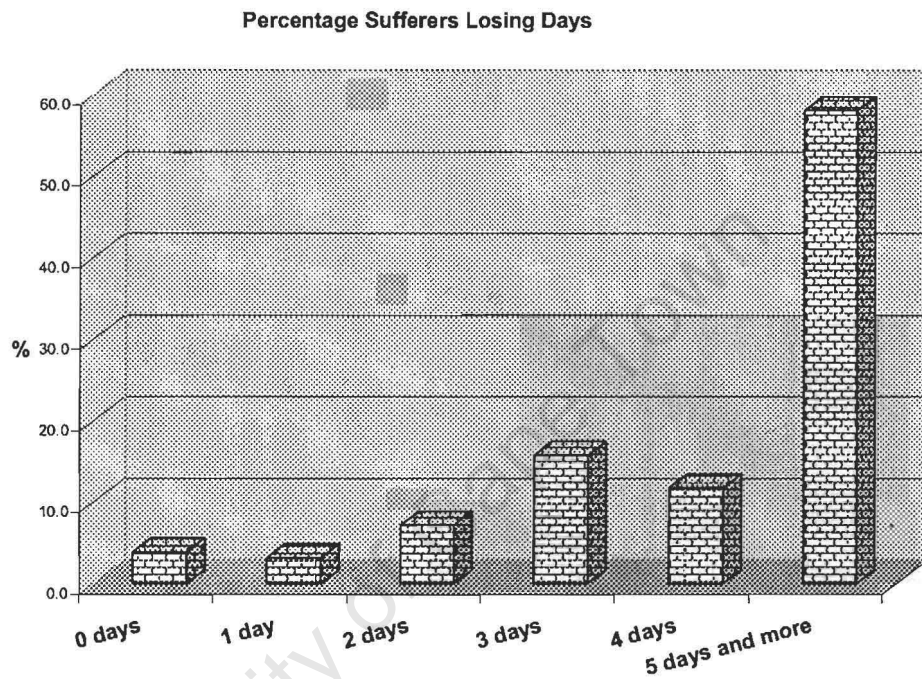
This section will highlight the time lost by sufferers, caretakers and school children.

### **5.8.1 Percentage of Days lost by All malaria Sufferers**

As Figure 10 shows, the majority of malaria sufferers lost more than five days due to sickness. Specifically 58.10% of all malaria sufferers lost more than five days due to malaria whilst 15.80% and 11.80% of sufferers lost three and four days respectively.

About 3.80% of sufferers did not lose any days during their sickness whilst 3.2% lost a day during their malaria sickness.

**Figure 10: Percentage of Sufferers Losing Days**



### 5.8.2 Time Lost by Sufferer and Caretaker Irrespective of Gender

The time lost by sufferer is described as that time when the malaria sufferer could not do his or her normal duties whilst that of the caretaker is when he or she took time off to look after a household member sick with malaria.

As indicted in Table 23, all severe malaria sufferers had a combined total loss of 2665 days. The average number of days lost per sufferer was 16 days. All the caretakers for severe malaria sufferers lost a total of 682 days and on average each severe malaria caretaker lost 6 days. In sharp comparison, the mild sufferers and their caretakers lost far

less days than severe malaria sufferers and their caretakers. Specifically mild malaria sufferers lost a cumulative total of 427 days with an average of four days per mild malaria sufferer whilst the mild malaria caretakers lost a cumulative total of about 164 days in total and three days on average per caretaker.

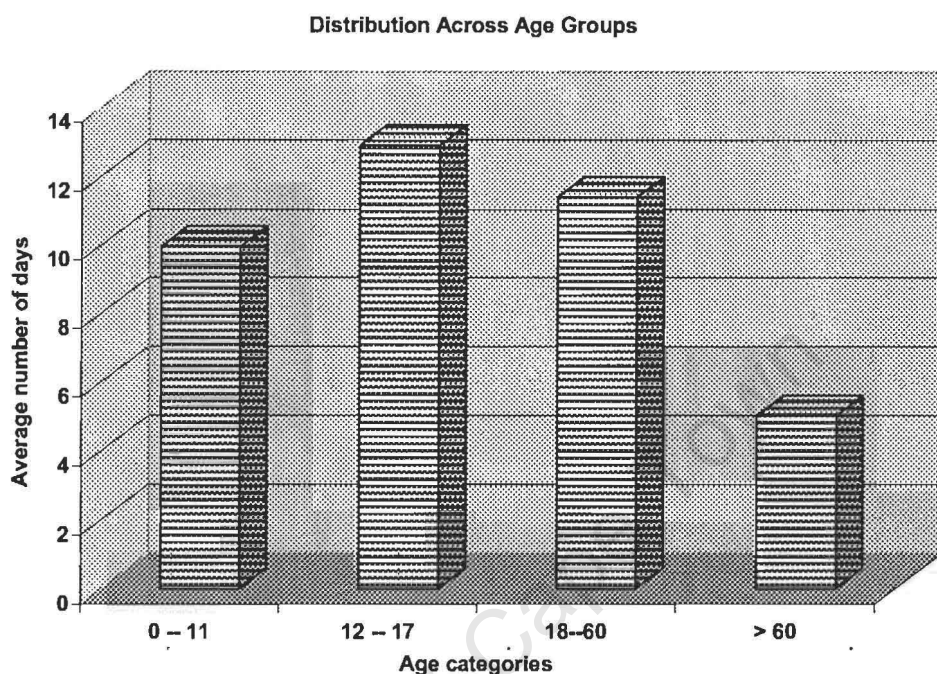
**Table 23: Time lost by sufferer and caretaker**

Severe Malaria		
Type of person	Total time lost in days	Average time lost in days
Malaria sufferer	2665	16
Caretaker	682	6
Total	3347	21
Mild Malaria		
Type of person	Total time lost in days	Average time lost in days
Malaria sufferer	427	4
Caretaker	164	3
Total	591	7

### 5.8.3 Lost Time by Age Group – malaria Sufferer

As Figure 11 indicates, within each category of lost time, the highest losers of time were those between the ages of 12 to 17. In this age group, all malaria sufferers lost on average about 13 days per malaria sufferer whilst the second biggest losers were those between the ages of 18 to 60 who lost about 11 days per sufferer. The least number of lost days were in those above 60 years of age (4 days). It should also be noted that the analysis of lost time was done irrespective of malaria severity.

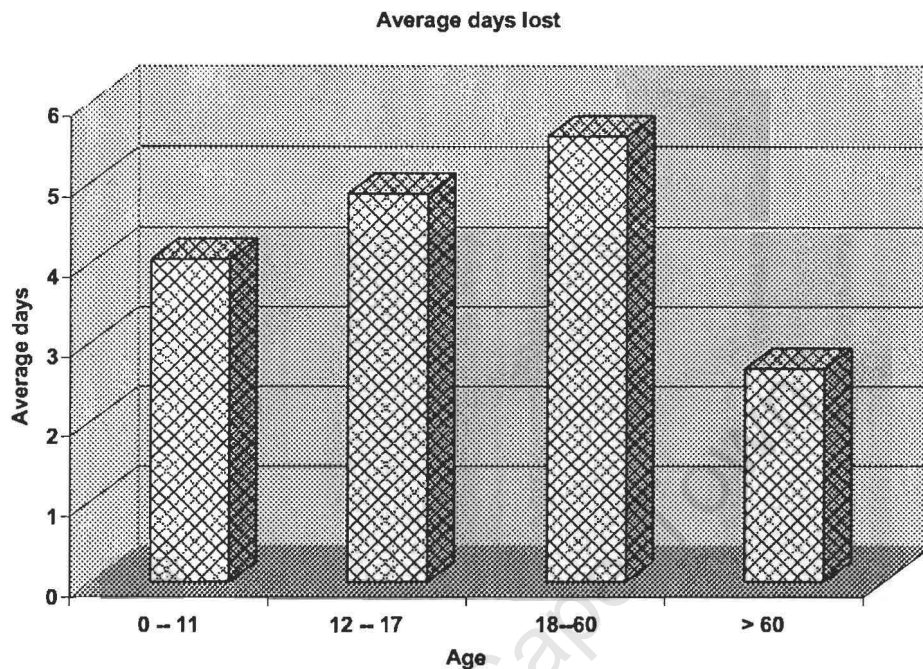
**Figure 11: Distribution Across Age Groups – malaria Sufferer**



#### **5.8.4 Lost Time by Age Group – malaria Caretaker**

The results also showed that those caretakers between the ages of 18 to 60 years were the highest losers of time amongst all the caretakers. Specifically the 18 to 60 year olds lost an average of five and half days whilst caring for the sick. This was followed by the 12 to 17 year age group where an average of nearly five days was lost whilst caring for malaria sufferers. Notably children below the age of eleven lost a significant number of days (four days on average). Figure 12 shows the average days lost by caretakers of different age groups per case of malaria and it was an average for all caretakers in the study.

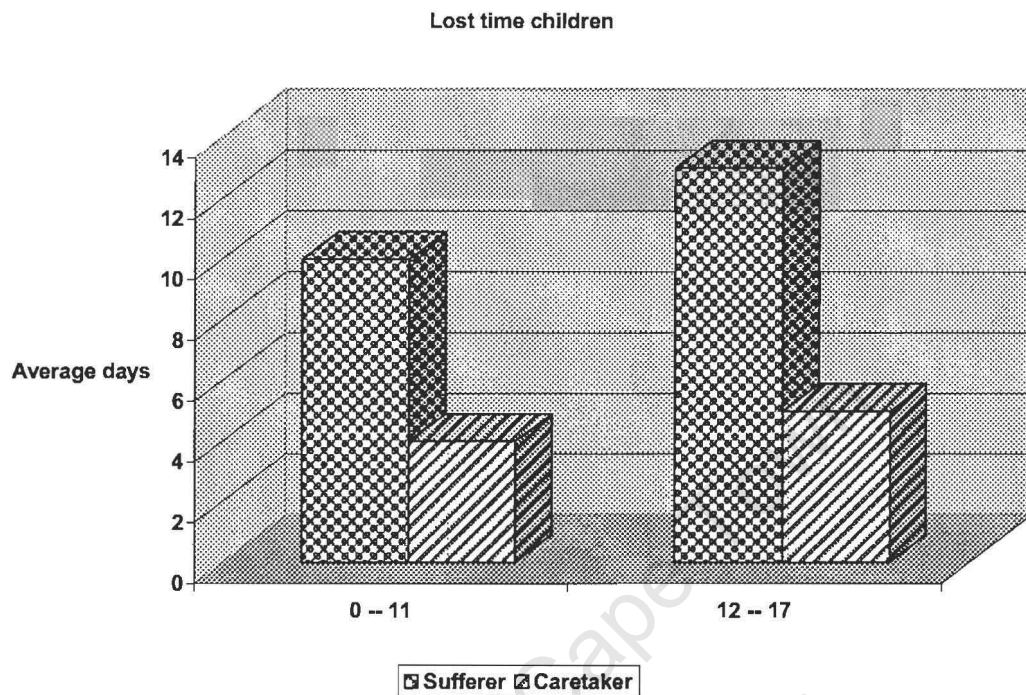
**Figure 12: Average Lost Days - Caretaker**



### 5.8.5 Lost Time by School Children

The study revealed that for those child malaria sufferers who had lost time, the loss was on average about 9 days due to malaria sickness for the 0 to 11 year age group. Those in the 12 to 17 year age group lost on average about 12 days. In addition child caretakers lost about 4 days on average for the 0 to 11 year age group and about three and a half days for the 12 to 17 year age group. Figure 13 gives an overview of average days by child sufferers and caretakers. The overall average days lost by school children were about 7 school days per child. The average days lost by children in this study are consistent with results from other studies by Kere et al. (1993) where school children lost on average 5.3 days and Leighton & Foster (1993) where school children lost between 3 to 12 days on average.

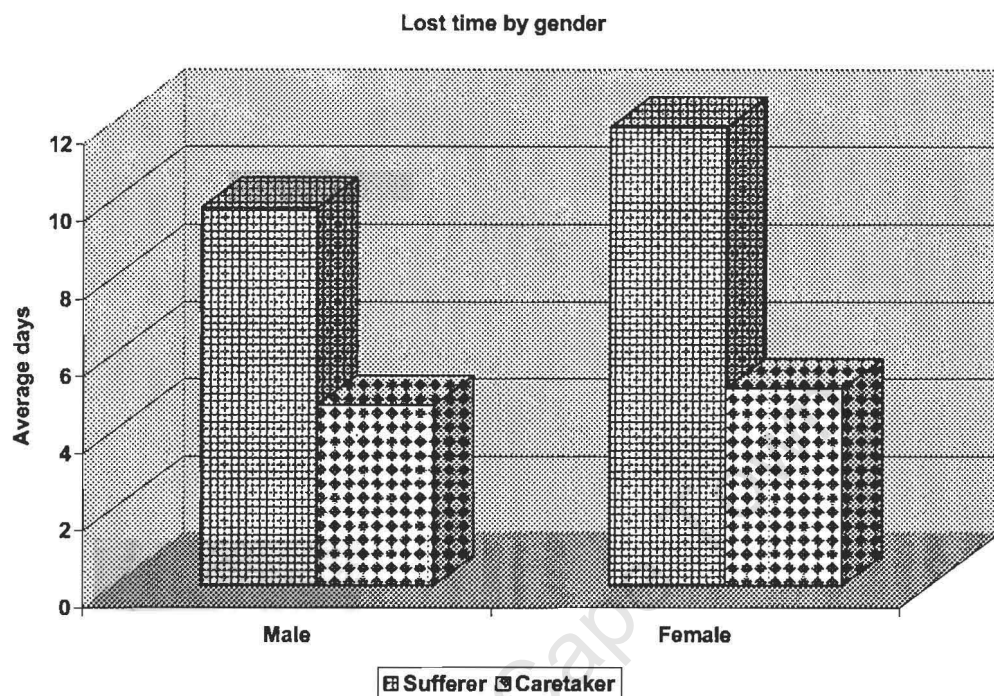
**Figure 13: Lost Time by School Children**



### 5.8.6 Distribution of Lost Time by Gender

As shown by Figure 14, on average, 9 days were lost per male sufferer and 11 days were lost per female sufferer as a result of malaria sickness. The higher average days lost by female sufferers may be explained by social, cultural marginalisation of women where they are less likely to access health services early and as easily as men. In addition 4 days were lost per male caretaker and 4.5 days per female caretaker.

Figure 14: Lost time by Gender



## 5.9 Indirect costs of malaria

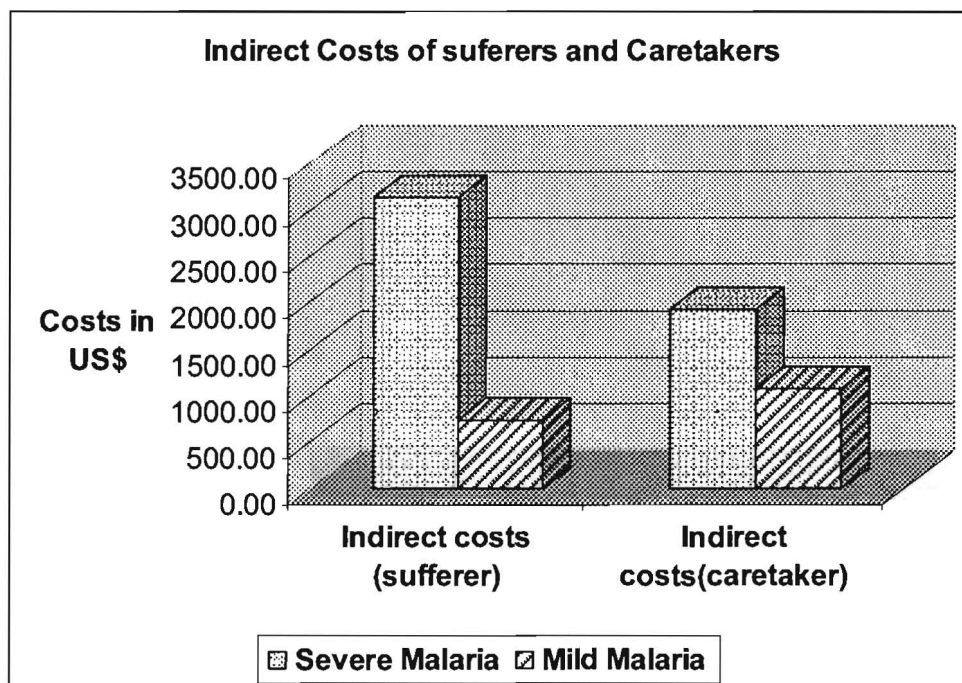
The following section will analyse the distribution of indirect costs between severe and mild malaria.

### 5.9.1 Total Indirect Costs of Mild and Severe malaria

A comparison was done between indirect costs for malaria sufferers and caretakers in terms of severe and mild malaria. As Figure 15 shows, severe malaria sufferers suffered the highest indirect costs as it took them longer to recover. This meant that they lost more productive time resulting in more indirect costs. Consequently their caretakers also suffered higher costs compared with caretakers of mild sufferers. This is so because severe malaria sufferers required more care time during sickness than mild sufferers. For

example they may have required help to walk, eat and do other basics yet the mild sufferer could manage such activities without much help. In addition mild sufferers would recover within a shorter time than severe malaria sufferers resulting in lower costs. Thus the productive time lost by both the mild malaria sufferers and their caretakers was lower hence lower indirect costs. Figure 15 summarises the analysis.

**Figure 15: Total Indirect Costs of Sufferers and Caretakers**



**5.9.2 Total Indirect Costs irrespective of malaria Severity.**

A summary of total indirect costs is given in the Table 24. The third income quartile which may be considered as the middle to high income households had the highest average indirect costs per malaria case. Irrespective of income levels the average indirect cost of malaria was US\$ 9.27. It should be noted that the average indirect costs of malaria were higher than average direct costs of malaria. This finding is consistent with other

economic burden of illness studies including malaria where average indirect costs have been concluded to be higher than average direct costs.

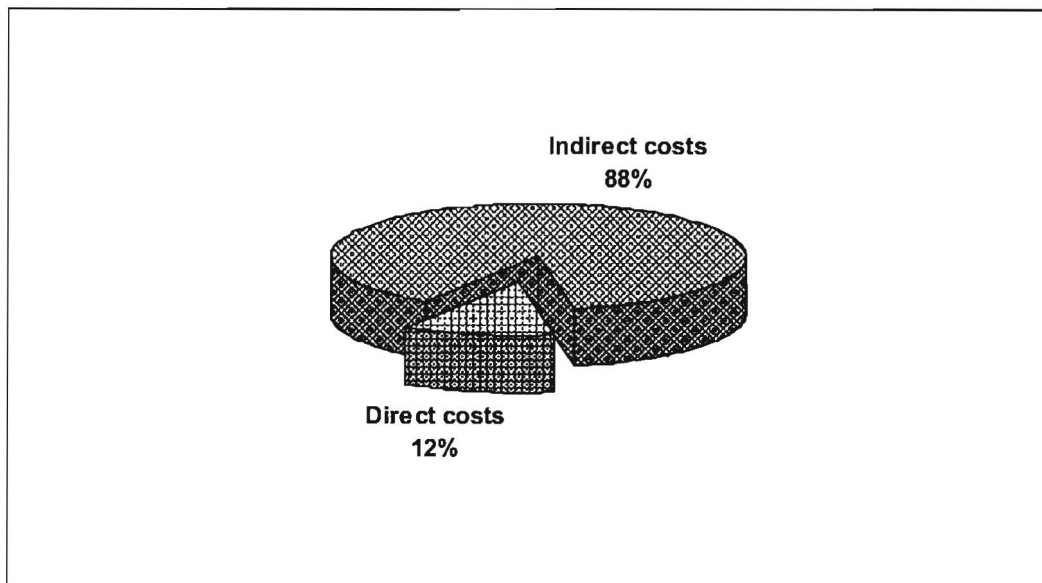
**Table 24: Summary of Indirect Costs**

Income Quartiles	Total Indirect costs (Z \$)	Total Indirect (US\$)	Average Indirect costs per Malaria Case (Z \$)	Average Indirect costs per Malaria Case (US \$)
Lowest quartile	3,730,016.75	678.18	53,285.95	9.69
2nd quartile	3,485,180.20	633.67	49,788.29	9.05
3rd quartile	4,111,552.28	747.55	57,909.19	10.53
Highest quartile	2,899,705.89	527.22	42,642.73	7.75
Total	14,226,455.12	2,586.63	50,990.88	9.27

### 5.10 Total Costs (Direct and Indirect costs)

The direct and indirect costs of malaria discussed in this section were based on the total costs reported across all malaria cases. Analysis of total costs (direct costs and indirect costs added up together) indicates that indirect costs constitute a greater percentage of the total costs. As shown in Figure 16 indirect costs constituted 88% of total costs whilst direct costs only constituted 12% of total costs. This finding is consistent with other studies like one done in Ghana by Asenso - Okyere and Dzator (1997) where indirect costs constituted 79%. In Sri Lanka, Attanayake et al. (2000) also found that indirect costs constituted a far larger portion than direct costs.

**Figure 16: Total Costs**

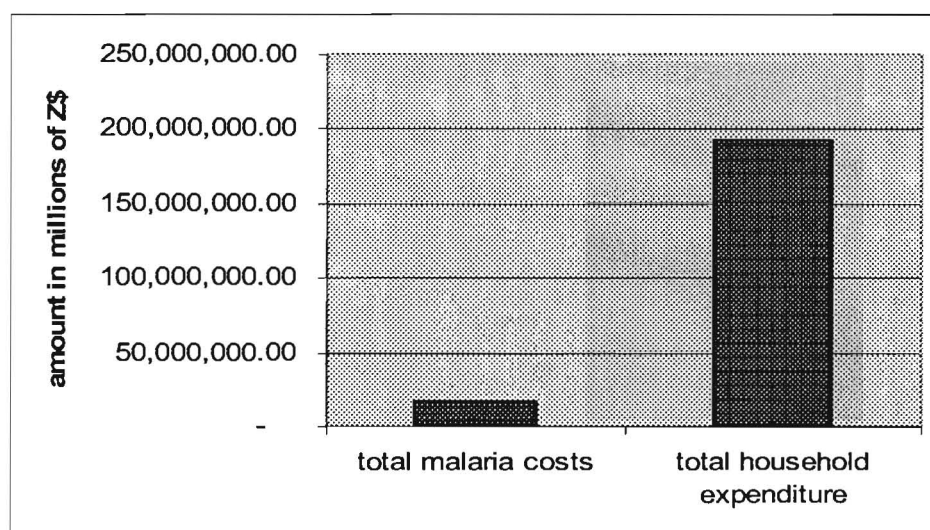


However the extent to which indirect costs outweigh direct costs depends on the type of method used to calculate them in the first place. Some methods tend to underestimate indirect costs whilst others tend to overestimate them. Thus the proportion of indirect costs tends to differ from study to study.

### **5.11 Comparisons of Total Costs and Household income.**

As shown in the Figure 17, total malaria costs were very small compared to household income. However this conclusion should be treated with caution because the household income was also influenced by the festive season when the study was done. A lot of households spend more at this time of the year thus increasing their expenditures considerably.

**Figure 17: Comparison of Total Costs and Household Income.**



However the fact that malaria costs alone were almost 9% of total household income, shows that the burden of malaria on households is quite high.

### **5.12 Regressivity of Costs on Poor Households.**

Literature has shown that costs of illness normally impose the highest burden on the poorest households. When the analysis of costs is done the low income households (lowest quartile) often have low total costs. However if costs of malaria are analysed as a percentage of income, then the cost burden is heavily skewed towards the low income group (lowest and second quartiles). Table 25 shows the total household costs of malaria as a percentage of income from the lowest quartile to the highest quartile (low income to high income households).

**Table 25: Total Costs as a Proportion of Income.**

Income Quartiles	Total costs (Direct & Indirect) (Z \$)	Total Household Income (Z \$)	Costs as % of Income
Lowest quartile	3,981,441.75	16,909,940.00	23.54
2nd quartile	3,911,100.20	20,631,600.00	18.96
3rd quartile	4,659,892.28	35,406,520.00	13.16
Highest quartile	3,583,079.89	120,348,000.00	2.98
Total	16,135,514.12	193,296,060.00	8.35

Thus despite the low to middle income households (lowest and second quartiles) having an average cost of US\$ 9.69 and US\$ 9.05 per malaria case respectively, the total cost as a percentage of income is in fact the highest when all the income levels are compared. Specifically the low to middle income groups had about 23.54% and 18.96% of their incomes being accounted for by malaria related costs. In sharp contrast the highest quartile which consists mainly of high income households had only 2.98% of their income being taken by malaria related costs. This is so because the malaria costs on poor households make up a higher proportion of their monthly or annual income compared to high income households. Kindly refer to Table 24.

In fact poor households are caught in a vicious cycle whereby they delay seeking treatment because of lack of financial resources only to do so when the sickness is severe and then incur greater costs, especially lost productivity thus impoverishing them further. When they are impoverished, they delay treatment even further when they are attacked by the next episode, incurring more production losses and the cycle continues. This results in malaria costs imposing a greater burden (as a % of income) on poor households than on better off households. This phenomenon is explained by results presented earlier where low to middle income households (lowest and second quartiles) also had a higher percentage of severe malaria sufferers as compared to the third and highest quartiles (middle to high income households). Kindly refer to Table 12 for further details.

### 5.13 Possible limitations of the results

Some of the results should be treated with caution because the measurement of lost time differs from study to study and the overall tendency of most approaches is to over estimate the true indirect costs incurred by households. In this study costs may have been overestimated because of the methodology which was used to measure the costs. By multiplying the total hours/days declared lost by the average wage, the methodology ignored the fact that people in rural areas may not be productive for seven full days per week as the method assumes. In rural areas people may work effectively for less than seven days per week and with that in mind, the current methodology overestimates costs especially indirect costs. In addition the method ignores the likely labour substitution which occurs in the distribution of household labour. A sickness to a family member does not easily translate into losses in production to the household. Other members of the household more often than not come in to help resulting in little or no production losses.

Another point to note is that the identification of a malaria sufferer was based on the personal perceptions of participants meaning that some people might have been identified as malaria sufferers when in fact they were not suffering from malaria clinically. These patients might have different costs from malaria sufferers thus raising the possibility of overestimating or underestimating the true costs of malaria.

Indirect cost measurement was confined to those who could engage in any form of income generating activities. Those below 12 years of age and above 60 years were assumed to be physically and mentally incapable of engaging in productive activities. This exclusion of such people in particular tends to underestimate indirect cost estimates because in most rural settings children and old people tend to contribute immensely to household production. However a similar method was used by Asenso-Okyere & Dzator (1997) in their study in Ghana and Attanayake et al, (2000) in Sri Lanka. This means that it is a fairly acceptable method in malaria cost analysis despite its drawbacks.

## 6 Introduction

This chapter will discuss the results presented in the previous chapter.

### 6.1 Prevention of Malaria

Malaria prevention is always the best way to avoid malaria infections. The study revealed that about a third of the households were not taking malaria preventive measures. This is worrying in view of the potential socio economic consequences of suffering from malaria in the household. This phenomenon may be because most households cannot afford to take preventive measures like mosquito nets as they are beyond the reach of many. Fewer households in the low income quartiles were taking some form of preventive measures whereas in the high income quartiles, the percentage of households instituting preventive measures increased considerably (refer to Table 9). This indicates that the ability to institute preventive measures is heavily influenced by the household's economic well-being.

### 6.2 Malaria Treatment

The fact that almost two thirds of the respondents had used a public hospital to seek treatment might reveal that most people are now by-passing clinics and going straight to hospitals because of lack of faith in the lower levels of the health care system, especially in view of the acute shortage of drugs and medicines in the smaller health centres like clinics. This trend has been observed in other African countries like Malawi (Ettling et al, 1994), Burkina Faso (Sauerborn et al 1996), and Ghana (Asense-Okyerere & Dzator, 1997).

However another school of thought might argue that patients mainly use the public facilities in general because they are far cheaper than private facilities and a lot of people simply do not have the resources to seek care in private facilities in the absence of health insurance. On average, consultation fees at private health facilities were almost 1000% more than those charged at public health facilities (see Figure 8). In addition, drug prices were on average ten times more than public facility prices (refer to Figure 9). Thus the major barrier to health care access for the rural poor is affordability, although lack of drugs is another important factor to them not accessing health care from the lower levels of health care. This explains why the high income households were able to access health services from the private facilities which are more expensive in terms of their fees - outpatient, inpatient, drug costs etc. On the other hand, public health facilities are cheaper in terms of their outpatient consultation costs and drug costs and hence are more attractive to low income patients (see Table 16). Thus the need to ensure that the poor are exempted from paying fees looks more apparent than ever.

Because the poor were struggling to raise funds to pay for malaria care and treatment, most households ended up using household savings or selling assets to pay for malaria treatment and care. Using household savings means that most households were depleting resources which could be used for other purposes or for future use. However the most worrying trend is the selling of assets to pay off malaria related costs. This is so because assets form part of the most important base for household's economic stability and selling them could plunge the household into an economic trap and a poverty cycle. The fact that about 17% of the households in this study were selling assets to cover malaria related costs shows that the economic burden of malaria is potentially high to some households.

### **6.3 Malaria Severity**

The fact that many people in the sample suffered severe malaria might be an indication that most of the sufferers were not accessing curative care early enough for them to be treated but would wait until the illness was serious to seek treatment. The results revealed

that there were more severe malaria sufferers who were in the low income category than in the high income category (see Table 12). This may mean that the people could not afford to pay for treatment to the extent that they avoided seeking care until they were forced to.

In addition there was a positive correlation between household borrowing patterns and malaria severity (refer to Table 13). This finding suggests that because of severe malaria, households were forced to borrow more often than those households with a mild malaria sufferer. It may be plausible to conclude that severe malaria was imposing a greater economic burden on households than mild malaria resulting in them borrowing more and sinking deeper into debt. However this conclusion should be treated with caution as households did not necessarily borrow specifically to finance malaria treatment and care. The data does not specify that the borrowing was for malaria care alone and thus the borrowed resources may have been used for other household needs over and above malaria treatment.

#### **6.4 Direct Costs**

As indicated in Figure 9, drug costs were highest in private facilities and pharmacies were the second most expensive medicine outlets. The cheapest medicine was sold by traditional healers and one possible explanation for this is that the costs of producing traditional healers' drugs are not as high as modern medicines. It may take the bark of a certain tree to cure a patient of a certain ailment whereas modern medicines have to go through the process of manufacturing the drug. Thus costs of branding, research and development are high making the medicines generally more expensive. However, the possibility of other explanations cannot be overruled.

In any case drug costs were the highest direct cost component for both mild and severe malaria sufferers and this may be explained by the fact that severe malaria sufferers would require more medication or stronger medication to recover, thus increasing their

drug costs. As for mild sufferers, the high drug costs maybe due to the purchase of medicines from pharmacies, private health facilities and drugs are normally far more expensive from those sources as compared to public facilities. As indicated in Table 15, a significant number of mild malaria sufferers purchased their drugs from private health facilities compared to a low percentage of severe malaria sufferers. In fact a considerable number of mild malaria sufferers were in the middle to high income category and so they could afford to purchase drugs from private facilities. Similarly, in Ghana it was found that pharmaceuticals accounted for 62% of direct costs for mild malaria and 70% for severe malaria (Asenso– Okyere & Dzator, 1997).

It was interesting to note that average transport costs per severe malaria case were almost five times that of mild malaria case (see Table 19 and Table 20). This interesting finding may be attributed to the fact that a lot of severe malaria patients may have required more advanced treatment care and had to seek care from hospitals where drugs were more likely to be available. In fact more severe malaria sufferers went to purchase drugs from public hospitals (see Table 15). Usually, these hospitals are furthest away from most communities, making it more expensive in terms of transport to go and seek care. By contrast, the majority of mild sufferers could afford to walk to lower levels of care i.e. clinics which are nearer, thus reducing their transport costs. However, other costs like average consultation costs, were not significantly different mainly because the consultation fees are normally constant irrespective of malaria severity.

Moreover transport costs were the second biggest component for severe malaria sufferers mainly because most sufferers would require transport to go and seek care as they were unlikely to walk on their own. This is likely to increase the transport costs considerably. Interestingly, the hospitalisation fees for severe malaria sufferers were the lowest component of total direct costs. This may not be surprising considering the fact that the majority of severe malaria sufferers were using public health facilities which are cheaper and thus more affordable.

Despite the fact that other direct costs of seeking care like transport costs, drug costs are high, the poor are still being charged user fees. These are charges to the individual for health care at the time of utilisation (Nanda, 2002). Unlike other forms of health care financing such as pre-payment schemes or insurance, the timing of payment coincides with the need for health care. In Zimbabwe, user fees have been in use for some time and subsidies on drug costs have been scrapped resulting in patients paying the full amount of drug costs. User fees never achieved their objectives of raising revenue mainly because of the administrative difficulties in implementing the user fees (Singh et al, 2000). At the time of implementation the user fees in Zimbabwe only managed to raise less than 5% of recurrent costs.

One of the prominent issues was that user fees in Zimbabwe did not come about with an improvement in quality of service. In Senegal for example, the introduction of user fees brought with it a marked improvement in the quality of service (Singh et al 2000). Research has proved that the negative effect of a price increase can be offset by the positive attributes of quality with the effect that more people will actually begin to utilise health services when user fees are introduced (Singh et al 2000). This was not the case with Zimbabwe and therefore user fees failed. In any case the exemption of those who were genuinely in need of health care but could not afford it was not effective. A comprehensive study of user fees in Zimbabwe suggests there has been discretionary waiving of fees based on client characteristics and relations or discretionary application of fees based on the motivations and circumstances of providers (Nanda, 2002). In other words the poor were not exempted from paying for health care and this resulted in a marked decline in health service utilisation. For example, a decline in prenatal use was noted in Zimbabwe in the early 1990s when user fees were strongly enforced (Nanda, 2002).

UNICEF also reported that the quality of health services in Zimbabwe had fallen by 30 percent since 1990, twice as many women were dying in childbirth in Harare hospital as before 1990 and fewer people were visiting clinics and hospitals because they could not afford hospital fees (UNICEF, 2000). Attendance at one clinic went from 1200 in March,

1991 to 450 in December, 1991 following imposition of fees (UNICEF, 2000). In any case, participation in the decisions on fees and the use of revenue was only limited to the health facility personnel and the general communities were not fully involved. (Singh et al, 2000).

Thus, in summary, user fees were a failure in Zimbabwe because of demand side factors i.e. the elasticity of demand for health care, (which was very elastic in this instance) lack of improved quality after the introduction of the user fees and supply management factors like user fee exemptions which were abused by health personnel and so did not benefit those genuinely in need of health care but could not afford it. In addition the majority of health facilities could not retain some of the revenue derived from the fees as it all went to treasury. This discouraged health personnel from seriously collecting user fee revenue as they knew quite well that their institution would not benefit.

Another interesting finding was that as income levels of households decreased, the percentage of households who were borrowing money increased marginally (see Table 22). This inverse relationship might be explained by the reality that the initial financial endowment of low income households was so low that any unexpected illness in the household would drain most of the household resources leaving them with no option but to borrow to augment the little left after the illness. In sharp contrast, the initial endowment of rich households was high enabling them to cover themselves financially in the event of unexpected illness in the household. This meant that poor households were consistently being sucked into more debt when illness hit the family.

## **6.5 Indirect costs and Lost Time**

Indirect costs per malaria episode were marginally lower for the low income households than the other higher income households (see Table 24). The fact that low income households in this study had the lowest average indirect costs per malaria case may be explained by the reasoning that poor households tend to earn lower wages yet wages are

an important component in the calculation of indirect costs. Thus, their monetary loss for an hour lost for example is far lower than of rich households. In other studies, indirect cost per episode ranged from as low as US\$0.73 to as high as US\$ 23.00. Specifically in rural Ghana it was about US\$7.63 (Asenso-Okyere & Dzator, 1997), in Malawi it was about US\$ 1.54 (Ettling et al. 1994), rural Burkina Faso, US\$4.21 (Guiguemde et al., 1994) and in Sri Lanka it was about US\$4.15 (Attanayake et al. 2000). The country with the highest indirect costs was Ethiopia with between US\$6.00 and US\$23.00 (Cropper et al, 1999).

The level of indirect costs incurred by malaria sufferers and caretakers was directly linked to the amount of time they lost whilst sick or caring for the sick. Lost time was higher among the severe malaria sufferers and their caretakers than it was for mild malaria sufferers and their caretakers (refer to Table 23). This might be explained by the fact that severe malaria sufferers would take long to recover from illness and so would ultimately lose more days than mild sufferers. Consequently, their caretakers would lose more days than those caretakers for mild-sufferers because it was imperative to invest more time in taking care of the severe malaria patient i.e. preparing special foods helping them walk and eat etc.

In addition, it was interesting to note that caretakers for both severe and mild malaria sufferers lost less time compared to the sufferers. This is so because caretakers are not always with the patients. They are able to carry out one or two productive chores whilst looking after the sick member thus resulting in less lost time compared with the sufferers. However it is important to note that average figures for days lost per malaria episode conceal large variations across individuals. For example in most studies only 50% or less of the sample lost economically productive time due to malaria but a minority lost a lot of time (Russell 2003). In Malawi 52% of adults reported that malaria affected their work or study but 32% of these cases could still work at a reduced rate (Ettling et al, 1994). In Sri Lanka, 39% of malaria patients were economically active (n=133/344) and of these, only 59 patients (17% of the whole sample ) were affected in terms of lost wages, business revenue or lost time for agricultural production (Attanayake et al, 2000). Thus, the

average time losses per individual tend to be over estimated because of the few individuals who might have lost a lot of time thus skewing the average loss upwards.

However the loss of time was not only limited to adults only as children, especially those going to school, were big losers due to malaria sickness. Many of these children have to do household activities in the absence of their parents who will be sick or caring for the sick and this results in loss of school days. (Refer to Figure 13). Children in most rural areas in the developing world including Mtoko district are thus expected to sacrifice school and look after sick elderly household members. In an area of rising endemicity and increasing drug resistance in the highlands of Zimbabwe, school absenteeism due to malaria sickness was as high as 28% (Russell, 2003). With HIV/AIDS scourge, there is also an increase in child caretakers in households as some adults will be too sick to take care of other people or dead altogether (Booyesen 2003). This loss of school days by children has got the potential to affect their future prosperity assuming they are deprived of education now.

#### **6.6 Total Costs.**

The research also showed that if the total costs are divided according to income quartiles, then low quartile households were paying more as a percentage of their incomes (refer to Table 25). This is interesting in that although low quartile households seem to be incurring fewer total costs in general, they were spending a larger proportion of their incomes on those seemingly low costs, thus resulting in serious financial problems. In fact, such total costs are considered catastrophic to the household as they consume a high percentage of the household's income. In this study, only those households in the highest quartile had malaria related costs which were not considered as catastrophic. Similarly, in Malawi, calculated annual household expenditure on malaria treatment by very poor households was US\$ 19.13 (1994 prices) or 28% of annual household income, but for other households this burden was only 2% of annual income despite similar levels of spending (US\$ 19.94) (Ettling et al. 1994). In Kenya, annual malaria costs ranged from

9% to 18% of household income with lower income households having the higher percentage costs (Leighton & Foster, 1993).

A comparison of total direct malaria costs and total indirect malaria costs revealed that indirect costs normally constitute a larger proportion of total malaria costs. This may be mainly due to the use of the human capital approach in most studies which ignores potential labour substitutions by household members in the event of sickness. (More limitations on the methodology are outlined at the end of chapter 4). The other explanation is that indirect costs are high as time losses are always high in any sickness including malaria. In this study, indirect costs constituted about 88% of total costs. In Ghana, Asenso-Okyere & Dzator (1997) concluded that indirect costs made up 79% of the total costs of seeking treatment for malaria, not because of the time taken to travel to a modern public provider, but because of the very long waiting times at these facilities. Thus, although the reasons for the high indirect costs are different in various studies, the basic fact is that indirect costs frequently constitute a far greater proportion of household total costs than direct costs.

However within total direct costs alone, consultation costs were lowest as a percentage of total direct costs (12% of total direct costs). The low consultation costs might be attributed to low consultation fees charged by public health facilities which are more dominant in provision of care in rural areas. Public health facilities cannot change consultation fees without ministerial approval. This approval normally takes time to be effected leaving public health facilities charging uncompetitive fees. On the other hand, most private health providers shun the rural areas because of lack of demand for their services leaving public providers who charge far less to provide services. For example, in Zimbabwe, 75% of private practitioners are located in Harare which is an urban area (Moorman, n.d). In addition the private sector in Zimbabwe accounts for 37% of health sector expenditure but benefits less than 10% of the population mainly in urban centres (Hanson & Berman, 1998). This leaves the rural poor with the only option of accessing health care from public health facilities where the quality of care maybe very low. Because of their limited incomes, rural people cannot afford to access privately provided

health services even if they were available in the rural areas (see Table 16). Therefore public clinics and hospitals tend to be the main source of care for rural folks.

On the other transport costs were the second highest (about 23% of total direct costs). This might be explained by the fact that those sufferers who used some form of transport incurred costs which were high as a percentage of income considering the low incomes which prevail in rural areas. The other reason may be that because the study was cross sectional, people had to recall costs for a full month and thus figures given may have been inaccurate. This would result in higher than actual transport costs being reported.

With respect to severity, the average total costs per severe malaria case were about a third more than those of mild malaria cases (see Table 19 and Table 20). This was expected since severe malaria would require more medicines, special foods and drinks etc as compared to mild malaria.

### **6.7 Comparison with Other studies**

It should be mentioned that the values of costs found in this study were comparable with other malaria studies done across Africa. For example this study found that for the poorest households, total costs of malaria were above 10% of monthly income (23.54%). Similarly, a study in Kenya and Nigeria by Leighton & Foster, (1993) found that total costs of malaria were 18% of low income households in Kenya and 13% in Nigeria. In Sri Lanka, total costs of illness were 11.50% of income (Russell, 2001).

In addition, indirect costs were exceeding direct costs in this study. Specifically indirect costs constituted 88% of total costs with direct costs constituting only 12% of total costs and thus indirect costs were about 7 times more than direct costs. In studies done by Asenso-Okyere & Dzator, (1997), in Ghana, Attanayake et al, (2000) in Sri Lanka, and Sauerborn et al, (1996) in Burkina Faso, indirect costs were found to be between 2 to 3.6 times of direct costs.

Another similarity between this study and other studies is the proportion of drug costs out of total direct costs. In this study, drug costs constituted 65% of total direct costs. This is comparable with other studies done in other parts of Africa. For example, drug costs constituted 60% of direct costs in Ghana in a study done by Asenso-Okyere & Dzator, (1997). There were similarities as well in terms of indirect costs of malaria by gender. In this study, women lost on average more time whilst sick or caring for those who were sick and this may be explained by the longer hours women work relative to men. Sauerborn et al, (1996) found a similar result in the study in Burkina Faso where it was reported that women lost more productive time especially when household maintenance activities were included in the analysis.

In terms of the methods used for calculating costs especially indirect costs, the researcher in this study used the wage rate method which has its underpinnings in the human capital approach. This method has its drawbacks which have been discussed extensively in the methods section. However despite the drawbacks this method was also used by Asenso-Okyere & Dzator, (1997) in Ghana, Ettling et al, (1994) in Malawi. However in Sri Lanka, Attanayake et al, (2000) used the willingness to pay approach to estimate indirect costs. Mixed methodologies were used by Leighton & Foster, (1993) in Kenya and Nigeria.

Thus, other studies done in other countries during different years compare well with this study in terms of the major results and the methodology used to estimate indirect costs.

## CHAPTER SEVEN – CONCLUSIONS AND RECOMMENDATIONS

### 7 Introduction

This chapter will highlight the conclusions of this study based on the results. Some recommendations are also given for each conclusion.

#### 7.1 Types of Preventive Measures

The results showed that the most common preventive measure was the use of mosquito nets but there is still quite a low level of usage of nets (Refer to table 8 in the results section). Thus, there may be need for the government to promote increased use of bednets in this area. The rationale is that these people are already familiar with this preventive method and so the costs of educating people may be minimised. In any case it is easier to promote preventive measures which are popular and most common to people already than completely new measures.

#### 7.2 Poverty and Preventive Measures

The study also revealed that there was a positive correlation between the ability of a household to take preventive measures during the high malaria transmission season and their socio economic wellbeing. The study showed that the lower the income of a household, the less likely they were to take preventive measures. Results from the study showed that in the lowest quartile households, 31.40% took preventive measures whilst in the high income households, 88.40% took preventive measures. The conclusion is therefore that exposure to malaria is very high in the low income category. This finding may aid policy makers in government to consider giving priority to poor households when it comes to carrying out preventive measures in malaria endemic areas.

The Zimbabwe government has for years been doing household spraying programmes with the aid of foreign donors but there has been no emphasis on making sure that the poor in those communities get preference in that type of prevention measure. This finding may provide information for policy makers to seriously think of helping the poor in the malaria affected areas. The researcher acknowledges that these findings may not necessarily change the government's policy on malaria prevention but will be a stepping stone in making sure such prioritisation might take place later in the future.

### **7.3 Education and Preventive Measures**

Results of the study showed that the more educated households were more likely to implement preventive measures than the uneducated (refer to Figure 4). This may be explained by the fact that the uneducated may not be in a position to fully appreciate the importance of preventing malaria. The conclusion therefore is that education is an important tool to understanding the importance of preventive measures. Thus it may be plausible for the Ministry of Health to give priority to the uneducated when they carry out educational campaigns to encourage prevention activities. This may be critical considering the fact that the uneducated are most likely to be poor as well and so their ability to quickly deal with disease is limited because of resource constraints.

### **7.4 Malaria and the Economically Active Age Group**

Malaria has also been concluded to be affecting the economically active age group who contribute most to the economic well being of the household (Refer to Figure 11). Thus malaria can result in an intolerable economic burden on households when their economically active members are affected. When this happens, the economic stability of the household is severely affected resulting in suffering and loss of valuable assets in an attempt to help the sufferers. Thus there may be need to do more educational campaigns amongst the economically active age group to ensure that they minimise their

chances of getting malaria through carrying out simple preventive measures like making sure there are no pools of water near the household.

### **7.5 Treatment Options**

Results also indicated that the major source of treatment for most households in the rural areas was public clinics and hospitals (Refer to Table 14). This may be partly due to the affordable prices they charge to patients. However, the main problem is that most public facilities in Zimbabwe like in most developing countries, are severely under-funded and the service is very poor. Of course it will always be difficult for the Zimbabwe government to improve services overnight. However, the researcher suggests that the government consider at least providing malaria specific care in all clinics and hospitals, particularly ensuring routine availability of malaria drugs, so that there is a reduction in deaths and mortality. Malaria is a serious health problem and thus it needs to be taken seriously at government level. The researcher obviously appreciates the resource constraints to doing that and with Zimbabwe grappling with economic problems; it may not be a viable option but nonetheless was worth mentioning.

This study showed that most severe malaria affected those from the low income households, thus directly linking poverty with malaria. However another important dimension to the disease is the belief that it is caused by witchcraft or supernatural powers. Although this study did not explore this aspect, it is very important to educate influential leaders and traditional healers in rural areas about the causes and symptoms of malaria so that they can quickly refer patients for appropriate treatment. This could drastically reduce the burden the disease places on many rural households due to late or lack of treatment altogether.

## **7.6 Malaria and Poor Households**

The study conclusively showed that malaria imposes a high economic burden on households, especially indirect costs which are frequently overlooked. This means that malaria control programmes need to take into account all of the costs of malaria faced by the household. Another important conclusion is that malaria takes up more resources from poor households than it does from rich households although rich households seem to pay more in absolute terms for treatment (Refer to Table 24 and Table 25). Thus it will be more equitable and cost-effective for the government to consider channelling more resources to the poor in preventive and education activities. This could be done by deliberately prioritising preventive resources to the less privileged in all poor malaria endemic areas. Alternatively, the researcher suggests that health authorities intensify their current prevention programmes in the poor malaria prone district so as to reduce the economic burden of the disease.

### **7.6.1 Malaria Severity and Household Debt**

It was shown in the study that there was a relationship between malaria severity and household debt. There was a higher percentage of severe malaria sufferers in debt compared to mild malaria sufferers (Refer to Table 13). This may be an indication that the disease is taking its toll on some households. Thus, there may be a strong need to consider putting in place some programmes which lessens the burden of disease on poor households. An exemption of the poor from paying for health care at public health facilities may be one of the obvious options for consideration although it requires some political will, careful planning and resource mobilisation to be successful.

## **7.7 Drug Costs**

Another conclusion which can be drawn from the study is that medicine costs are quite high in malaria treatment as they constituted the highest proportion of direct costs. This might explain the fact that some sufferers would wait until they are suffering from severe malaria before seeking formal care, after pursuing other cheaper options like herbs to cure themselves. The government could subsidise the costs of treatment drugs for the poor to avoid the vicious cycle of the poor getting poorer and sicker. A contributing factor to the high drug prices is lack of education on the part of people, especially with regards to the use of malaria medicines, because failure to purchase and/or finish the full malaria medicine course might lead to future drug resistance. Thus, if people are well educated and informed about the dangers of not finishing the full malaria medicine course, then drug resistance could be minimised. This may ultimately reduce the costs related to patients suffering from severe malaria.

The study also showed that more people in the sample were severe malaria sufferers. This might raise the need to have more intensified education campaigns in all malaria endemic areas to ensure that people do not wait until they are so sick to seek treatment. In addition to educational campaigns, the government should also make an effort to increase financial accessibility to treatment because this is an important determinant of whether an individual will seek care or not.

## **7.8 Lost Productive Time**

A lot of malaria sufferers lost time when they were sick. In terms of gender, both the female sufferers and the female caretakers lost substantial time (Refer to Figure 14). This finding may be related to the fact that most women in rural areas do not have control over earnings of the household even if they contribute immensely towards that income. Their ability to access cash at any time of the year is thus restricted (Nanda, 2002). Thus,

women end up seeking care when sickness is already severe or using ineffectual thus resulting in longer periods of recovery from sickness (Nanda, 2002). In addition females tend to be the caretakers of the sick in most rural places in Africa and thus a sickness in the family would result in them losing much time caring for the sick. With this in mind, there is need for those who institute preventive measures to ensure that they teach females about how to take preventive measures as they seem to lose the greatest time when sick.

In addition, women could be taught how to administer basic malaria medication. This means that the Ministry of Health may want to strengthen health care capabilities within the village or even the household. This involves teaching female household members, especially mothers, to be able to diagnose and treat malaria at home. This would go a long way to lessening time costs related to travelling to health centres. In addition, this method involves less managerial expertise for it to be a success, as long as the women are well trained to be able to identify malaria symptoms and administer the medicine correctly.

### **7.8.1 Time Losses by Children**

The study showed that children of school going age lose a lot of time due to either sickness or caring for a sick family member (Refer to Figure 13). The fact that school going children are missing classes because of malaria is worrying. This is so because by missing school, children's ability to prosper in the future is affected as education is one of the main requirements for a better future. There is a need to consider educational programmes specifically for children on malaria especially at school so that they help to prevent it back home. If the children manage to teach their family members about malaria prevention, they directly and indirectly avoid the possibility of losing time either as a sufferer or a caretaker.

## **7.9 Burden of Indirect Costs**

The other conclusion for this study is that indirect costs of malaria were very high mainly due to lost productive time whilst patients and caretakers were going to and from health facilities. In most developing countries including Zimbabwe, most people walk for several kilometers to the nearest health facility to seek treatment. It might be worthwhile in the long run for the government through the Ministry of Health to invest in 'closer to client' health services. In fact this is a World Health Organisation (2001) recommendation aimed at reducing travelling time to a health facility. Results in this study showed that patients and caretakers took as much as 49.81 hours on average to and from health facility. This may be achieved by introducing mobile health clinics in most rural areas. With regards to malaria, these mobile clinics may be introduced during the peak malaria transmission season i.e. November to March to ensure that malaria sufferers are treated early and don't have to walk long distances to clinics: However, this option is fairly costly in terms of resources needed to kick-start the programme, takes time to yield results and it is demanding in terms of management of the whole system. Thus it needs serious commitment by the government. However this might not be the best option for Zimbabwe at the moment in view of the fact that the government is failing to run the current public health facilities efficiently due to lack of sound management and adequate resources.

## **7.10 Regressivity of malaria Costs**

The study also revealed that most poor households were paying a lot of resources as a proportion of household income. Specifically lowest quartile households were using up as much as 23.54% of their incomes in treatment costs. In the second income quartile, households used as much as 18.96% of their incomes on malaria related costs. This puts them in precarious positions financially as they are normally not able to finance other household needs. Normally, households which are at greatest risk of incurring

catastrophic costs were those in poor resource settings where, most health payments are out of pocket. Regression analysis has shown that a 1% increase in the proportion of total health expenditure provided by out of pocket payments is associated with an average increase in the proportion of households facing catastrophic payments of 2.2% (Xu et al, 2005)

In addition, such settings also do not have the social institutions to offer low cost insurance to patients. The problem of catastrophic expenditures will not simply go away; rather the need to put in place some low cost insurance schemes which can effectively pool financial risk is an option which the government may want to seriously consider. Therefore, it would seem plausible for the authorities to consider introducing and/or expanding coverage of tax or insurance based financing to reduce out of pocket payments paid by the poor rural households since these payments impose significant barriers to access to health care services and cause high cost burdens on the poor.

An appropriate low cost insurance especially in the rural areas might be a community based insurance scheme where all rural households contribute a nominal fee to the fund which would cater for sicknesses like malaria. Although this system poses major management challenges, especially with the uneducated rural people, it will be the duty of the government to ensure that they provide enough expertise to ensure the success of this type of insurance.

After all, it has worked successfully in countries like Mali (Singh, 2003). However, it should be pointed out that a low cost insurance scheme may not eliminate the chances of catastrophic expenditures. This is true especially when insurance schemes cover a certain type and number of health needs, for example, if households have to pay some extra costs of care through formal or informal payments. Thus, a system with a mixture of low cost schemes and tax funded health cover may be a possibility for the country in order to ensure that poor households do not spend a large proportion of their income on malaria care and treatment. This will mainly involve scrapping user fees especially for the poor

and making sure there are proper exemption systems in place to ensure that those genuinely in need of free health care access it.

In addition, since results showed that the poor are the ones who suffer most economically due a sickness in the household, there may be need to introduce progressive user fees for patients if the government feels it should not scrap them altogether. This means that patients will pay user fees depending on their economic standing. High income earners should pay for health care whilst those deemed to be poor will be exempt from paying user fees altogether. This system, however, may be difficult to implement as it may be difficult to assess who is poor and who is well off. In addition it will be prone to corruption by health personnel as they may give preference to their colleagues, family or friends irrespective of economic status. Besides, if there is no system for retention of some of the user fee revenue by the health facilities, there will be no incentive to make sure those who should pay do so. Despite all these drawbacks, this option may help alleviate the economic burden of malaria sickness on the poorest segments of the population.

### **7.11 Further research**

The study focused on the costs of malaria to households. There is a need to do more research on the economic effects of malaria on health providers especially the government and the economy at large. This will give a more comprehensive picture of the economic burden of malaria on health services in the developing world.

There is also a need to have more research on the methods of measuring the economic impact of malaria both at household level and national level. At the moment different researchers use different methods which they deem necessary, making it difficult to compare studies across different settings because of the different methodologies. There is a need to have a generic method of measuring economic impact which can be used across different settings enabling different researchers to compare results.

This study was a cross sectional study, concentrating on a month only for the analysis. There is a need to have more research work done over time to ensure more accurate research results as disease incidence, illness episodes and cost fluctuations can be captured over a longer time. At the moment most studies have a bias as the costs they use for analysis depends on the time of the year the research was done. This study was done towards the festive season where expenditures by households are generally higher than normal.

However this study showed that the cost burden of malaria sickness was high in rural communities and the burden was far greater for poor households. These poor households are exposed to a vicious cycle of poverty as they have low access to health services. In fact, they may be delaying treatment due to lack of financial resources and this exposes them to higher direct costs like longer hospital stays and higher productivity losses as severely sick members take longer to recover from illness. When this happens the poor households are impoverished even further.

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University of Cape Town

Appendix 1: Questionnaire

HOUSEHOLD MALARIA QUESTIONNAIRE						
	Name of interviewer					
	District					
	Date of interview					
	Household no					
ENTRY LEVEL						
	In the past one month is there any household member who has suffered from malaria?					
	Yes					
	No					
	<b>N.B If no then end the interview.</b>					
SOCIO DEMOGRAPHIC CHARACTERISTICS						
<b>1</b>	What is your age	<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		<b>AGE</b>
<b>2</b>	Marital status	single	single	single	1	<b>MAR</b>
		married	married	married	2	
		widowed	widowed	widowed	3	
		divorced	divorced	divorced	4	
		never married	never married	never married	5	
		separated	separated	separated	6	
		other	other	other	7	
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		
<b>3</b>	Sex	male	male	male	1	<b>SEX</b>
		female	female	female	2	
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		
<b>4</b>	What is your level of education?	none	none	none	1	<b>EDU</b>
		primary	primary	primary	2	
		secondary	secondary	secondary	3	
		tertiary	tertiary	tertiary	4	

		other	other	other	5	
<b>5</b>	What energy is used for cooking in the household?	electricity			1	<b>ENE</b>
		wood			2	
		gas			3	
		paraffin			4	
		charcoal			5	
		other			6	
<b>6</b>	What are the types of houses on the compound? ( <b>Interviewer should observe</b> )	brick & modern roofing			1	<b>TYP</b>
		mud & grass			2	
		mixture of both			3	
		other			4	
<b>7</b>	Does the household own any of the following?	vehicle			1	<b>OWN</b>
		fridge			2	
		stove			3	
		sewing machine			4	
		television			5	
		radio			6	
		bicycle			7	
		cattle			8	
		goats			9	
		sheep			10	
		beds			11	
<b>8</b>	How many people live in this household?					<b>MAN</b>
<b>B) HOUSEHOLD DIRECT &amp; INDIRECT COSTS</b>						

9	How many members of the household including you have suffered from Malaria in the past month?					SUF
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		
10	What was the state of the malaria and how many suffered each state?	severe	severe	severe	1	STA
		mild	mild	mild	2	
		don't know	don't know	don't know	3	
		other	other	other	4	
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		
11	Did the sick member seek treatment?	yes	yes	yes	1	DID
		no	no	no	2	
12	If yes where did they seek treatment?	plc clinic	plc clinic	plc clinic	1	WHE
		plc hospital	plc hospital	plc hospital	2	
		pvt clinic	pvt clinic	pvt clinic	3	
		pvt hospital	pvt hospital	pvt hospital	4	
		trad healer	trad healer	trad healer	5	
		faith healer	faith healer	faith healer	6	
		self treatment	self treatment	self treatment	9	
		don't know	don't know	don't know	10	
		other	other	other	11	
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		
13	By what means did member go to seek treatment?	on foot	on foot	on foot	1	MEA
		bicycle	bicycle	bicycle	2	
		bus	bus	bus	3	
		hired car	hired car	hired car	4	
		wheelbarrow	wheelbarrow	wheelbarrow	5	
		cart	cart	cart	6	
		other	other	other	7	
		<b>member 1</b>	<b>member 2</b>	<b>member 3</b>		

14	Was the sick member accompanied to seek treatment?	yes	yes	yes	1	ACC
		no	no	no	2	
15	If yes to 14, who?					
16	Approximately how long did it take the sick member to go seek treatment and come back home? ( with or without caretaker)					LON
17	If the member got treatment for the malaria how much did he/she pay for consultation?					PAY
18	Did member buy any medication?	yes	yes	yes	1	MED
		no	no	no	2	
19	If yes to 18 how much did member pay?					MUC
20	Where was the medication bought?	plc facility	plc facility	plc facility	1	FAC
		pvt facility	pvt facility	pvt facility	2	
		pharmacy	pharmacy	pharmacy	3	
		trad healer/faith healer	trad healer/faith healer	trad healer/faith healer	4	
		Other	other	other	5	
21	Was any of the members with Malaria admitted to hospital/clinic/treating place?	yes	yes	yes	1	ADM
		no	no	no	2	
22	If yes to 21, for how long did member stay?					
23	How much was paid for the stay?					
24	Was member able to do his/her normal duties due to Malaria sickness?	yes fully	yes fully	yes fully	1	DUT

		yes partially	yes partially	yes partially	2	
		not at all	not at all	not at all	3	
		don't know	don't know	don't know	4	
25	If yes partially or not at all to 24, how long was the member unable to do his/her duties before full recovery from malaria?					REC
26	What is the occupation of the Malaria affected member?	formal job	formal job	formal job	1	JOB
		farming	farming	farming	2	
		food processing	food processing	food processing	3	
		craft making	craft making	craft making	4	
		housework	housework	housework	5	
		at school	at school	at school	6	
		too old to work	too old to work	too old to work	7	
27	If member is going to school how many days was he/she absent from school whilst sick from Malaria?					SCH
28	If malaria sufferer was earning income from any activity, how much would he/she have earned in a day if he/she had not been sick? (to be asked to the malaria sufferer or the most knowledgeable person in the household or malaria sufferer)					HIR
29	Did the sick member have anyone looking after him/her during sickness?	yes	yes	yes	1	CAR
		no	no	no	2	

30	If yes to 29, what is relationship to the sick member?					REL
31	What is the sex of the person looking after the sick member?					SEX
32	Age of person looking after sick member					
33	What is the occupation of the person looking after the sick member?	formal job			1	OCC
		farming			2	
		food processing			3	
		craft making			4	
		housework			5	
		at school			6	
		too old to work			7	
34	Was the person able to do his/her normal duties whilst looking after the sick member?	yes fully			1	NOR
		yes partially			2	
		not at all			3	
		don't know			4	
		n/a			5	
35	If yes partially or not at all to 34, how long was the person unable to do his/her normal duties?					UNA
36	How much will the member have earned in the activity he/she does per month?					EAR
37	Did the household embark on any measures in the past month to prevent Malaria in the future?	Yes			1	PRE
		no			2	
38	If yes to 37, what measures were taken?	buy mosquito nets				MEA

		insecticide spraying				
		repellents				
		other(specify)				
	In total how much was spent in the last month to prevent Malaria?					<b>TOT</b>

<b>TOTAL HOUSEHOLD EXPENDITURES AS A PROXY TO HOUSEHOLD INCOME</b>						
<b>39</b>	In the past month how much did the household as a whole spend on the following (to be asked to the most knowledgeable person)					<b>EXP</b>
	<b>ITEM</b>	<b>YES/NO</b>	<b>IF YES AMOUNT IN \$ZIM</b>			
<b>A</b>	Capita items e.g. radios, bicycles, ploughs, hoes, scotch carts etc.					
<b>B</b>	Clothing and shoes for the whole family					
<b>C</b>	Health care - clinic, hospital fees, purchase of drugs, other fees from traditional or faith healers					
<b>D</b>	Education - school fees, books and other school contributions					
<b>E</b>	Foods - cooking oil, mealie - meal, meat, salt & other foods.					
<b>F</b>	Other expenditures					

## **9 Appendix 2: Informed Consent Form**

### **Purpose of study**

This study is aimed at approximating the costs of malaria morbidity in Mtoko district, north east of Zimbabwe in Mashonaland province and the Health economics unit at the University of Cape Town in collaboration with the Blair Research Institute (Ministry of Health) in Harare will be conducting the study. Thus you have been chosen to participate in the study after statistical random sampling. The study is expected to help the government of Zimbabwe come up with policies that help in malaria management and control which can be done to lesson the economic on the rural households.

### **Procedure**

After mutual consent the interviewers will interview you on the economic costs you incurred in seeking malaria care and treatment. The interview should take up to 30 minutes and all the questions are not mandatory. You may choose not to answer some of the questions if you so wish.

### **Risk and Discomfort**

There are no imminent dangers in participating in this study. The only major discomfort is the time you will spend trying to answer the interview questions. However you may do your normal activities during the course of the interview and the interviewer is willing to wait and resume later. In any case you can withdraw at any time you wish.

### **Benefits**

The study will be of great importance to those families living in malaria endemic areas as it will help the government and other N.G.Os to find effective ways of helping malaria affected households.

**Confidentiality**

Participant’s information will be held confidentially. Care will be taken to ensure that all the documents are kept in a safe place and the information gathered will be used for this research only and nothing else.

**Respondents’ right to withdraw.**

The participation in the study is purely voluntary and you will be allowed to ask questions on anything you might want clarified. Your decision not to participate will not affect your relationship with the researcher or the research institute in any way. It will also not affect your right to benefits that might come along after the project if you qualify for them.

For any further information and clarification on the study you can contact Mr. Shingirai David Chandiwana on cell number: 011 729071 or email to [samaz83@yahoo.com](mailto:samaz83@yahoo.com). Alternatively you can report physically to the Blair Research Institute, corner Mazoe Street and J. Tongogara in Harare OR send correspondence to the above-mentioned person on the following address:

Blair Research Institute  
Box CY 1753  
Causeway  
Harare  
Zimbabwe.

**Consent form to be signed by interviewee.**

I have fully agreed to participate in the study.

**Signature of interviewee:**.....

**Date:**.....