Dissertation By

M'MASI LUMUKWANA STEPHEN

Egerton University

MALARIA MORBIDITY AMONG CHILDREN AGED BELOW FIVE YEARS AND HOUSEHOLD RESPONSE STRATEGIES IN KABRAS DIVISION OF KAKAMEGA DISTRICT, KENYA

October 2007

MALARIA MORBIDITY AMONG CHILDREN AGED BELOW FIVE YEARS AND HOUSEHOLD RESPONSE STRATEGIES IN KABRAS DIVISION OF KAKAMEGA DISTRICT, KENYA

BY

M'MASI LUMUKWANA STEPHEN

A Thesis Submitted to the Graduate School in Partial Fulfillment of the Requirements for the Award of the Degree of Masters of Arts (Geography) of Egerton University

Egerton University

October 2007

DECLARATION AND RECOMMENDATION

DECLARATION

This thesis is my original work and has not been submitted in any University or College for the award of a degree or diploma.

Signature_____ Date _____

M'masi L. Stephen
NM13/0672/02,
Department of Geography,
Egerton University.

RECOMMENDATION

This thesis has been submitted for examination with our approval as University supervisors:

Signature_____ Date_____

Prof. Francis N. Wegulo,
Department of Geography,
Egerton University.

Signature _____ Date_____

Dr. Kennedy N. Ondimu,
Department of Geography,
Egerton University.

COPY RIGHT

DEDICATION

This thesis is dedicated to my parents Festus and Ebby, My Wife Lydia and children (Charles, Catherine & Sussy) whose love, care and guidance have made me what I am today.

ACKNOWLEDGEMENT

I am indebted to a large number of people without whom this study would not have been possible. First and foremost, my special and sincere thanks go to my academic supervisors; Prof. F. N. Wegulo and Dr. K. N. Ondimu of the Department of Geography, Egerton University for many constructive and critical reflections on different aspects of this work. I wish to privately acknowledge their personal initiative in assuring that I wrote a fine thesis. This thesis is a reflection of my orientation into this study through my supervisors' inspiration and perseverance. I am grateful, as well, for the efforts of all the staff members of the Department of Geography, whose incisive observations often made me to rethink more about this work. The final product of this work would be far poorer quality without the efforts of these individuals.

I would like to acknowledge all the 200 household respondents for their time and co-operation throughout this work. In particular, I am sincerely grateful to all the opinion leaders in the study area for their valuable hospitality and friendship during my fieldwork. Special mention is due to Dr. Bett (MOH, Malava Sub-district Hospital), Mr. Inziani (Public Health officer –Kabras) for their valuable time and productive

Consultations. Many thanks also to Mr. Ndinyo (Chief – East Kabras Location) and officials of local NGOs (FHI, PSI and AMREF), for providing background information on malaria morbidity in the study area and the efforts to curb malaria morbidity. Third, it would be ungrateful of me if I do not acknowledge the contributions from fellow graduate students (2002 Class), and especially Mr. Lugairi E and Mr. Mainuri Z. To all of them I say thank you for being very helpful. Also, I owe much gratitude to my parents, my wife – Lydia and lovely children Charles and Catherine for all the support and encouragement they accorded me throughout my studies.

Finally, my sincere appreciation goes to CODESRIA, for providing financial and material assistance through the Small Grants for Thesis Writing programme.

ABSTRACT

Malaria is a major cause of morbidity as well as a principle cause of death among children aged below five years in Kakamega district. This notwithstanding, not much is known about the disease burden and response strategies at the household level. This study thus sought to determine malaria prevalence among children aged below five years, document response strategies and determine the influence of household socio-economic characteristics on the response strategies. Primary data was collected through a cross-sectional household survey, involving 200 household heads and 10 key informants. Data collected was then analyzed using both descriptive and inferential statistics. Results from reveal that: (1) Malaria prevalence among under-fives was estimated to be 94 percent with over 70 percent of children experiencing 2-6 malaria episodes per year, at household level. (2) Treatment of malaria at home by use of anti-malaria and other drugs is commonly practiced in the study area. (3) Only 43 percent of children suffering from malaria sought treatment in health facilities due to geographical and economic barriers. (4) The affected households adopt coping strategies aimed at minimizing costs of medication (5) Adoption of the recommended malaria prevention measures such as use of treated nets and sound environmental sanitation is evidently low. (6) Socio-economic characteristics such as respondents' education level, housing, household income, access to health services, and environmental sanitation and malaria control information significantly influence malaria prevalence and adoption of malaria response strategies. The study makes the following recommendations to the Ministry of Health and other stakeholders in malaria control: (1) Home treatment strategy should be promoted and strengthened through education and awareness among the primary healthcare providers (mothers/carers and agents of drug supplies). (2) Effective malaria prevention involving sound environmental sanitation and increased coverage of treated nets should be promoted, emphasizing community participation, and health education (3) Malaria control interventions should mitigate the health and economic impacts through strengthening and enhancing existing viable malaria coping strategies in the study area.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.0 Chapter Introduction

This Chapter covers the background to the study, statement of the problem, study objectives, hypotheses, significance of the study, scope and limitation, as well as definition of technical terms.

1.1 Background to the Study

Malaria is a common and serious tropical disease caused by P*lasmodium falciparum* parasite transmitted through bites by Anopheles mosquitoes. Malaria is a major contributor to the global disease burden, with 40 percent of the world's total population at risk of malaria infection. About 60 percent of the estimated 350-500 million global clinical malaria episodes and over 80 percent of over a million deaths globally each year occur in African countries (WHO, 2002; WHO, 2000).

Malaria is a major public health concern in sub-Saharan Africa, accounting for 20-50 percent of all outpatient cases in health facilities and the greatest cause of mortality in hospitals (WHO, 2000). About 90 percent of all the deaths occur among children below the age of five years, in Africa alone. It is estimated that malaria kills a child in Africa every 30 seconds and remains the most notable threat to the health of pregnant women (WHO, 1993). Malaria imposes enormous cost to human and social well being in Africa (WHO, 2000). The associated malaria burden on the healthcare systems, absenteeism among school-going children and diminished or lost worker productivity, all contribute to make malaria a significant contributor to low economic growth in endemic countries. It is estimated that malaria illness costs African nations about U.S.$ 12 billion annually (WHO, 2002; WHO, 2000).

In Kenya, malaria is rated as the single largest medical problem. It is estimated that, at least 8.2 million cases are reported each year, with children aged below five years and pregnant women, the most vulnerable groups (R.O.K, 2003). Furthermore it is estimated that each year, some 34,000 children aged less than five years die from causes related to malaria. The high risk among the under-fives is attributed to immune systems that are not

yet fully developed. In addition, malaria morbidity causes 160-170 million adult workdays to be lost per year.

The Ministry of Health estimates that malaria accounts for 30-50 percent of all illness nationwide, as measured by out-patient clinic visits and over 20 percent of all admissions (R.O.K, 2004). Malaria is endemic in most parts of Kenya, with either stable (continuous) or unstable (seasonal and epidemic) transmission patterns. Approximately over 20 million (half of total population) live in areas where intense malaria transmission occurs throughout the year (holo-endemic). Such areas include Nyanza, Western and Coast provinces, where malaria morbidity constitutes about 30-40 percent outpatient attendance.

In Kakamega district of Western province, intense malaria transmission occurs throughout the year, characterized by high levels of anti-malarial drug resistance (R.O.K, 1996). It is estimated that malaria prevalence in children is as high as 95 and 51 percent during high and low transmission seasons, respectively. Furthermore, malaria is the most frequently diagnosed condition in outpatients at health facilities and the principle cause of deaths among children in the local district hospital (R.O.K, 2002b). Over 85 percent of the total population of Kakamega district live in rural areas, where a significant proportion cannot easily access basic health facilities because of geographic or economic barriers even though they recognize their illness as malaria.

In view of threat that malaria poses to the health of the population in Kenya, various efforts have been made both globally and at national levels. For instance, the Roll Back Malaria (RBM) and Millennium Development Goals (MDGs) initiatives aim at increasing coverage of Insecticide Treated Nets (ITNs) by 60 percent, and reducing malaria mortality by 50 percent by the year 2010, respectively (WHO, 2000; RBM, 2002). In Kenya, the Ministry of Health through the Kenya National Plan of Action for Malaria Control and National Malaria Strategy (NMS) are multi-faceted and diverse action plans, emphasizing prevention, diagnosis, and case management of malaria (R.O.K, 1992; R.O.K, 2001). Other malaria control efforts are undertaken by public health department, emphasizing malaria prevention including promotion of insecticide-treated bed nets, vector control interventions as well as health education.

In spite of the deliberate efforts to control malaria, pervasive morbidity and high mortality still persists in Kenya. This to a large extent has been attributed to lack of access to basic health services owing to economic and geographical barriers. Indeed, about 85 percent of total population in Kakamega district lives in rural areas where a significant proportion cannot access health services. Also, lack of laboratory facilities means that majority of malaria cases are more likely to be diagnosed presumptively rather than clinically.

Overall, inadequate health services, high costs, inaccessibility and inefficiency together with high malaria burden have continued to hinder effective control of malaria. As a direct result, affected communities often resort to self-medication and management of malaria as well as related coping mechanisms. Some of the policy issues arising from this trend include determination of malaria burden and effectiveness of adopted response strategies at the household level. Such emerging issues and trends are the main reasons for the current interest in assessment of malaria morbidity, especially among vulnerable groups (children) and response strategies at household level in malaria-endemic regions.

1.2 Statement of the Problem

Malaria is the most frequently diagnosed condition in outpatients at health facilities and the principle cause of deaths among children in Kakamega District (R.O.K, 2002b). Studies on malaria morbidity have been done in some parts of Kenya (Nevill *et al,* 1996; Mwenesi *et al,* 1995; Ruebush *et al*, 1995). This notwithstanding, not much is known about the disease burden and response strategies at the household level in Kakamega district. This study addresses this information gap through an empirical survey of sample households in the study area, which sought to determine malaria prevalence, response strategies as well as socio-economic factors that influence adoption of appropriate responses.

1.3 Objectives of the Study

The broad objective of this study was to determine malaria prevalence among children below five years as well as response strategies employed by households to counter malaria

in sampled households in Kabras Division of Kakamega district. The study specifically sought to:-

1). Determine the malaria prevalence in under-fives among sampled households in the study area.

2). Determine the influence of socio-economic characteristics on malaria prevalence among children aged below five years in the study area

3). Document the response and coping strategies adopted by households to counter malaria in the study area.

4). Determine the influence of socio-economic characteristics on malaria response strategies adopted by households in the study area.

5). Recommend measures to control malaria morbidity among children in the study area.

1.4 Research Hypotheses:

The following hypotheses were tested in this study for their validity:

H_{01}: Household socio-economic, characteristics do not significantly influence malaria prevalence among children in the study area.

H_{02}: Socio-economic characteristics do not significantly influence adoption of response strategies against malaria by households in the study area.

H_{03}: Malaria prevention strategies have not significantly reduced malaria prevalence at household level.

1.5 Justification of the Study:

Malaria is the most frequently diagnosed illness and a principle cause of death among children aged below five years in Kakamega District. The consequence is not just an intolerable burden for individuals, the households and national health systems, but also to the socio-economic development of such malaria endemic areas. The significance of this study is based on the following enumerated strengths:

This study is an assessment of malaria prevalence among children and how households often manage malaria morbidity and related impacts. The capacity to control malaria

morbidity and mitigate its impacts is underpinned by households' ability to make decisions about how to respond appropriately to manage malaria illness and cope with impacts of malaria at household level. This depends on their perception of malaria, diagnosis, access to resources and the availability of information that enables households to make informed choices.

The study outcomes provide a basis on which the intended users such as, policymakers, healthcare planners, malaria control programmes/agencies and affected communities develop and implement appropriate and effective interventions to counter malaria among the under-fives at the household level in Kabras division, and other malaria endemic areas in Kenya. As an indication of the common diseases that most children experience, malaria can also be used as an indicator to strengthen primary health care and child survival services more generally.

1.6 Scope and Limitation of the Study:

The study focused mainly on assessing malaria prevalence among children aged below five years at the household level and examined the different response strategies adopted by the sampled households in Kabras division of Kakamega district. The choice of Kabras division is based on the fact that, malaria is the most frequently diagnosed condition in outpatient cases among children at local health facilities and the principle cause of child deaths at the district hospital (R.O.K, 2002; R.O.K, 1996).

Further, the study focused on malaria illness and response strategies at the household level. Household morbidity surveys provide useful information that cannot be obtained through other ways such health-facility surveys. Nevertheless, the scope of this study specifically excluded analysis of system-wide health sector practices in the health facilities for malaria treatment and prevention.

The scope of the study was limited to perceived "malaria", as reported by respondents and what health workers typically and presumptively diagnose as "malaria." It is concerned

with what people perceive to be malaria illness episodes, as opposed to prevalence of malaria as confirmed by clinical laboratory tests. This approach was ideal for the study area that lacked reliable malaria diagnostic facilities and also consistent with the W.H.O presumptive diagnosis and treatment guidelines (WHO, 2002)

Study respondents, preferably mothers or other carers of children aged below five years provided information on malaria prevalence among children aged below five years as well as personal information, socio-economic data and malaria response strategies. The interview methodology used to elicit responses on malaria prevalence, ensured that respondents reported on malaria episodes based on symptoms as close as possible to accepted clinical symptoms. But because of the well-known discrepancy between perceived and "true" laboratory-confirmed cases of malaria, estimates based on existing data for laboratory-confirmed malaria were also used. This approach provided a reality check for people's perceptions on malaria and related policy implications of malaria control.

In most cases, responses in this study required a recollection of past events and, decisions spanning a period of between 4 weeks to 12 months. The inherent limitation in this retrospective evaluation of self-reported behaviour patterns was recall bias. This limitation was adequately addressed through the use of appropriate interviewing techniques. It would have been preferable to collect individual level quantitative data from the entire study population. Nevertheless, time and resources precluded the inclusion of the entire population in this study. A representative sample of 200 households and 10 key informants was considered practicable for interviews and large enough to statistically infer results to the entire population.

1.7 Definitions of Technical Terms

The following are the technical terms and their meanings as used in this study:

Malaria: A tropical disease transmitted to humans by female Anopheles mosquito and characterized by fever and chills. In this particular study, malaria incidence will be based on the local symptomatic description (such as high body temperature, shivering, headache and vomiting etc).

Malaria case/episode: A person or individual exhibiting the malaria symptoms.

Presumptive malaria diagnosis and treatment: Suspicion of malaria illness in all cases of fever among patients/children and subsequent treatment, especially in the absence of laboratory tests by blood smear (WHO).

Percentage malaria prevalence (%): The proportion of malaria cases/episodes reported among the under-fives within a period of 4 weeks preceding the study.

Household Malaria prevalence: The average number of malaria cases/episodes among under-fives per household, in the last 12 months.

Individual-level characteristics: Characteristics inherent in the individual household, for example, respondent's age, education level, religion, family size, number of under-fives, and income.

Community-level characteristics: Characteristics that typify the social system (characteristics outside the individual household), for example, distribution and accessibility of health services, information flow, culture, infrastructure, seasonality and healthcare system.

Mortality rate: The number of deaths in a specific proportion of the population (WHO)

Under-five mortality rate (U-5MR): The number of deaths of children under five years of age per 1000 live births (WHO).

Morbidity: The state of ill health and disability caused by diseases (WHO).

Household: A group of persons residing in the same compound, answerable to same head and sharing a common source of livelihood and provision.

Study Respondent: Any adult member (mother or guardian) of household who provides information to the interviewer on issues related to health of children or having accurate information on other routine issues.

***De jure* household members:** Persons who are usual residents of sampled households, excluding those working away, always traveling or boarding students.

Response strategies: All the possible efforts (preventive and curative measures) adopted by households to counter or cope with malaria morbidity.

Coping strategies: Strategies adopted to deal with the impacts (social & economic) of malaria.

Home treatment: Defined as involving the use of an anti-malarial drug before or in the absence of a visit to a health facility.

Health-seeking strategies: Refers to the process of seeking medication exclusively outside home (eg. Public, Private and other healthcare providers)

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.0 Chapter Introduction

This chapter reviews documented literature on the subject of malaria morbidity among children, as well as malaria prevention and control. While it is not possible to provide a complete review of all studies that have been conducted on all issues of malaria morbidity and control at household level, an attempt has been made to focus on issues of concern to this study. Preference is given to works that demonstrate concrete evidence of malaria morbidity and response strategies at household level. A thematic approach where key factors so far identified is summarized in a conceptual framework.

2.1 The Cause and Transmission of Malaria

The cause of malaria is infection with one of the four species of parasitic protozoan organisms of the genus p*lasmodium* that alternates during their life cycle(s) between human and mosquito hosts. The parasite develops inside the salivary glands of a female Anopheles, mosquito host. The mosquito, requiring a meal of blood to nourish her eggs, bites a human and infects material from her salivary glands, including immature malaria parasites called sporozoites. The characteristic chills and fever of malaria are caused as the parasites multiply within the red blood cells causing cells to burst and release the contents into the blood stream.

Anopheles mosquitoes typically breed in stagnant, unpolluted surface waters. Eggs are laid on the water surface among floating vegetation. The larvae float horizontally just under the water surface, breathing air and feeding on small suspended particles. Typically, breeding sites for different species include forest pools, irrigated fields, lakes, and temporary rainwater puddles. For this reason, anopheline mosquitoes are mainly associated with rural settings. However, there are a few exceptions where malaria vectors have adapted to city life.

Physical, biological, and social environments play an essential part in the epidemiology of malaria. For the larval and adult stages *Anopheles*, the physical environment depends on

favourable climatic temperatures, humidity, rainfall, and, or the presence of standing or gently flowing water. Biologically, plants accumulating in small collections of water may support *Anopheles* breeding while domestic animals may be beneficial by diverting mosquitoes from feeding on people. Socially, factors encouraging the transmission of malaria include close proximity of houses to mosquito breeding sites, types of house construction that facilitate mosquito entry, failure to remove peri-domestic collections of fresh water, and various activities and occupations that increase exposure to adult mosquitoes or promote mosquito breeding.

2.2 Malaria Treatment and Prevention

Following the failure of eradication efforts in many areas during 1970s, the shift was made to malaria control. WHO adopted a revised strategy based on effective and affordable method of diagnosis and prompt treatment as well as prevention of malaria. The Integrated Management of Childhood Illness (I.M.C.I) is a strategy that prescribes treatment for malaria in any child below five years of age, presenting history of fever, especially in typical rural settings without reliable diagnostic and health services (WHO, 2000). Although presumptive treatment of malaria is a promising approach to malaria control in relatively remote areas, lack of clear policy guidelines at household level hinders its implementation

Anti-malaria drugs such as chloroquine, quinine, sulfadoxine pyrimethamine (Fansidar), and mefloquine, have successively been recommended as first line antimalarial drugs for both health facility and home treatment (Institute of Medicine, 1996; WHO, 1996). Nevertheless, due to widespread malaria resistance to currently sulpha/pyrithamine (SP) drugs such as Fansidar and Metakelfin, a more effective Artemesinin Combination Therapy (ACT) has been developed although still not available. Chemoprophylaxis is also recommended for high-risk groups, such as infants and young children, pregnant women, and recent immigrants from malaria-free areas, to reduce but not totally eliminate the risk of infection. However, prophylaxis for small children is still debated because of the risk of long-term side effects and selection for resistant parasite strains (Collins *et al* 2000; Collins & Paskewitz, 1995).

Preventive strategies prescribed by WHO range from personal protection including insecticide-treated bed nets, repellants and sprays; to environmental management through improved drainage, bush-clearing, solid waste disposal. (Van der Geest and Van Geldermalsen, 1999; Nicoll, 2000; WHO, 2002). Among all these preventive measures, use of insecticide treated bed nets has proven to drastically reduce malaria cases. According to the Roll Back Malaria – Abuja 2000 Summit, provision of treated nets to 60 percent of the pregnant women and children age under five years would reduce malaria morbidity by half and related child mortality by 20 percent by the year 2006 (R.O.K, 2003). Nevertheless, only 6 percent of households in Kenya own at least one insecticide treated net (R.O.K, 2003).

Purchasing a bed net today entails a substantial outlay of cash (Ksh. 300 per piece), which in some areas of the world, especially Africa, may be a great economic burden. According to Aikins, Pickering & Greenwood (1994), if local residents do not have the money up front, they cannot purchase bed nets. They thus resort to other, less expensive methods, including burning various substances such as mosquito (pyrethrum) coils, leaves, dung, and wood fires to repel mosquitoes (Ziwa *et al*, 1994). The disadvantage of these less costly methods is that they work while people are awake but offer no protection during the critical mosquito biting hours (11pm- 4 am), when people are sleeping and can no longer maintain them. The efficacy of bednets is tied to the peak biting hours of the local mosquito population, when malaria transmission is expected to be at its peak (Choi *et al*, 1995).

2.3 Factors Influencing Treatment and Prevention of Malaria:

Several studies done on malaria morbidity and control measures indicate that, generally malaria treatment and prevention can be separated into three main categories: (1) home–based/self-treatment and prevention (including both herbal/traditional treatment and pharmaceutical/antibiotic use); (2) traditional treatment and prevention; and (3) the official allopathic or "Western" medical type, including treatment and prevention offered at health facilities (hospitals, clinics, dispensaries, private practitioners, and village health workers).

According to many studies, the general treatment-seeking behaviour can be influenced by a variety of factors, including local beliefs about disease, access, costs, and attitudes toward health-care providers (both formal and informal). Indeed, the same factors are known to influence treatment and prevention of malaria (McCombie; 1996 and Ahorlu *et al,* 1997).

Review of literature on treatment and prevention of malaria reveal a well-established multiple treatment and poly-pharmacy practice – both in terms of the concurrent as well as sequential use of different types of treatment and prevention therapies (McCombie, 1996). According to McCombie, exclusive use of traditional healers and/or herbal treatment seems to be rare except in the most remote areas, while combining traditional remedies with "Western" methods is common. A multi-country study by Susan Foster (1991) found that people employ a hierarchy of some sort in seeking treatment for malaria especially in rural` Africa. In most cases home-based remedies or "self-treatment" usually serve as the first line of action in malaria control. The cost of medication, convenience and perceptions on conventional medication also play a significant role in influencing individuals to prefer home treatment to conventional medication when faced with malaria illness.

Other studies show that self-treatment is the most common mode of action in malaria cases, especially in rural areas of Africa, where 75 percent of the cases of malaria occur (Foster, 1991; WHO, 2001; Holtz *et al*. 2000; Mwenesi, 1994; Massele *et a*l, 1993). According to findings from studies, a significant proportion of children with malaria were treated with an anti-malarial drug at home, with chloroquine from a street market or vendor being the drug of choice for many people (Deming *et al*, 1989; WHO, 2001). This trend is often attributed to factors such as attitude of health workers, lack of appropriate drugs, or poor quality of health services. These greatly reinforce preference for self-treatment at home (Yeneneh *et al*, 1993; Kengeya-Kayondo *et al*, 1994).

The use of traditional methods of malaria treatment and prevention is widely documented. Many communities, especially in Africa, combine religion, sorcery, health, and inter-personal conflict into a unified system of belief and practice, making it necessary to consider all aspects of the social and economic environment in studying treatment-seeking

behaviour for malaria (Gessler *et al,* 1995). The use of traditional medicine is often considered an inexpensive alternative to western antibiotics (Ruebush *et al*, 1995; Silva, 1991). Traditional healers may be consulted for a number of reasons - social, economic, therapeutic, and psychological. In a review of treatment-seeking behaviour, McCombie (1996) found that, even if most people preferred self-treatment, traditional healers were most often consulted for cases of convulsions, even if these symptoms were not associated with malaria. Perceptions about the cause and appropriate methods to be used can play a significant role in the type of treatment and prevention chosen.

Studies on use of health services in treatment and prevention of malaria indicate considerable variations and patterns. Part of this variability lies in cultural practices, but other barriers play an important role as well (McCombie, 1996; Foster, 1991). McCombie found that income, educational levels, and prevalence of the disease, severity of illness, and cost were the main determinants to health-facility use. Indeed, as much as cost is considered a primary reason for non-use of health clinics, as well as being a primary motivator for self-treatment, the main problem is ability, not willingness, to pay (Foster, 1991). Visits to health facilities, on the other hand, may entail additional and sometimes prohibitive costs, including traveling expenses and time lost from productive activities (Ahorlu *et al,* 1997; Snow *et al*, 1992; Mburu, Spencer, & Kaseje, 1987; Ruebush *et al*, 1995).

2.4 Gaps in the Literature

Malaria morbidity, especially among children aged below five years in Kenya still persists even though simple, effective and affordable treatments are known to exist. In spite of information documented on malaria, deliberate efforts in terms of research and policy formulation, the problem of malaria morbidity and mortality, especially among children, still persists. The following are some of the areas that the previous studies and literature have not adequately addressed.

One of the primary constraints for malaria studies in Africa is the generally weak or unavailable secondary source of information, especially relevant epidemiologic statistics,

for the affected populations. For example, epidemiological data for malaria needed to make reasonably reliable estimates at the aggregate national level are limited. Data necessary for sectoral or household impact are virtually non-existent. The Ministry of Health (MOH) information systems typically report on malaria episodes in the aggregate from health facility utilization data. This approach often ignores a significant proportion of the affected population because it is well-documented that a large portion of malaria episodes do not get treated at health facilities (Chitsulo, *et al.* 1992).

Most studies of the impact of various diseases in developing countries assess the impact at only the national or regional level. Few have assessed the impact of such diseases on various population groups or at the household level. The usefulness of this study's approach is to reveal impacts of malaria on the under-fives that may be masked by overall averages, identify the relative distribution of the disease burden among selected households in a way that has the clearest implications for program decisions and actions.

2.5 Conceptual Framework

The theoretical framework on which this study is based is informed by work originally done by Mosley and Chen (1984). In this model, the authors identified general determinants of child morbidity that operate through a set of proximate determinants (maternal, environmental, nutrient deficiency, injury, and personal illness control). The original model, however, was modified in order to capture the linkages between malaria morbidity and the household socio-economic characteristics explored in this study. This is essential in exploring how such relationships and linkages impact on the malaria prevalence and response strategies at the household level in the study area.

The conceptual framework takes into account a number of socio-economic variables (individual-level and community-level) that profoundly influence prevalence of malaria among children as well as response strategies adopted at the household level. According to this model, individual-level variables include; respondent's age, education level, household size, living density, knowledge of malaria and control, income and health expenditure. Community-level variables include; environmental sanitation, adequacy of and

accessibility to health services, and health support systems. The study conceptualizes that households with characteristics that positively enhance adoption of appropriate response strategies (curative and/or preventive) will experience less malaria burden and vice versa.

The theoretical framework not only helps to link study objectives, hypotheses and findings, but is also crucial in identification and strengthening of socio-economic characteristics associated with relatively low malaria prevalence and effective response strategies to reduce malaria morbidity and related mortality in malaria-prone regions. All these relationships are depicted in Figure 1.

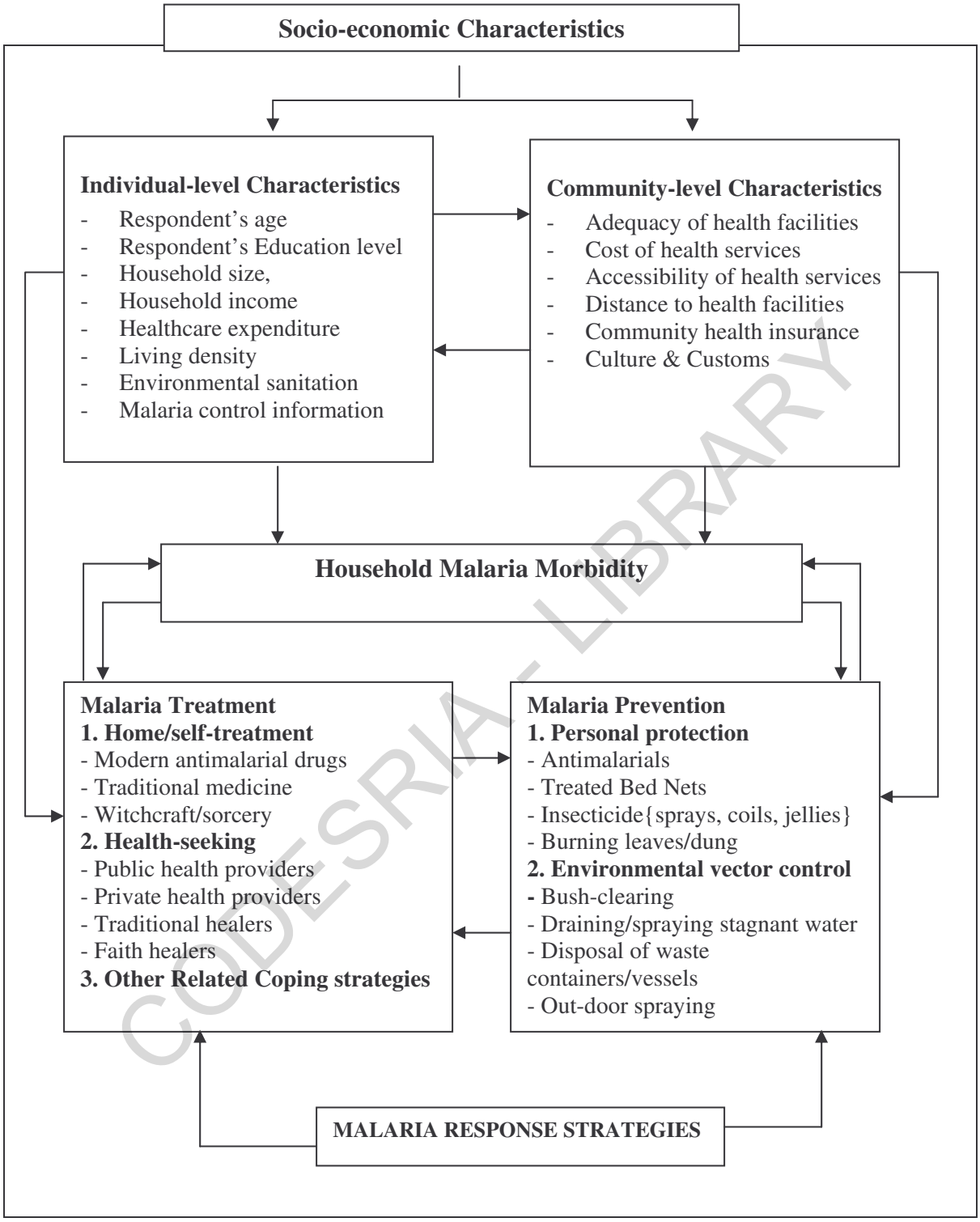

Figure 1: Linkages in Malaria Prevalence and Response Strategies

Source: Adopted and Modified from Mosley and Chen (1984).

CHAPTER THREE: STUDY AREA AND RESEARCH METHODOLOGY

3.0 Chapter Introduction

This chapter covers the description of the study area and research method employed in this study.

3.1 Description of the Study Area

This section highlights the main physical, socio-economic and demographic aspects of Kakamega district where the study was undertaken. It also examines how the above factors have influenced malaria morbidity in the study area.

3.1.1 Physical Location and Administration Divisions

Kabras division, the research site, is located in Kakamega district of Western province, Kenya (Figure 2). Kakamega district is located between longitudes 34°20′ and 35° East and latitudes 0° 15′ and 1° North of the equator. The district is bordered by Busia, Siaya and Bungoma districts to the west; Nandi and Uasin Gishu to the east; Lugari and Trans-Nzoia to the north; as well as Butere/Mumias and Vihiga to the south. It covers a total area of 1421 square kilometers. It is also composed of seven administrative divisions: Ikolomani 140 sq. Km; Shinyalu 352 sq. Km; Ileho 75 sq. Km; Lurambi 193 sq. Km; Kabras 462 sq. Km and Kakamega Municipality 48 sq. Km (R.O.K, 1996, R.O.K, 2002). Kabras division is further divided into six administrative locations and 21 sub-locations (Table 1 and Figure 2).

Table 1 Administrative Locations and sub-Locations in Kabras Division

Locations	*Sub-locations*
1. South Kabras	Mahira, Shianda, Shamberere
2. West Kabras	Lukume, Shikutse, Burundu
3. Shirugu	Malekha, Samitsi, Shivikhwa, Mugai
4. East Kabras	Chimuche, Ikoli, Musingu, Kakunga
5. Central Kabras	Tande, Butali, Chegulo, Matsakha
6. Shivanga	Luandeti, Shivanga, Fubuye

***Source**: Kenya, 2000b*

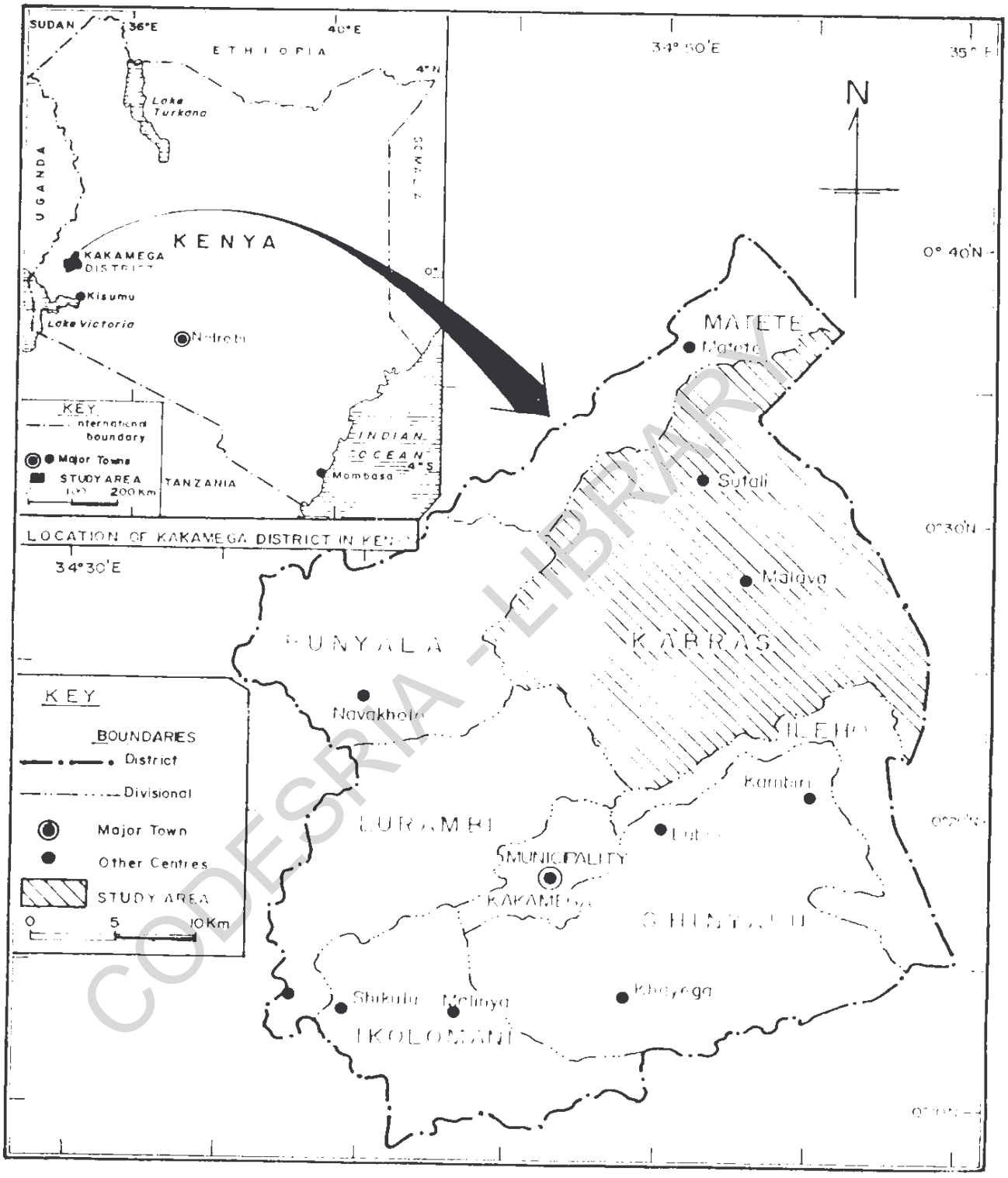

Fig. 2: LOCATION OF KABRAS DIVISION IN KAKAMEGA DISTRICT.

3.1.2 Climate, Land-use and Major Economic Activities

The district receives an average rainfall of between 1000–2400 mm per annum and average minimum and maximum annual temperatures of 14°C and 29ºC, respectively. The long rains commence in March and end in June with a peak rainfall in May. The short rains start in July and end in September with a peak in August. The drier months in the district are December, January and February. Generally, the climate is conducive for production of a variety of crops such as bananas, maize, beans, sweet potatoes, sugar cane and horticultural crops. However, heavy rainfall and humid conditions associated with this region adversely affect people's health via diseases such as malaria, upper respiratory tract ailments. Moreover, physical access to health facilities via earth-surface roads is hampered during the wet rainy season.

The predominant socio-economic activity in the area is small-scale subsistence agriculture. Approximately 70 percent of the arable area is under maize, cultivated for commercial and domestic consumption. About 30 percent is under cash crops such as sugarcane, covering Mumias, Lurambi, Navakholo, and Kabras divisions. Livestock rearing is also a dominant land use type, with cattle, sheep, goats and poultry commonly kept by the area residents for both subsistence and commercial purposes. Other sources of income for the residents include formal and informal business enterprises, casual labour especially in the agricultural sector.

3.1.3 Population and Demographic Profile

The population size, structure, distribution and density are vital variables in the development process. This section seeks to examine their underlying implications on the overall health of the inhabitants and malaria morbidity in the study area, in particular.

The population of Kakamega district was 603,422 people based on the National Census report (R.O.K, 1999). Despite a decline in natural growth rate from 3.4 to 2.98 percent between (1979 –1999), the absolute population in the district remains high (R.O.K, 1999). The area has one of the highest rural population densities (406 people/km^2).

Table 2 Population Densities per Division

Division	Population	Households	Population Density
Navakholo	65,337	13,083	377
Kabras	149, 510	29,226	352
Ileho	32,505	6,534	419
Shinyalu	103,947	21,460	313
Ikolomani	92,104	19,686	645
Lurambi	85,863	17,509	442
Kakamega Municipality	74,115	18,408	1485
Total	**603,422**	**125,901**	**433**

Source: Population Census Report, 1999

It is observed from Table 2 that Kabras, Shinyalu, Ikolomani and Kakamega Municipality divisions have the largest populations in the district. The higher population in Kabras division is due to in-migration of people in search of arable land from other divisions. This generally reduces productivity, exerts pressure on resources and hence contributes to high poverty levels (58 percent). The population structure of Kakamega district indicates that, the youthful population (0-14 years) account for about 51 percent of the total population. Children aged below five years account for about 45 percent of the total youthful population in the district as well as the study division. High total fertility rate (TFR) of 6.4 compared to the national average of 5.4, means a rapid increase of under-five children. This exerts pressure on existing health facilities for maternal and childcare needs (R.O.K, 1997).

3.1.4 Health Profile and Healthcare Delivery System

Malaria is the leading cause of morbidity in Kakamega district (R.O.K, 2002). This is followed by respiratory tract infections, skin infections, intestinal infection (Diarrhoea and Cholera), Pneumonia and Anaemia. Spread of HIV/AIDS has also been on the increase in the study area. Malaria is however, the most frequently diagnosed condition among outpatients reporting to the local health facilities. The consequence is not just an intolerable burden for individuals, their families and national health systems, but also to the socio-economic development of such endemic areas.

The present health delivery system in Kakamega district is supported by the government, religious, non-governmental organizations, and by private individuals. Altogether there are 4 hospitals, 28 health-centers, 33 dispensaries and over 28 private nursing homes and clinics (R.O.K, 2002. The Kakamega Provincial General Hospital is the only government hospital, also doubling as a district hospital. Malava sub-district hospital (recently upgraded from a health-centre), is the only major referral health facility in the study division. In addition, there are 5 government dispensaries and a number of private clinics, and other subsidiaries such as chemists, drug shops that supplement the public health sector in the provision of health services in the area. Healthcare delivery in Kabras diovision is characterized by low bed capacity, lack of water, electricity, inadequate medical personnel, and reliable diagnostic laboratory services in most of the health facilities. This setting therefore, represents a challenging context for the study of malaria morbidity among under-five children and household response strategies.

3.2 Research Methodology

This section discusses the methodological procedures used in data collection and analyses. Described in detail are field survey techniques involving: research design; sampling design, sampling frame and sample size; sources of data and collection, as well as data processing and analysis. Also discussed briefly are the technical problems encountered during the data collection process

3.2.1 Research Design

The research method in this study was a cross-sectional household survey. This method involved face-to-face interviews with household heads in the randomly selected households within the study area. Data collection was achieved by use of structured questionnaires, which were filled during structured interviews with respondents in the selected households. This research methodology is an alternative as well as a deliberate departure from the other designs such as health-facility surveys. The health-facility surveys provide selective morbidity data often without individual background information. The household survey design employed by this study made it possible to collect much of the individual level quantitative data from a fairly representative random sample for easier generalization of findings to the entire population in the study area.

3.2.2 Sampling Design, and Sample Size

Ideally, it would have been preferable to collect data from the entire population in the study area. However, because of time, manpower and financial constraints, only a representative sample was used. Although resource constraints limited the sample size, the design attempted to develop a sample that would be representative of the population in the study area. The survey collected primary data from a sample of 200 households and 10 key informants within the study area. Probability and non-probability sampling techniques were specifically used to achieve the required number of households and key informants, respectively.

Probability sampling was used in this study to select sample households. This sampling procedure has the advantage of giving all elements in the universe an equal chance of being included in a sample (Nachmias and Frankfort-Nachmias, 1996). It also provides an efficient system of capturing in a small group, variations that exist in the target population.

Multi-stage random sampling technique was applied to attain the required sample households for the survey. The study area (Kabras division), is administratively divided into 6 locations and 21 sub-locations (Table 3).

Table 3 Administrative Locations and Sub-locations in Kabras Division

Locations	Sub-locations
****South Kabras**	**Mahira, **Shianda, Shamberere
West Kabras	Lukume, Shikutse, Burundu
Shirugu	Malekha, Samitsi, Shivikhwa, Mugai
****East Kabras**	**Chimuche, Ikoli, Musingu, **Kakunga
Central Kabras	Tande, Butali, Chegulo, Matsakha
****Shivanga**	Luandeti, **Shivanga, **Fubuye

(**) Indicate randomly selected Locations and Sub-locations
Source: R.O.K, 1999b

The first stage of multi-stage sampling involved selection of three locations out of the total six in the study area (Kabras division). Lottery method was used to select the required locations from among the six locations in the division. This was achieved by assigning numbers to the six locations and then mixing them thoroughly in a container. This was

then followed by randomly picking 3 numbers from the container, in succession without replacement. The locations corresponding to the numbers picked were included in the sample. This process yielded the following three locations: East Kabras, South Kabras and Shivanga (Table 3).

The second stage of the sampling procedure involved selecting two sub-locations from each of the three selected sample locations. This also involved assigning numbers to all the sub-locations in each of the selected locations and applying the same selection procedure as used in the first stage of sampling. The six sub-locations picked from the above selected locations included: Chimuche, Kakunga, Mahira, Shianda, Shivanga and Fubuye, respectively (Table 3).

The third stage entailed listing of all the households in each of the six locations (clusters). This was made possible by the listing based on the National Census Report (R.O.K, 1999b) in the respective clusters (sub-locations). This gave rise to a total of 2677 households in the eight sample areas (Table 4) forming the sampling frame of the study.

From the sampling frame, proportionate sampling technique was employed to draw a sample of 200 households. This was effectively achieved by randomly selecting households in proportion to the total number of households in each of the selected clusters (sub-locations). The use of proportionate random sampling design enabled a wide and more even-spread of the required sample over the target population. The resultant sample size of 200 households was considered adequate for practical interviews and a fairly representative sample for statistical inference (Kathuri and Pals, 1993; Gall *et al,* 1996).

Table 4 Sample areas, number of households and selected households

Sample area	Number of households	Selected households
Chimuche	420	26
Kakunga	464	28
Mahira	538	32
Shianda	625	38
Shivanga	350	20
Fubuye	280	16
Total	**2677**	**200**

***Source**: Field Data, 2004*

Non-probability sampling technique was used to select ten key informants from a wide range of sectors (government and non-governmental agencies). Non-probability sampling allows one to use only those elements in the population that are considered by the researcher to have the required information with respect to the objectives of the study. These informants included both the district and divisional Ministry of Health officials; local NGOs officials, local religious leaders, and local administration officers. By virtue of their position in society and work, these informants were considered to have important insights on malaria morbidity in the study area. This sampling technique had the advantage of requiring less time, easy administration and less cost, in addition to providing in-depth information on subjects of interest.

3.2.3 Sources of Data and Information

Data used in this study was collected from both primary and secondary sources. Primary data was obtained through the household survey, which as earlier stated involved 200 randomly selected households and 10 key informants within the study area. The identified respondents provided information regarding household socio-economic characteristics, malaria prevalence among the under-fives as well as response strategies adopted to counter malaria morbidity. Informal interviews with key informants considered critical to the objectives of the study yielded invaluable and in-depth insights into the dynamics of malaria morbidity in the study area.

Secondary data was obtained from relevant books, District Health reports, journals, periodicals, theses and government publications. The data collected was used for descriptive purposes so as to give insights on the trend of malaria morbidity in Kakamega district as a whole. However, it is the primary data that was significant for the study as it was used for statistical analysis

3.2.4 Household Questionnaire

A structured questionnaire (Appendix A) was used to collect primary data during the survey. A structured questionnaire has the advantage of eliciting standard answers to questions, making it possible for comparisons to be made between sets of data. However, the questionnaire limits detailed responses and precludes possibilities of gaining in-depth views on the research problem. These inherent limitations were overcome by use of effective interview techniques (such as probing) and supplementing the questionnaire with data from other sources such as key informants.

The questionnaire was developed before the actual survey in English, and then pre-tested among a small sample similar to the survey population in the study area. The pre-testing was done to ensure that the actual questionnaire elicited the responses that answered the study questions as well as adapting it to for relevant local variations. During the actual survey, the questionnaire was administered by the researcher to selected households, targeting household heads or respondents in charge of children aged below five years. These were targeted because they directly contributed to decision-making affecting the health of children at respective households.

Single-visit structured interviews were conducted whereby the respondents were interviewed and the responses recorded by the researcher. The questionnaire was administered in English. However, interpretation into other languages such as Kiswahili or Luhya was done for respondents who had problems understanding English. Other members of the household were encouraged to participate especially in cases where the household head experienced problems in recalling events/data

3.2.5 Key Informant Interview Schedule

A key informant schedule (Appendix B) was employed to collect information from the key informants considered critical to the objectives of the study. These yielded invaluable insights into the dynamics of malaria morbidity in the study area. Among those interviewed were the Medical Officer of Health (Kabras division), Divisional Public Health Officer, an officer each from, Population Service International (PSI), Family Health International (FHI) and Chimuche Community Pharmacy, and local administration officers from each of the four selected sub-locations. The above named key informants provided additional and in-depth information on malaria-related child morbidity and their role in malaria control and prevention in the area.

3.2.6 Data Collection Limitations

An important limitation was that, the predetermined selection of sample households could not always be strictly adhered to during household visits. In some cases, the selected households were either vacant or did not have children aged below five years at the time of the survey. Subsequently, neighbouring households were selected as "replacements" and household heads interviewed instead.

While most of the questions asked the study respondents to think in terms of a typical malaria episode, the recall period for numbers of episodes was one year. This recall period is considered longer than usual and hence can lead to recall bias. Nevertheless, the one-year recall period was chosen because there were no reliable data from which to extrapolate a shorter period to the annual period needed for this research. In such cases other members of the household who could recall were encouraged to participate during the interviews so as to get as accurate information as possible

Another notable constraint was the difficulty of identifying malaria distinctly from other diseases in the absence of laboratory-tested blood smears. The scope of this study confined the malaria definition to illness episodes that people and clinicians presume to be and refer to as "malaria".

The use of a hybrid approach (i.e household interviews, key informant interviews and review of health records) for this study was designed to compensate for as many as possible of these data and definitional constraints. A representative sample household survey was considered a preferable method for collecting much of the individual and household level quantitative data and whose resultant findings are generalizable to the study population

3.2.7 Data Processing and Analysis

Analysis of data collected was done by use of the Statistical Package for Social Sciences (SPSS) program version 12.0. Pre-coded data was entered into the SPSS program after which it was cleaned to remove the effect of outliers. A descriptive analysis of data, involving frequency distribution and measures of central tendency (such as mean, mode and median) was done to provide statistics useful for describing characteristics of the sample population.

Inferential statistics such as correlation and regression analyses were used in this study to establish the relationship between variables and hence test the study hypotheses. Correlation analysis is used to analyze (describe) the strength and degree (amount and direction) of relationship between two linearly related variables (Huntsberger and Billingsley, 1997; Mugenda and Mugenda, 1999). In this study, correlation analysis was used to determine the strength and direction of association between malaria prevalence and identified socio-economic variables (hypothesis 1). Also, correlation analysis was used to determine the relationship between response strategies and socio-economic variables (hypothesis 2) as well as between response strategies and malaria prevalence (hypothesis 3). In all cases, correlation analysis was tested at $p < 0.05$ and 0.01 significance levels (2-tailed test), as conventionally applied in social science surveys.

On the other hand, multiple regression analysis was employed to determine, estimate and predict the values of dependent variable (adoption of response strategies), given the values of the independent variable (socio-economic characteristics) when the two variables are linearly related to each other (Huntsberger and Billingsley, 1997; Nachmias and Frankfort-Nachmias, 1996; Mugenda and Mugenda, 1999). This technique was used in this study to

find out whether the socio-economic characteristics influence the adoption of malaria response strategies in the study area. The technique is based on the linear equation model expressed as: $Y= b_0 + b_1x_1 + b_2x_2 + b_3x_3$ -------n

Where Y= dependent variable (adoption of response strategies)

B_0= constant

B_1= regression coefficient

X_1, x_2, x_3= independent variables (age, education, income etc)

Based on the above equation, the standardized regression coefficients (beta weights or β) measures the amount of change in the dependent variable associated with one unit change in the independent variable while controlling all other variables in the equation. To examine the combined effect of all the independent variables, the coefficient of determination (R^2) was computed. The measure (R^2) designates the percentage of the variations in the dependent variable explained by all the independent variables in the multiple regression equation. The greater the value of R^2, the stronger the power of the independent variables in predicting the dependent variable. In this study, multiple regression analysis was used in testing hypotheses 2 and 3 at $p < 0.05$ and 0.01 significance levels (2-tailed test).

This model was preferred since it satisfies the underlying assumption that variables should be both randomly selected from a normally distributed population and statistically independent of each other. When used, it eliminates the bias of extraneous variables by including them as regressors and hence improves the confidence intervals and tests.

3.2.8 Interpretation of the Study Findings

Interpreting the findings of this study must take account of both the advantages and disadvantages of the research methodology used for this study. For example, because the study data was derived from a fairly representative sample of households, statistical measures applicable to large, random samples of quantitative data suitably apply. Thus, the findings must be viewed as predictive or statistically representative of the study population.

In addition, the methodology used in this study produces reliable estimates that are in line with findings of other similar studies in Africa such as Malawi and Nigeria. It is therefore worth noting that the data used in this thesis, is not free from errors especially due to the afore-mentioned limitations. To some extent therefore, the use of results obtained and conclusions should be weighed against these limitations

CHAPTER FOUR: SOCIO-ECONOMIC & DEMOGRAPHIC CHARACTERISTICS

4.0. Chapter Introduction

This chapter presents a discussion of the research findings based on the socio-economic and demographic characteristics in the study area. This chapter also discusses malaria prevalence, response strategies as well as the environmental conditions of the sample population. Such information is important as it helps to unravel the factors which influence malaria morbidity as well as the response strategies adopted to counter morbidity at household level.

4.1 Age and Sex of Study Respondents

Age is an important factor with significant influence upon the demographic as well as epidemiological aspects of a given population. Survey data (Figure 3) indicate that the sample respondents were all women aged between 15 and 70 years, with a mean and median age of 35 and 42.5, respectively. This in a way confirms the well-known fact that women are the primary undertakers of healthcare provision for children aged below five years.

It is also observed that, majority of the respondents are fairly young women and in their prime reproductive age. The predominance of this group is significant in this study, as it suggests an increase in the population of children aged below five years and hence a proportional increase in demand of healthcare needs. Consequently, this has far-reaching implications on allocation of resources to healthcare needs (such as malaria control) at the household level.

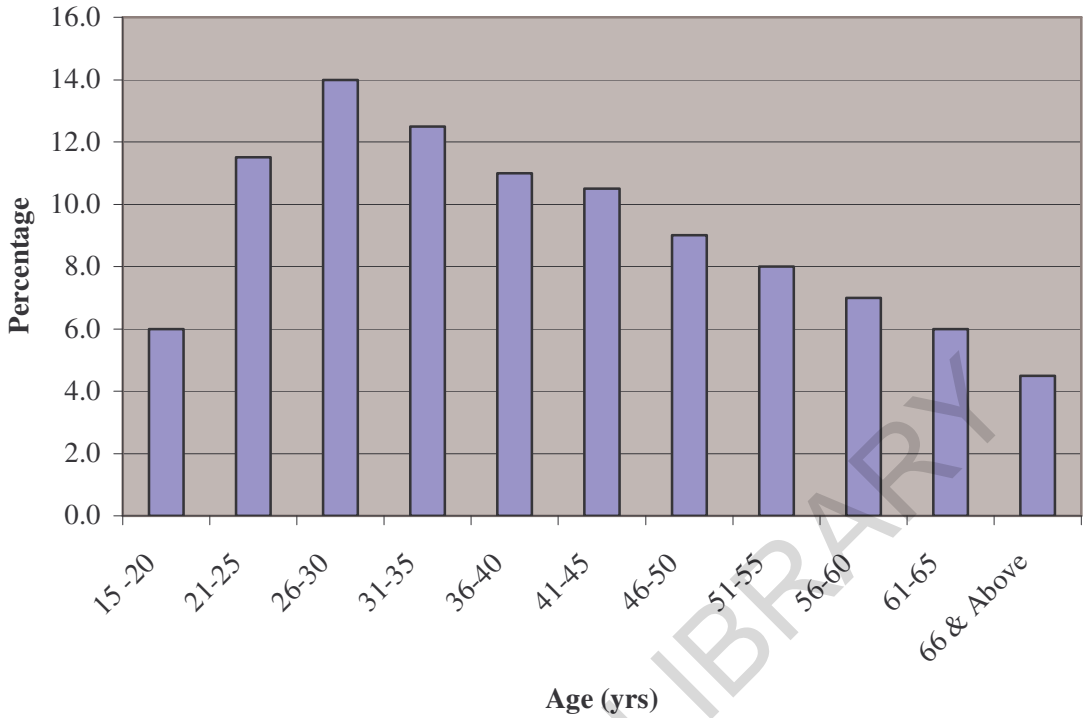

Figure 3. Age Distribution of the Sample Respondents

***Source**: Survey Data, 2004.*

4.1.1 Gender and Household Headship

Household headship is an important factor in the overall health of the members of a given household. This is because the acquisition of household goods, which foster health, is often subjected to a process of negotiation and differential power based on gender (Tanner and Vlassoff, 1998). In many cases, men are the decision-makers, whereas women are mainly housewives in charge of childcare and home-keeping.

In this study, data on household headship reveal that 75 percent of the sample households were male-headed while only 25 percent were female headed. This probably suggests that men are the decision-makers, whereas women retain their reproductive roles (home-keepers and childcare) in their respective households. These gender roles are even

profound in family structure (Table 5), in which 75 percent of the sample respondents were married, 17 percent were single, 8 percent were widowed and 2 percent were divorced.

Table 5 Marital Status of the Sample Respondents

Marital status	Frequency	Percentage
Married	149	74.5
Single	34	17.0
Widow/Widower	15	7.5
Divorced/separated	2	1.0
Total	**200**	**100.0**

***Source**: Survey Data, 2004*

4.1.2 Household Size

Household size is an important factor in determining the size of expenditure budget as well as the amount of disposable resources available for social services such as healthcare. Household size generally refers to the total number of inhabitants residing within the household on relatively permanent basis at one particular time. This study focused on regular residents of sampled households, excluding those working away, always traveling or boarding students

The study established that household size ranged from 3 to 10 persons with a mean and modal family size of 5.8 and 5 persons, respectively (Figure 4). A closer look reveals that 55 percent of the sample households had a family size ranging between 5-7 persons, 20 percent had 8-11, while 26 percent had 1-4 persons. Given the high poverty level of 58% (R.O.K, 2001, R.O.K, 2002b) in the study area, such large household sizes exert considerable pressure on allocation of resources to vital services such as healthcare.

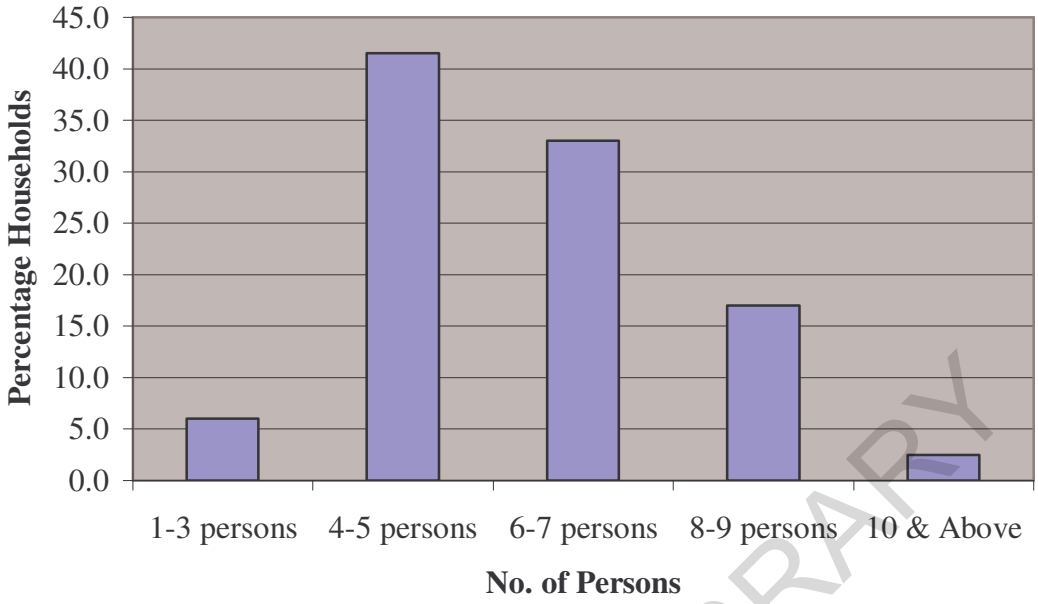

Figure 4. Distribution of Sample Households by Size

Source: Survey Data, 2004

4.1.3 Religion

Religious faith of the respondent and by extension that of the household, is an important socio-cultural factor owing to its influence, not only in disease recognition and diagnosis, but also in seeking healthcare. Indeed, some studies indicate that Christian denominations have higher rates of health service-utilization than either Muslim or traditional sects (R.O.K, 2004).

Survey findings (Figure 5), show that 45 percent of the sample households professed Protestant faith, 29 percent were Catholics, 8 percent were Muslims, 7 percent *Bahai*, 6 percent were African traditional sect (*Dini Ya Musambwa*), 4 percent were Holy Spirit (*Abaushi*) and 2 percent did not belong to any specific religious sect.

It was noted that, whereas Protestants, Catholics, *Bahai* religions allowed and appreciated conventional medication, the Holy Spirit (*Abaushi*) sect and *Dini Ya Musambwa* discouraged the use conventional medication. They instead recommended healing based on

prayers or traditional medicine for all diseases. This suggests a potential barrier to full utilization of health services in treatment of malaria in the study area.

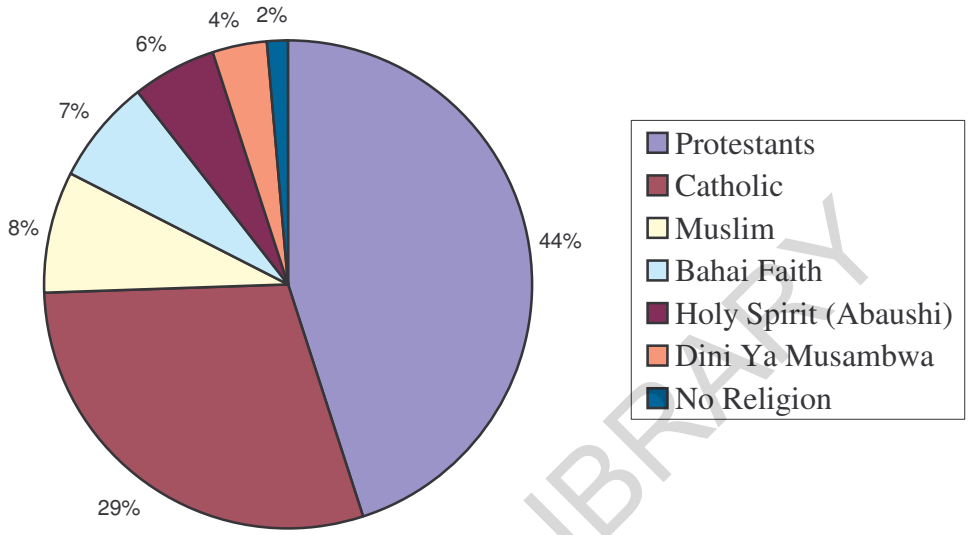

Figure 5. Distribution of Sample Households by Religion

***Source**: Survey Data, 2004*

4.1.4 Education

The education level of the household head enhances the household's ability to afford healthcare (via income through gainful employment). Furthermore, education is an important requirement in adoption of appropriate malaria prevention and treatment measures (Mwabu & Mwangi, 1986; Okonofua *et al*, 1992). Indeed, awareness and ability to read and interpret educational as well as malaria-related information, considered key to control programmes, depend upon literacy levels among the affected population.

It is evident from Figure 6, that 28.5 percent of the sample household respondents received no formal education, 47 percent attained primary school education, 13 percent secondary school education, 7.5 percent tertiary, and 4 percent university education. It is evident that

the respondents in the study area attained relatively lower education levels. The low levels of education among the respondents, does not only affect their awareness on malaria, but also limit their role in malaria control at the household level.

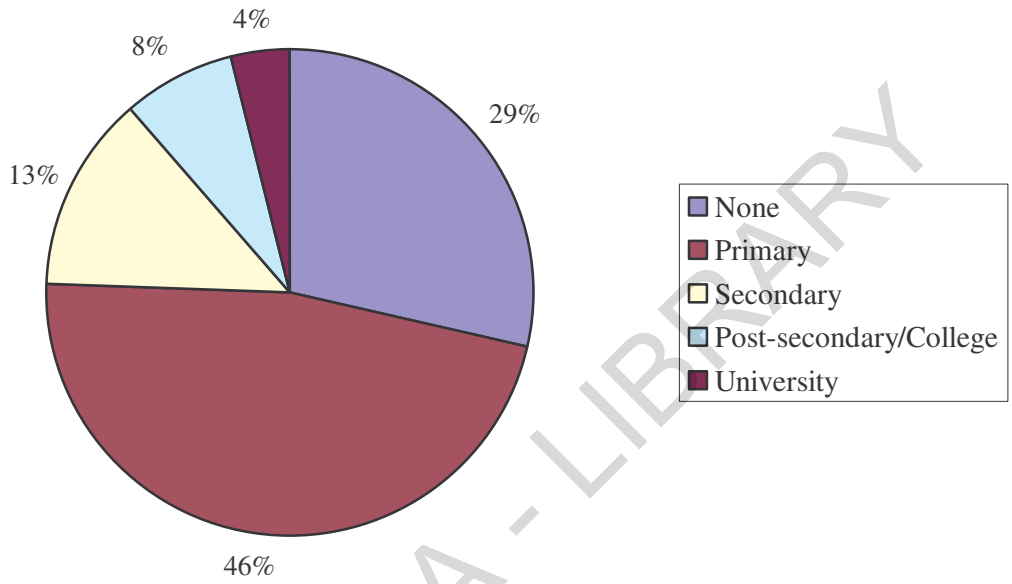

Figure 6 Education Levels of Study Respondents

***Source**: Survey Data, 2004*

4.1.5 Employment Status and Main occupation

Respondents' employment status and main occupation determines the level of access to medical care (through income) in a household. Employment data indicate that, 28 percent of the sample respondents were formally employed, 38 percent were self-employed while 34 percent were un-employed at the time of survey. According to Figure 7, 52 percent of the respondents were farmers, 15 percent engaged in business, 12 percent were civil servants, 24 percent were casual laborers.

These further supports earlier observations that many households relied on income derived from farming to meet healthcare obligations. It is worth mentioning that, majority of the un-employed female respondents engaged in home-care and rely on remittances from male spouses and other income sources to offset costs related to malaria treatment and other health services for their under-five children.

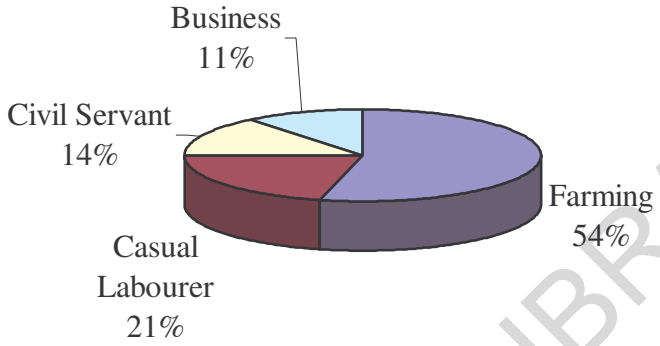

Figure 7. Respondents' Main Occupation

Source: Survey Data, 2004

It is evident that farming is a major source of livelihood (income and food) for many households in the study area. Survey data indicate that households are engaged in a wide range of farm enterprises including crop farming and livestock rearing. Data shows that a significant proportion of households (97 percent) kept livestock (cattle and poultry), 77 percent engaged in subsistence crop farming while only 28 percent practiced cash-crop farming (sugarcane). According to respondents, the crops and livestock were often sold or bartered to provide financial resources to offset medical bills.

4.1.6 Household Assets

Availability of a variety of disposal assets within the household influences child health in two main ways: First, availability of some assets such as radio and TV can act as media through which health-related information is relayed to improve health status of a given household. Second, assets such as bicycle, motorcycles, and cars usually provide means by

which health facilities can be accessed. Furthermore, in extreme cases of severe child morbidity, sale of these disposable assets enable households to offset medical bills arising from illness.

Table 6 shows that, a significant proportion of sample households (91 and 98 percent) owned radio and bicycle, respectively. Twenty four percent owned a television set, 7 percent owned ox/hand cart, motorcycle (5 percent), personal car (2 percent), tractor (2 percent) and *Posho mill* (1 percent). The ownership of bicycle and radio by majority of households was attributed to their information and transportation roles in the study area.

Table 6. Household Asset Ownership

Type of Asset (n=200)	Percentage
1. Bicycle	91.0
2. Radio	98.0
3. Television	23.5
4. Ox/Hand Cart	7.0
5. Motorcycle	5.0
6. Personal Car	2.0
7. Tractor	2.0
8. *Poshomill*	1.0

***NB**. Total percentages exceed 100 due to multiple responses*
Source: Survey Data, 2004

4.1.7. Household Annual Income

Household income determines the ability of the household not only to afford healthcare services in the event of child morbidity, but also to invest in malaria preventive care (Hobb-Craft *et al*, 1984, Biritwum *et al*, 2000). In this study, annual household income refers to all the monies that accrue to a household in a year from various sources. The total monthly incomes reported by respondents were classified into 5 categories: less than Kshs. 1,240; Kshs 1,241-5,000; Kshs. 5,001-12,000; Kshs. 12,001-20,000; and Kshs. 20,001 and above.

The lowest monthly income of Kshs.1240 was chosen as a bench mark, as adopted from the derived national rural absolute poverty line of Kshs.1239 per person per month. The above categories were then used to compute income earned over the past 12 months prior

to the study: less than Kshs 14,880; Kshs. 14,881-60,000; Kshs 60,001-144,000; Kshs 144,001-240,000; and Kshs 240,001 and above.

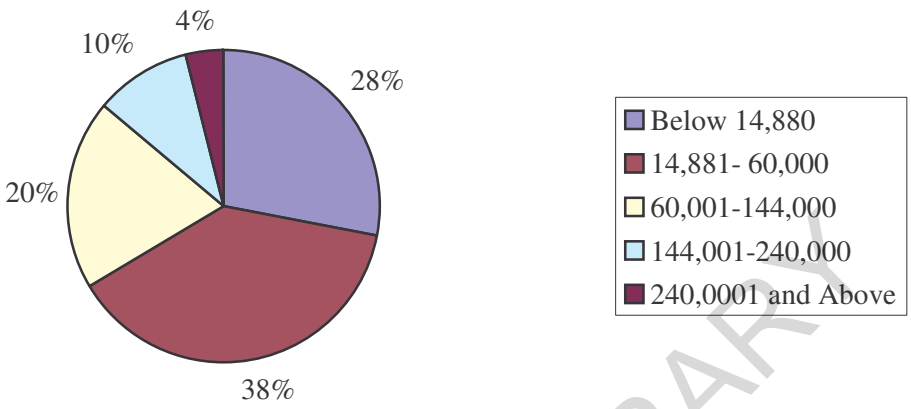

Figure 8. Household Annual Income

***Source**: Survey Data, 2004.*

Figure 8 shows that in the last 12 months, 28 percent of the sample households earned less than Kshs 14,880, 39 percent earned between Kshs 14,881-60,000, 20 percent earned between Kshs 60,001-144,000, 10 percent earned between Kshs 144,001-240,000, and only 4 percent earned Kshs 240,001 and above. As earlier alluded to, a significant proportion of the household income was earned from formal and self- employment (farming and business).

A closer observation indicates that, majority (67 percent) of the households in the study area earned between Kshs 0 and 144,000 in the year 2004. In Kenya, the estimated national absolute poverty incomes are Kshs 1,239 and 2,645 per month per adult person in rural and urban areas, respectively (R.O.K, 1999b). With a mean of 6 persons per household in the study area, the 67 percent of sample households can be regarded to be spending between Kshs 357 and Kshs 1429 per month per person and hence considered to live below the poverty line. This figure of 67 percent is evidently way above the national and district poverty estimates of 56 and 58 percent, respectively (R.O.K, 2001, Appendix E).

4.1.8. Health Expenditure Budget

The health status of members of a given household depends on how the financial resources are allocated to health needs vis-à-vis other competing needs such as food and non-food items. Field data generally shows that majority of households in the study area allocate more resources on food items than healthcare. This implies that generally, healthcare needs are given low priority compared to food requirements in the study area. The study went further to find out the proportion of household income expended on illness associated to malaria (Figure 9).

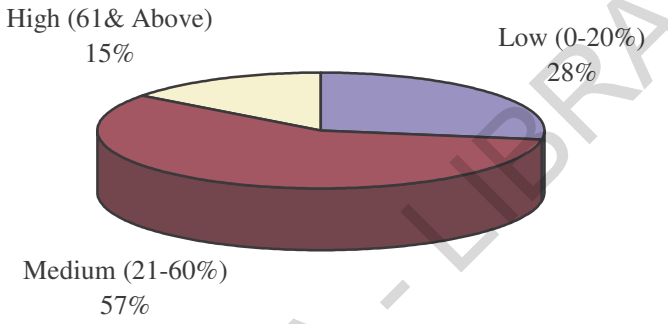

Figure 9. Proportion of Income Spend On Malaria Treatment

***Source**: Survey Data, 2004*

It is worth noting from Figure 9 that expenditure on malaria treatment and control constitutes a significant proportion of the household budget. Indeed, survey data reveals that the annual health cost to treat and control malaria represents 20 to 80 percent of the total annual household income in the study area. This suggests that typically poor households would be unable afford and hence would in reality adopt various coping mechanisms to minimize costs and other impacts related to malaria morbidity.

4.1.9. Housing

Housing (type, quality and density) is an important environmental component that greatly influences transmission of malaria among children within a household. Better housing and environmental sanitation are known to drastically reduce human-vector contact and hence

malaria morbidity. In this study, housing was categorized into: "permanent", "semi-permanent" and "temporary or traditional" based on materials used in the construction of the floor, walls and the roof. The permanent units had cemented floors, walls and iron roof. The semi-permanent units were characterized by mud walls, earthen floor and iron roof, whereas temporary units had mud walls, earthen floor and grass-thatched roof. Field data (Table 7) indicates that, majority of the households (53 percent) resided in "temporary" units (traditional huts), 41 percent in "semi-permanent" and only 6 percent lived in "permanent" houses.

These figures are consistent with those reported at national level (R.O.K, 2003; R.O.K, 1999b). A closer observation however, reveals marked variations in living density (crowding) among the identified household categories. Overall, living density ranged from 2 to 5 persons per living room, with a mean of 5 persons per room. The mean density, though higher, is consistent with the national average of 4.6 for rural areas (R.O.K, 2003). Much more significant is the observation that majority of households living in temporary (traditional) units evidently have relatively higher densities (4 to 5 persons per room). The openings on the typical traditional housing together with apparent crowding, impacts negatively on the health of the inhabitants. For instance, such conditions often enhance transmission by exposing the inhabitants to malaria vectors (mosquitoes). Indeed, crowding reduces the effective application of treated bed nets in malaria prevention.

Table 7. Housing Type and Living Density

Type of House	Percentage Households Living density (persons/room)				Total
	2	3	4	5	
Permanent	63.2	10.5	21.1	5.3	**100.0**
Semi-permanent	19.5	28.0	45.1	7.3	**100.0**
Temporary	5.7	16.0	56.6	21.7	**100.0**

Source: Survey Data, 2004

4.1.10 Environmental Sanitation

Sound environmental management and sanitation is known to drastically reduce mosquito population as well as vector-human contact thereby helping to control malaria transmission. The observed environmental sanitation based on aspects such as presence or absence of bushes, stagnant water, and disposal of solid waste near living quarters were used to measure the level of sanitation (Appendix D). Study findings (Table 8) show that with regard to presence of bushes, a cumulative 85 percent of households had tall grasses, shrubs, maize/cane field & forest around homesteads. Also findings indicate that 85 percent had stagnant water surfaces (puddles/ponds & swamps). It may be observed (Table 8) that 80 percent of households had solid wastes (open containers & litter/rubbish) around homesteads. These findings suggest that the environmental sanitation in many sample households were poor and hence predisposed inhabitants to malaria infection.

Table 8. Level of Environmental Sanitation

Observations	**Percentage Households**
1. Vegetation/Bushes	
Open Land (recently Ploughed)	5.0
Tall grass	10.0
Tall grass & shrubs	35.0
Maize/Cane field	40.0
Forest	10.0
Total	**100.0**
2. Stagnant Water Surface	
Water Puddles/Ponds	50.0
Spring/Swamp	35.0
River/Stream	15.0
Lake	0.0
Total	**100.0**
3. Solid Wastes	
Large open containers	50.0
Small containers	30.0
Rubbish/Litter	20.0
Total	**100.0**

***Source**: Survey Data, 2004*

4.1.11 Sources of Information on Malaria Disease and Control.

The effectiveness of malaria control strategies is significantly influenced by the active and informed participation of intended beneficiaries (respondents). In this study, the respondents were asked about the main source of malaria information as well as its relative adequacy in malaria control. Survey findings (Figure 10) indicate that the radio was the major source of information on malaria disease (75 percent), followed by public health workers (15 percent). Other sources included social networks (friends, relatives) accounting for 8 percent, public *Baraza* (4 percent), medical personnel (2 percent) and NGOs (1 percent).

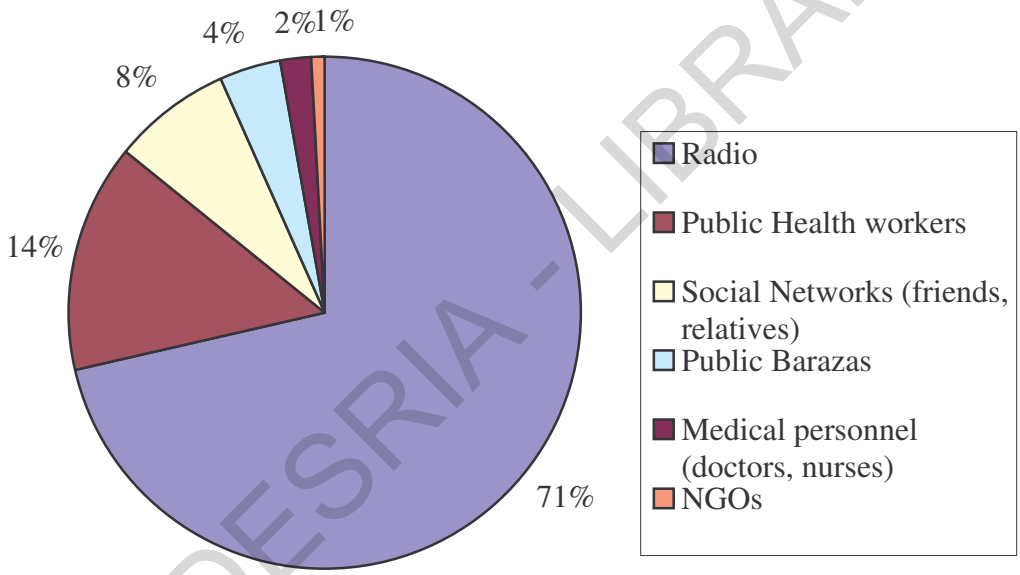

Figure 10. Sources of Malaria Information

***Source**: Survey Data, 2004*

The respondents were further asked about the adequacy of such sources of information in malaria control and their responses are summarized in Figure 11. It may be observed that majority of the respondents (73 percent) considered the information as being inadequate for purposes of malaria control in the study area.

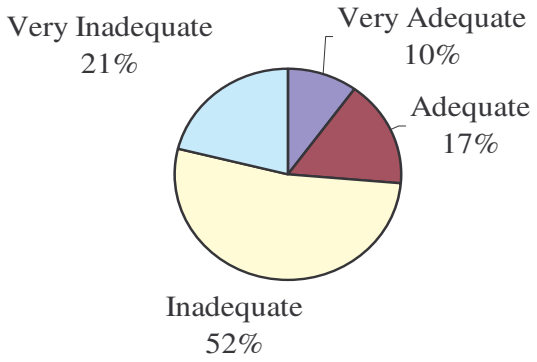

Figure 11. Respondents' Views on the Adequacy of Malaria Information

Source: Survey Data, 2004

The adequacy or inadequacy of various sources of information on malaria was explained in various ways. Information on malaria conveyed via radio was readily available but in most cases encouraged use of anti-malaria drugs and preventive measures. This in effect encourages prompt treatment of malaria at home by use of anti-malaria drugs. Nevertheless, unregulated use of anti-malaria drugs often bought over the counter at local kiosks, and drug shops, usually delays in seeking of medication and results in over-use and misuse of drugs thus bringing about the drug resistance.

Although the public health workers provided professional information on malaria and its control, they were inadequate to effectively carry out awareness and control campaigns in the study area. On the other hand, information sourced from the social networks (friends, relatives, herbalists and religious leaders) in most cases was incomplete and misleading. Public *barazas* were rare, and when convened, were found either to specifically deal with matters other than malaria awareness or failed to involve women who are critical beneficiaries of malaria control information. Generally, information on malaria was inadequate and in most cases not targeted to intended recipients in an appropriate and suitable form.

4.1.12 Utilization of Health Services

Utilization of health services has a profound influence on treatment and control of malaria illness. In pursuit of the issue of utilization of health services, the study investigated the respondents' perception on important aspects of utilization of public health services such as adequacy, accessibility and quality of services. The respondents were asked about adequacy of the existing public health services in responding to morbidity in the study area and responses summarized in Figure 12.

The findings indicate that 70 percent of respondents considered the existing public health services inadequate, whereas only 30 percent considered them generally adequate. Owing to the general inadequacy of public health services, it was interesting to find out how households coped with illness such as malaria.

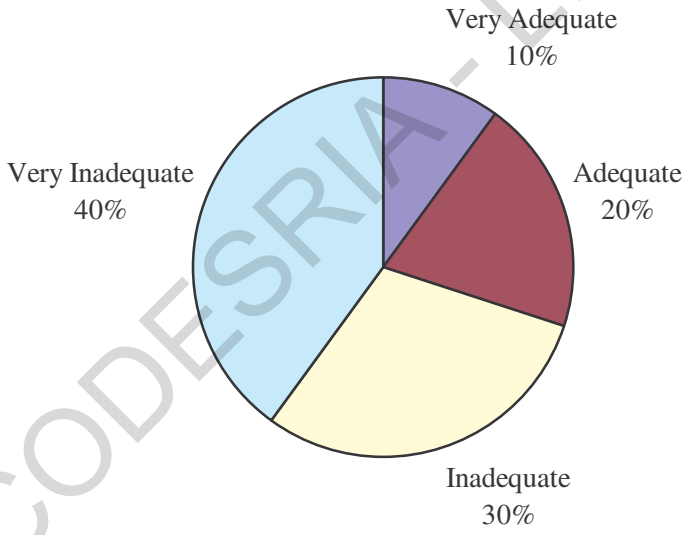

Figure 12. Respondents' Views on Adequacy of Health Services

Source: *Survey Data, 2004*

This study also investigated accessibility of public health services as influenced by distance to the nearest health facility (Figure 13). It may be observed that 60 percent of respondents are located within a range of 10-14 km from the nearest health facility, 2 percent (0-4 km), 20 percent (5-9 km), 18 percent (15-20km) and 1 percent (20 km and above). The average distance of 8km covered by majority of respondents to access the nearest health services, is relatively higher compared to the national average of (4 km) for the typical rural area (R.O.K, 1999). Distance to the nearest health facility represents both a perceived as well as an actual cost and influences decision to seek medication outside home by many households.

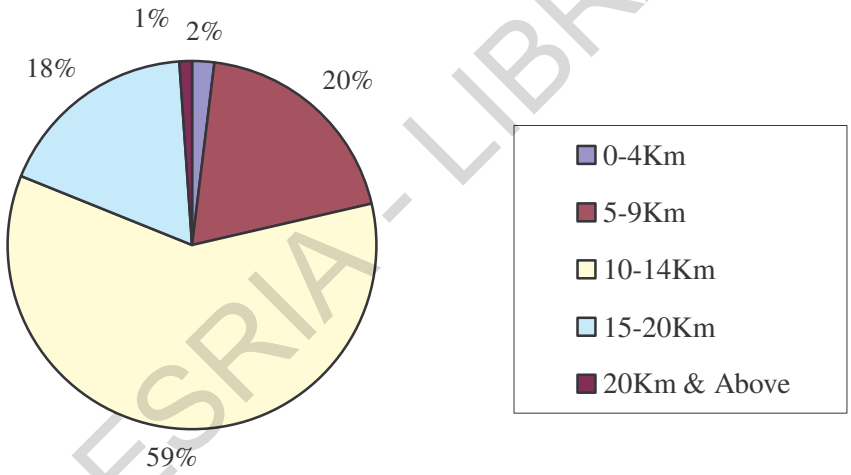

Figure 13. Average Distance to Nearest Health Facility

***Source**: Survey Data, 2004*

Also, of interest to this study was the accessibility of health facilities as influenced by means of transport and the condition of road network to the nearest health facility. Walking and use of bicycles were the predominant means of accessing health facilities, accounting for 60 and 30 percent, respectively. The remaining proportion of respondents reported using *matatu*/bus, *taxi* and personal cars. It is worth noting that, majority of the respondents had to walk long distances, often carrying their sick children on their backs to

access the nearest health services. This suggests a potential barrier to access health services especially for children aged below five, during malaria morbidity.

The condition of the road network and its influence on the accessibility to health services was also investigated. Field data reveals that majority of respondents (60 percent) perceived the condition of road network as "*poor*", 34 percent "*satisfactory*" and 6 percent "*good*". Indeed, roads in this area are predominantly earth-surface and become impassable especially during the wet rainy season. This often coincides with the peak malaria transmission period and hence impedes prompt treatment of malaria

Taking into account all the factors affecting accessibility to health services discussed above, the respondents were asked about the overall accessibility of health services in the study area and responses summarized in Figure 14.

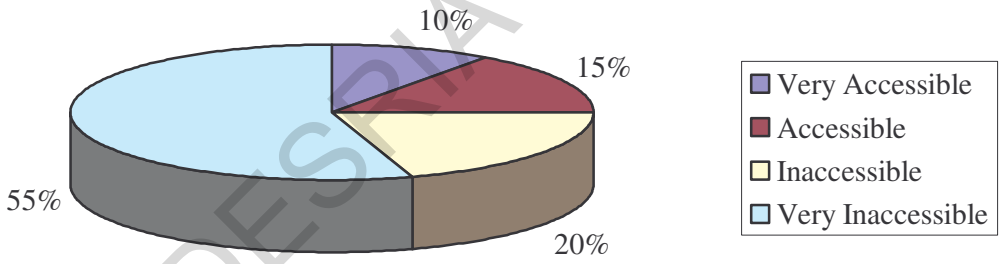

Figure 15. Respondents' Views on Accessibility of Health Services

***Source**: Survey Data, 2004*

On the basis of data in Figure14, the existing health facilities in the study area are generally inaccessible. This implies that whereas prompt and appropriate treatment is recommended, the sick children hardly access medication during malaria illness.

4.2 Malaria Prevalence among Children Aged below Five Years.

The study focused on perceived "malaria". This was guided by classical symptoms commonly associated with malaria illness such as high temperature, head and body aches, shivering, and weakness. A total of 200 sampled households were visited during the survey and information on malaria was collected among 350 children aged below five years in the sampled households. Study findings indicate that, 329 (94 percent) of the children had experienced malaria illness while 21 (6 percent) did not, during the 4 weeks preceding the survey. Thus malaria prevalence among the under-fives is therefore estimated to be 94 percent in the study area.

The reported malaria cases/episodes among children aged below five years found in each household during the last 12 months (1 year) were recorded. The average number of malaria episodes for each household was computed and summarized in Figure 16.

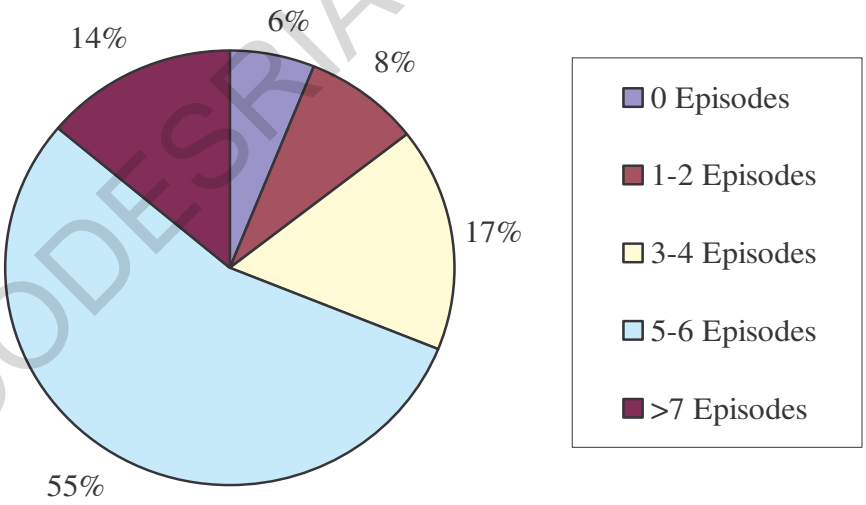

Figure 15. Household Malaria Prevalence in the Last 12 Months

***Source**: Survey Data, 2004*

The estimates of malaria episodes per year and duration of episodes fell between 0 and 10 episodes per household, lasting between two to ten days each episode in the past year. On the basis of data in Figure15, over a one-half (70 percent) of malaria prevalence at household level fell in the range of 2-6 malaria episodes, lasting three to seven days each episode, in the year preceding the study. The findings indicate that on average, 6.0 percent of the sample households reported no malaria episode, 8.5 percent (1-2 malaria episodes), 16.5 percent (3-4 episodes), 55.0 percent (5-6 episodes) and 10 percent (7 episodes and above) in the last 12 months. Based on the clinically confirmed malaria of one case per year among African children aged under five (Greenwood, *et al*. 1991) and 0.2 cases per person per year (WHO, in Shepard, *et. al*. 1991) more than 90 percent of the sampled households reported high malaria prevalence. Nevertheless, the prevalence estimates associated with this study are consistent with findings from similar studies, which found estimates based on people's own perception of malaria episodes to be 7.5 cases per year for children aged below five years in Malawi (Chitsulo, *et al.* 1992).

4.2.1 Diagnosis of Malaria among Sample Respondents

Study findings indicated that respondents perceived malaria to a frequent cause of illness among children aged below five years. Malaria symptoms most commonly described by respondents interviewed for this study included classical symptoms such as high temperature, head and body aches, shivering, and weakness. Descriptions also included symptoms that do not conform to clinical disease definitions such as yellow eyes, cough, sore throat, sneezing, yellow urine, and vomiting. In addition, other respondents listed other diseases such as typhoid fever and jaundice fever as types of malaria.

Responses on the cause(s) of malaria illness among their under-fives (Figure 16), indicate that only 33 percent cite mosquitoes as the cause of malaria. About 67 percent of those interviewed did not know the cause of malaria, and instead cited a range of causes for malaria illness. Among those who cited a range of causes for malaria mentioned cold weather, eating new foods, getting rained on, standing in stagnant water, and witchcraft/sorcery.

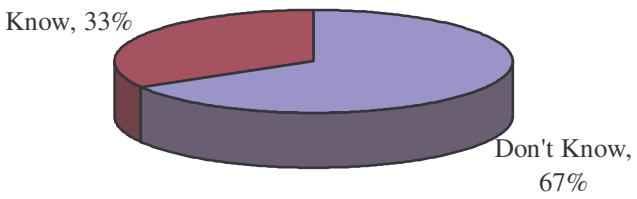

Figure 16. Respondents' Knowledge of Malaria Causes

***Source**: Survey Data, 2004*

Generally, study findings above reveal variations on the respondents' knowledge of causes of malaria causes and transmission. Further, the findings suggest lack of knowledge by the respondents on the actual cause of malaria and transmission, largely influenced by indigenous cultural beliefs. This in turn, is likely to influence the response strategies adopted to manage malaria morbidity in the study area.

4.2.2 Seasonality of Malaria Morbidity.

According to survey findings, incidence of malaria in the study area is seasonal with two peak seasons each year, during which inhabitants are most likely to experience high malaria morbidity. A significant proportion of respondents cited the months of May –July and September – December as high malaria transmission period. Indeed, the above-identified peak malaria periods coincide with long and short rain seasons, respectively

4.3 Management of Malaria Morbidity among Sample Households

This study also sought to find out how households responded to malaria morbidity among children aged below five years. Field data reveal that 33 percent of the sample respondents took their sick children to a healthcare facility, 57 percent administered treatment at home,

while 10 percent neither administered home treatment nor took their sick children to a health facility. A closer look at those who treated malaria cases in one way or another reveals that, 48 percent sought health services after administering some form of treatment at home, 18 percent visited health facilities without home treatment while 34 percent exclusively administered home treatment (Figure 17).

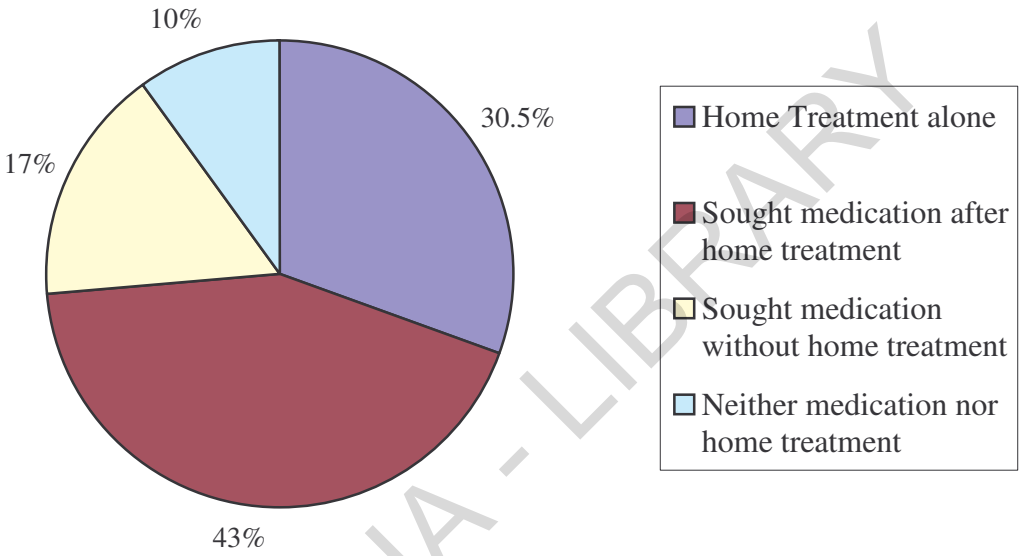

Figure 17. Actions Taken by Households to Manage Malaria Illness

***Source**: Survey Data, 2004*

4.3.1 Home Treatment Strategies

As eluded to in section 4.3, a significant proportion of sample respondents administered home treatment compared to those who sought healthcare services. Generally, respondents believe that seeking conventional medication for malaria and other diseases is relatively expensive compared to home-treatment. This study sought to document the specific actions taken by respondents to manage malaria illness at home. Responses given are summarized in Figure 19. It may be observed that majority of respondents (91 percent) routinely administered an anti-malaria or another class of drug by themselves to the sick

children, 5 percent administered traditional herbs, 2 percent resorted to healing based on prayers/faith, while 2 percent had their sick children attended to at home by an exociser (*Omufumu*).

It is apparently clear that "self-medication" by use of anti-malaria drugs was a predominant practice for many households in the study area. This trend can be attributed to the ready availability of anti-malaria drugs or leftover drugs acquired from previous visits to health facilities. The treatment of malaria by use of traditional herbs as well as by exorciser/*Omufumu* is attributed to strong cultural beliefs about diseases. In such cases severe cases of malaria, especially those involving convulsions are attributed to causes like evil spirits or sorcery/witchcraft. Thus, it is generally believed that such diseases do not respond well to conventional medication. Similarly, healing based on prayer is supported by strong religious beliefs as observed among those who belong to the *Abaushi* religion.

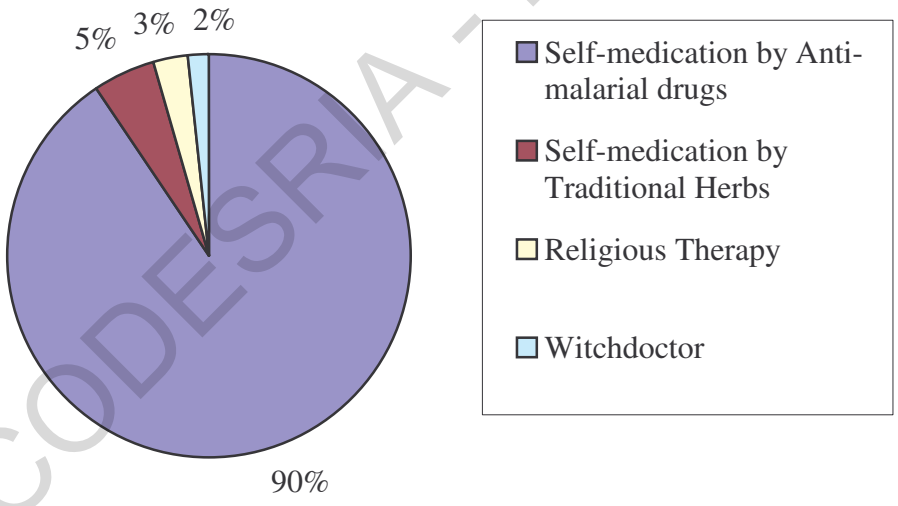

Figure 18. Home-Based Treatment Strategies

***Source**: Survey Data, 2004*

According to study findings, chloroquine and anti-pyretics (panadol, aspirin) were the most frequently used drugs for treatment of malaria at home. Other drugs administered included

the Sulphur-based such as Fansidar and Metakelfin. According to survey data (Figure 20) these drugs were readily obtained from pharmacies, small shops (K*iosks*), or health facilities. It is worth noting that chloroquine drugs continue to be administered despite having long developed resistance to malaria in many malaria-prone regions. On the other hand, the current recommended sulphur-based drugs (such as Fansidar and Metakelfin) are considered expensive. This compels many households with malaria patients to resort to the generic forms that increase drug resistance.

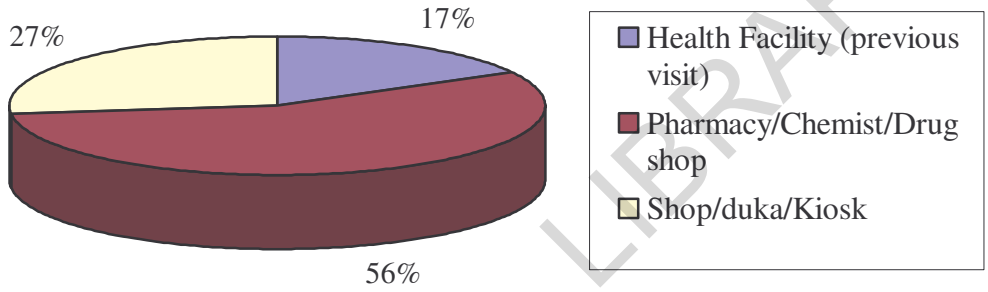

Figure 19. Common Sources of Anti-malarial Drugs

***Source**: Survey Data, 2004*

4.3.2 Health-seeking Strategies

Access to appropriate and prompt treatment is critical in the management of malaria morbidity. As already mentioned in section 4.3, only 33 percent of the sample respondents reported seeking treatment outside home, 3-4 days after onset of malaria illness. This study sought to find out from where the respondents sought treatment outside home and responses summarized in Figure 20.

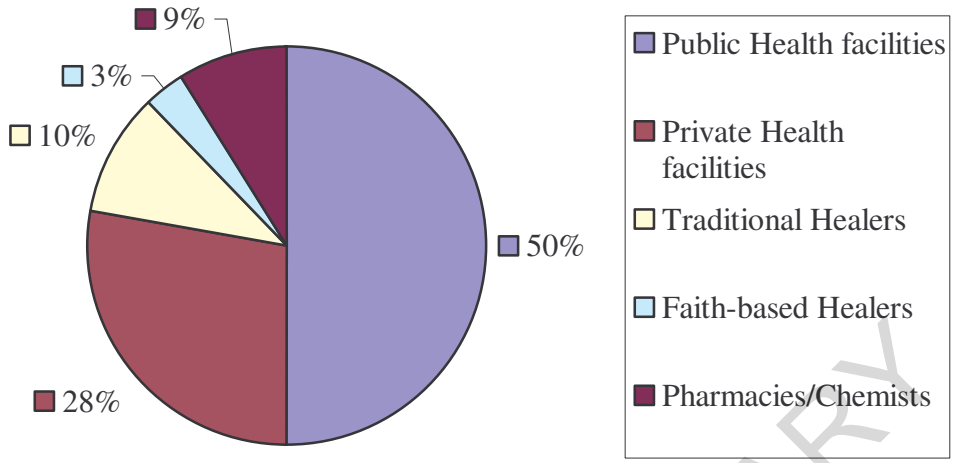

Figure 20. Malaria Health-Seeking Strategies

***Source**: Survey Data, 2004*

According to research findings, households sought for treatment from diverse health providers. These include public health facilities (50 percent), private facilities (28 percent), traditional healers (10 percent) and Faith-based healers (3.5 percent). It is clear from these statistics that public health facilities are commonly preferred in treatment of malaria by majority of households (50 percent) in the study area. These figures are consistent with the national average utilization rates of 51 and 28 percent for public and private providers, respectively (R.O.K, 2003). Majority of respondents preferred the use of public health facilities to treat malaria cases because of the perceived low cost of medication. However, factors such as frequent drug shortages, non-negotiable service charges and non-flexible opening schedules all contribute to discourage use of such facilities. Private health providers (clinics, nursing homes) were therefore generally preferred due to negotiable service charge, close proximity, and payment according to level of treatment received.

The use of traditional healers and faith-based healers in malaria treatment was based on strong cultural and religious beliefs that malaria illness does not respond well to western

medication. On the other hand, local drug shops and pharmacies did not only serve as sources of anti-malaria drugs but also treatment points for malaria.

4.3.3 Malaria Prevention Strategies

Malaria prevention is a critical input in the overall malaria control efforts. Besides the other objectives examined above, this study sought to investigate how respondents prevented malaria among children aged below five years. Figure 21 reveals that in 31 percent of sample households, anti-malaria drugs were used to prevent malaria infection. According to the respondents, these drugs were readily obtained from local shops or left-overs drugs prescribed during previous visits to health facility. Also, use of such drugs in malaria prevention can be attributed to the belief that they can be effectively used to prevent malaria infection.

It may be observed that in 20 percent of the sample households, no measures were adopted to prevent malaria among the affected children. This may suggest lack of clear understanding of causes and transmission of malaria by a section of respondents in the study area. Other measures used to prevent malaria infection include; burning leaves/dung (15 percent), use of treated nets (12 percent), insecticide sprays/coils (9 percent) and repellants/jellies (5 percent). Environmental management measures such as clearing of bushes, draining of stagnant water, container disposal and outdoor spraying were dismally adopted by sample households 3, 2, 2 and 1 percent, respectively.

Further, according to respondents, use of insecticide sprays/coils and repellants is attributed to their relatively low cost and local availability (from local shops). Nevertheless, their effectiveness is limited to early hours of night, to the extent that they fail to protect the subjects during late hours often associated with peak mosquito biting. Lighting of fires and burning of mosquito-repellant leaves (cypress) and dung, can be attributed to both lack of awareness of appropriate malaria prevention measures as well as influence of traditional and cultural beliefs.

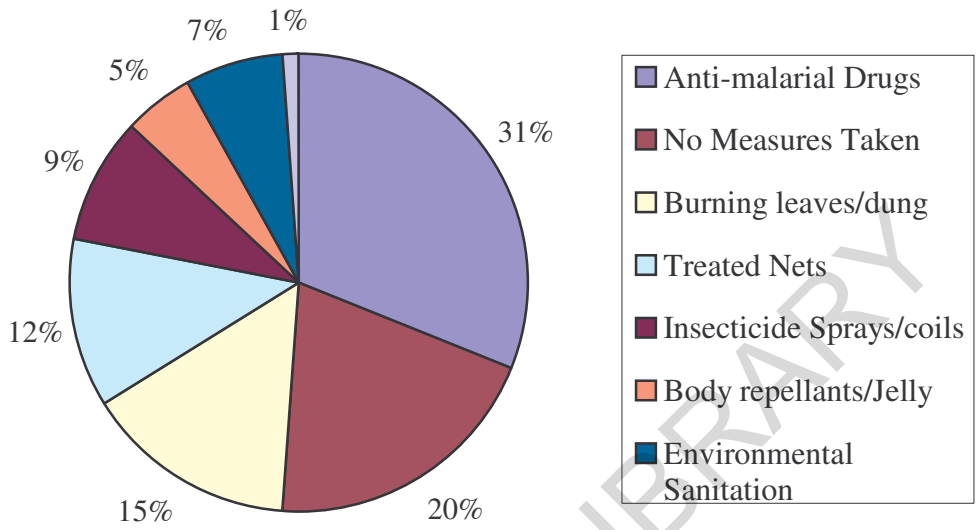

Figure 21. Malaria Prevention Strategies

***Source**: Survey Data, 2004*

Generally, it is evident that the recommended malaria control practices such as use of insecticide-treated nets (ITNs) and vector control have been marginally adopted in the study area. The observed 12 percent coverage of treated nets, though slightly higher than the national average of 6 percent (R.O.K, 2003), is much lower than the Roll Back Malaria Abuja target of 60 percent. Field data also indicate that expenditure on relatively expensive items such as mosquito net constitutes a greater share of the disposable income of more resource-poor households. Even further, study findings indicate that children who are the critical beneficiaries of treated nets are not given priority access to such protective nets

Similarly, even relatively fewer households had employed effective environmental control of malaria vectors (mosquitoes). Poor environmental sanitation in majority of households was characterized by stagnant water pools/ponds, overgrown bushes, un-disposed off

rubbish and abandoned containers in close proximity to living quarters. Further, field observations reveal presence of bushy crops (such as maize and sugarcane), near living quarters which enhance malaria transmission in the study area. It is worth noting that presence of sugarcane bushes close to homesteads meant that households are continuously at risk of malaria infection for as long as the crop takes to be harvested (at least after 2 years). Out-door spraying which is considered effective for large-scale malaria control is unfortunately adopted marginally in the study area due to the high costs involved that individual households can hardly afford.

4.3.4 Coping Strategies Related to Malaria Treatment

It is apparent from the foregoing discussion that malaria treatment and prevention represents a considerable economic burden for the affected households. Indeed, expenditure on malaria treatment is likely to represent the largest share of annual spending, such that affected households would in reality have to adopt various coping mechanisms to reduce these costs. The study identified two categories of such coping mechanisms namely; (1) those that minimize the costs of malaria treatment and prevention and (2) those that assist households to secure financial resources to afford malaria control. The cost-minimizing strategies include; foregoing treatment for some malaria episodes, purchasing less than full doses of medication or least expensive medication perceived to be effective, and undertaking no prevention to save cash for treatment when needed. Those that are used to mobilize financial resources include; sale or barter of disposable assets, donations (*Harambee*), loans and intra-household transfers and formal insurance cover such as National Hospital Insurance Fund (NHIF).

CHAPTER FIVE: RESULTS BASED ON HYPOTHESING TESTING

5.0 Chapter Introduction

This chapter focuses on the statistical data analysis and presentation of results based on hypotheses testing.

5.1 Hypothesis 1.

Socio-economic characteristics do not significantly influence malaria prevalence among children at household level in the study area.

In this hypothesis, correlation analysis was used to determine the strength and direction of association between malaria prevalence (dependant variable) and identified socio-economic characteristics (dependent variables).

The variables were measured as explained in Appendix C. First, a correlation analysis was run for each of the identified socio-economic variables (independent variable) on household malaria prevalence (dependent variable). Second, multiple regression analysis was run to determine the influence of independent variable (socio-economic variables) on the dependent variable (malaria prevalence). This is essential in identifying the significant factors that predispose children aged below five years to malaria morbidity in the study area.

However, before carrying out regression analysis, the socio-economic (independent) variables were correlated to verify and avoid cases of multi-colinearity among them. Appendix 4 shows inter-item correlation of the socio-economic variables depicting how each variable is correlated with one another. All the variables do not show very high correlations with each other (indicating lack of multi-colinearity). This provided the greenlight to use the variables in the regression analysis.

Results from correlation analysis (Table 9), indicate that of the eleven socio-economic variables predicted to be associated with malaria prevalence (dependent variable), six of them showed significant associations. These are in the order of magnitude of r: Household income, malaria control information, cost of health services, environmental sanitation, respondents' education level, and housing.

Table 9. Correlates of Malaria Prevalence

Socio-economic Characteristics	Pearson Correlation Coefficient (r)
1. Respondent age	-.045
2. Respondent educational Level	-.592**
3. Household size	.214
4. Household annual income	-.750**
5. Expenditure on malaria control	-.123
6. Environmental sanitation	-.679*
7. Malaria control information	-.710**
8. Housing density	-.524**
9. Cost of health services	-.680**
10. Distance to nearest health facility	-.108
11. Condition of road network	-.120

**Correlation is significant at p < 0.05 level, (2-tailed)*
***Correlation is significant at p < 0.01 level, (2-tailed)*
Source: Field Survey Data, 2004

On the basis of the evidence so far presented (Table 9), all the predicted socio-economic variables generally show negative relationship (except household size) with household malaria prevalence among the sample households in the study area. This suggests that, most of the predicted socio-economic variables influenced, to varying degrees influence malaria morbidity in the study area.

Table 9 further shows that household income is negatively correlated to household malaria prevalence ($r = -.750$, $P < 0.05$). This suggests that households with low income experience higher prevalence of malaria. This is attributed to the fact that low income is likely to result into low disposable income thus increasing the likelihood for such households not to adopt appropriate and effective malaria treatment and prevention strategies.

Access to malaria control information showed negative significant association with household malaria prevalence ($r = -.710$, $P < 0.05$). This implies that increased access to malaria and control information improves diagnosis, health-seeking as well as prevention of malaria. Similarly, education level of the respondent showed negative significant relationship with malaria prevalence ($r = -.592$, $P < 0.05$). This suggests that education not only increases the household income (via gainful employment) but also raises the awareness level of the respondents about malaria and its control. This is reflected through deliberate treatment and prevention efforts, resulting in reduced malaria morbidity.

The cost of health services shows negative significant association with household malaria prevalence ($r = -.680$, $P < 0.05$). This implies that high cost of health services (in terms of transport and medication) coupled with high poverty levels (see Appendix E) significantly reduces ability of the affected households to adopt appropriate curative and effective malaria control measures and hence high malaria prevalence.

Both housing and environmental sanitation show negative significant associations with household malaria prevalence ($r = -.524$, $P < 0.01$ and $r = -.679$, $P < 0.005$), respectively. This suggests that poor housing and living density (crowding) predispose inhabitants to malaria infection. Similarly, poor environmental sanitation characterized by overgrown bushes; stagnant waters and un-disposed off solid wastes provide favourable breeding grounds for mosquitoes and predispose the inhabitants to increased malaria morbidity.

On regressing household malaria prevalence (dependent variable) on the predicted socio-economic variables (Table 10), only four socio-economic variables showed significant relationships namely; household income, cost of health services, environmental sanitation and accessibility to malaria control information. The observed relationships suggest that, the above identified socio-economic variables significantly determine the prevalence of malaria among the sample households in the study area.

Table 10. Regression of Malaria Prevalence on Socio-economic Variables

Socio-economic Characteristics	Standardized Beta Coefficient (β)
1. Respondent age	-.103
2. Respondent educational Level	-.124
3. Household size	-.122
4. Household annual income	-.501*
5. Expenditure on malaria control	-.103
6. Environmental sanitation	-.326*
7. Malaria control information	-.401*
8. Cost of health services	-.452*
9. Housing density	-.112
10.Distance to nearest health facility	-.106
11.Condition of road network	-.118

$R^2 = 0.645$

**Beta is significant at $p < 0.05$ level, (2-tailed)*

Source: Field Survey Data, 2004

From the results of correlation analysis (Table 9), it can be concluded that the identified socio-economic variables are significantly associated with household malaria prevalence. Subsequently, results of multiple regression analysis of the malaria prevalence on the socio-economic variables confirm most of these associations. Also, they identified the most significant of the socio-economic characteristics that predispose children aged below five years to malaria illness at the household level (Table 10).

On the basis of the evidence adduced in Tables 9 and 10, the study hypothesis that states, "socio-economic characteristics do not significantly influence household malaria prevalence at household level" is therefore rejected. This is supported by the fact that about 64.5 percent (R^2 = 0.645) malaria prevalence at the household level is influenced (accounted for) by the combined effect of the socio-economic variables namely; household income, cost of health services, environmental sanitation and accessibility to malaria control information.

5.3 Hypothesis 2.

Socio-economic characteristics do not significantly influence adoption of response strategies against malaria by households in the study area.

In this hypothesis, correlation analysis was used to determine the strength and direction of association between adoption of response strategies (dependant variable) and identified socio-economic characteristics (dependent variables).

The relationship between the dependent and independent variables was determined using two statistical analyses. First, a correlation analysis was run for each of the response strategy index (Home-based treatment, health-seeking and preventive) with the socio-economic variables. Second, regression analysis was run to measure the degree of association of these variables and also identify the significant socio-economic variables in adoption of each of the response strategies. But before carrying out regression analysis, the socio-economic (independent) variables were correlated to verify and avoid cases of multi-colinearity among. Appendix D shows inter-item correlation of the socio-economic variables depicting how each variable is correlated with one another. All the variables do not show very high correlations with each other (indicating lack of multi-colinearity). And hence these variables were used in the regression analysis.

5.3.1 Socio-economic Variables and Home Treatment Strategy

In order to correlate home-based treatment strategies and predicted socio-economic characteristics, treatment strategy index was constructed. This was based on the home treatment strategies identified in section 4.3 (Figure 19).

Home treatment strategy index (Table 11) was constructed by summing all the four strategies namely; use of anti-malaria drugs, traditional herbs, prayer, witch-doctor/*Omufumu*. From Table 10, it is observed that the values of the index ranged from 4, implying no adoption of any treatment strategy, to 8 implying adoption of all the four strategies. The index score was then coded into three ordinal levels: low (1), moderate (2) and high (3). Low adoption represents an index score of 4 and 5; moderate adoption

represents an index score of 6; and high adoption represents an index score of between 7 and 8. Notice that the higher the index score, the more home treatment strategies were adopted.

It may be observed that 20 percent of the households reported low adoption, with 2.0 percent not adopting any of the strategies. Only 14 percent reported moderate adoption while 66 percent reported high adoption with 15 percent adopting all the home-based strategies. This suggests that majority of the households prefer home-based treatment strategies to the others identified in this study..

Table 11. Home-based Treatment Index

Index value	Percentage households
4.0	2.0
5.0	18.0
6.0	14.0
7.0	51.0
8.0	15.0
Total	**100.0**

Data in Table 12 indicates that of the nine socio-economic variables predicted to be associated with adoption of the home treatment strategies (dependent variable), six of them showed significant associations. These are in the order of magnitude of r: Household income, malaria control information, education level, and accessibility of health services, malaria prevalence and household size.

Table 12. Correlates of Home Treatment Strategies

Socio-economic Characteristics	Pearson Correlation Coefficient (r)
1. Respondent age	-.111
2. Respondent educational level	-.295**
3. Household size	-.172*
4. Household annual income	-.363**
5. Healthcare expenditure	.107
6. Environmental sanitation	.101
7. Malaria control information	-.301**
8. Living density	.090
9. Accessibility of health services	-.207**

**Correlation is significant at p < 0.05 level, (2-tailed)*
***Correlation is significant at p < 0.01 level, (2-tailed)*
Source: *Field Survey Data, 2004*

Household income shows a negative significant association with adoption of home-based treatment ($r = -.363$, $p < 0.01$). Low household income is likely to result into low disposable income and economic power making health services unaffordable. This in turn increases the likelihood to adopt home-based treatment as opposed to seeking medication outside home.

Education level of the respondent also shows negative significant correlation with home-based treatment ($r = -.295$, $p < 0.01$). This suggests that higher education increases the income levels (via gainful employment) as well as the basic knowledge of malaria control practices. This consequently, increases the likelihood for one to seek medication outside home as opposed to adopting home-based malaria treatment.

Accessibility to health services also showed a negative significant correlation with home-based treatment ($r = -.207$, $p < 0.05$). This implies that, the less accessible to health services a household is (due to geographic and economic barriers), the higher the chances that such households will be unable to overcome the above barriers and hence will adopt more home treatment strategies.

Household size showed positive correlation with home-based malaria treatment ($r = -.172$, $p < 0.05$). More often, the larger the household the more disposable income is required to access healthcare, among other competing needs. This in turn reduces household's ability to afford healthcare services and hence increases the likelihood of adopting home-based treatment of malaria to minimize related costs.

Accessibility to malaria control information shows a negative significant association with home malaria treatment ($r = -.363$, $p < 0.01$). This suggests that increased awareness on malaria control measures increases the chances of seeking medication outside home as opposed to home-based treatment of malaria.

On regressing the home-based treatment strategy index (dependent variable) on the predicted socio-economic variables (Table 13), only four variables showed significant

relationships with the home remedy strategies. These are; education level, accessibility to health services, household income and knowledge of malaria control. The observed relationships suggest that the above identified variables significantly determine the adoption of the home-based treatment of malaria by the sample households in the study area.

Table 13. Regression of Home Treatment Index on Socio-economic Variables

Socio-economic Characteristics	Standardized Beta Coefficient (β)
1. Respondent's age	-.109
2. Respondent's educational Level	.290*
3. Household size	-.076
4. Household annual income	-.365*
5. Healthcare expenditure	.125
6. Environmental sanitation	-.104
7. Malaria control information	-.305*
8. Accessibility to health services	-.234*
9. Living density	.154

*R^2 =0 .603 *Beta is significant at p < 0.05 level, (2-tailed)*
Source: Field Survey Data, 2004

5.3.2 Socio-economic Variables and Health-seeking Strategies

In order to correlate health-seeking strategies and predicted socio-economic characteristics, a health strategy index was constructed. This was based on the health-seeking strategies identified in section 4.3 (Figure 21).

Health-seeking strategy index (Table 14) was constructed by summing up the above five strategies namely; public providers, private, traditional healers, faith healers and pharmacies/chemists. The values of the index ranged from 5, implying no adoption of any health-seeking strategy, to 10, implying adoption of all the 6 strategies. The higher the index score, the more health-seeking strategies were adopted. The index score was then coded into three ordinal levels: low (1), moderate (2) and high (3). Low adoption represents an index score of between 5 and 6; moderate adoption represents an index score of between 7 and 8; and high adoption represents an index score of between 9 and 10.

It is observed that 27 percent of the sample households reported low adoption of the strategies, with 8 percent of them not adopting any health-seeking strategy. A significant

proportion (50 percent) of the households reported moderate adoption of the strategies. Only 18 percent of the households reported high adoption of the strategies with 8.3 percent adopting all the four health-seeking strategies. This in effect suggests that majority of households in the study area are low to moderate adopters of health-seeking strategies when faced with malaria morbidity.

Table 14. Health-Seeking Strategy Index

Index value	Percent
5.0	8.7
6.0	18.3
7.0	34.3
8.0	20.4
9.0	10.0
10.0	8.3
Total	**100.0**

Source: Survey Data, 2004

Data in Table 15 indicates that of the nine socio-economic variables predicted to be associated with the adoption of the health-seeking strategies (dependent variables), only five show significant correlations. These are in order of the magnitude of r: household income, malaria control information, education level, accessibility of health services, and household size.

Table 15. Correlates of Health-seeking strategies

Socio-economic Characteristics	Pearson Correlation Coefficient (r)
1. Respondent age	-.039
2. Respondent educational level	.523**
3. Household size	-.177*
4. Household annual Income	.737**
5. Healthcare expenditure	-.113
6. Environmental sanitation	-.117
7. Malaria control information	-.552**
8. Accessibility of health services	-.254**
9. Living density	-.108

**Correlation is significant at p < 0.05 level (2-tailed)*
***Correlation is significant at p < 0.01 level (2-tailed)*
Source: Field Survey Data, 2004

Higher household annual incomes increases household's disposable income, making it possible for such households to afford quality healthcare and the therefore the improved likelihood for households to seek medication outside the home when faced with malaria ($r = .737$, $p < 0.01$).

Higher education level of the respondent on the other hand increases both income (through gainful employment) and the basic knowledge on malaria control. This in turn leads to increased chances for such households to seek healthcare outside home as opposed to home treatment of malaria ($r = .523$, $p < 0.01$).

Large households experience lower purchasing power (via competing needs) thus reducing the likelihood for such households to adopt home-based treatment, rather than seeking medication outside home. This confirms the negative correlation between household size and health-seeking strategies ($r = +.177$, $p<0.05$).

Increased knowledge and awareness of malaria control information, increases the scope of malaria treatment options available to the household and stimulate the need to seek medication outside home ($r= .552$, $p< 0.01$). Accessibility to health services shows positive associations with health-seeking strategies ($r = .254$, $p <0.01$). This suggests that increased accessibility to heath services stimulates utilization of health services and hence the tendency to seek medication when faced with malaria morbidity.

On regressing health-seeking strategy index (dependent variable) on the socio-economic items, only four variables showed significant relationships (Table 16). These are: education level, household income, malaria control information, and accessibility of health services. This implies that the above socio-economic variables significantly determine the adoption of the health-seeking strategies by the sample households in the study area.

Table 16. Regression of Health-seeking Strategies on Socio-economic Variables

Socio-economic Characteristics	Standardized Beta Coefficient
1. Respondent age	.150
2. Respondent educational level	.320*
3. Household size	.104
4. Household annual income	.459*
5. Healthcare expenditure	.241
6. Environmental sanitation	-.120
7. Malaria control information	.542*
8. Accessibility of health services	.349*
9. Living density	.258

*R^2 =0 .662, *Beta is significant at p < 0.05 level (2-tailed)*
Source: Field Survey Data, 2004

5.3.3 Socio-economic Variables and Malaria Prevention Strategies

In order to correlate preventive strategies and predicted socio-economic characteristics, a preventive strategy index was constructed. This was based on the malaria preventive strategies identified in section 4.3 (Figure 21). The index was constructed by summing up the five main strategies namely; treated bed nets, use of anti-malaria drugs, insecticide sprays/coils/jelly, burning fires/leaves/dung and environmental sanitation. The values of the index ranged from 5, implying no adoption of any preventive strategy, to 10, implying adoption of all the five strategies. The higher the index score, the more preventive strategies were adopted. The index score was then coded into three ordinal levels namely: (1) low, (2) moderate and (3) high. Low adoption represents an index score of between 5 and 6; moderate adoption represents an index score of between 7 and 8; and high adoption represents an index score of between 9 and 10.

As shown in Table 17, 50 percent of the sample households reported low adoption of the strategies, with 24 percent of them not adopting any preventive strategy, while only 29 percent reported moderate adoption. Only 21 percent of the households reported high adoption of the strategies, with 8 percent of them adopting all the five malaria preventive strategies. This in effect suggests that majority of households in the study area are low adopters of malaria prevention measures.

Table 17. Preventive Strategy Index

Index value	Percent
5.0	24.0
6.0	26.0
7.0	20.0
8.0	9.0
9.0	13.0
10.0	8.0
Total	**100.0**

***Source**: Field Survey Data, 2004*

As shown in Table 18, of all the nine socio-economic variables predicted to be associated with the adoption of the preventive strategies (dependent variable), 6 of them showed significant associations. These are, in the order of magnitude of r; Household income, accessibility to information, living density, education level, environmental sanitation, malaria prevalence and household size.

Table 18. Correlates of Malaria Prevention Strategies

Socio-economic Characteristics	Pearson Correlation Coefficient (r)
1. Respondent age	-.048
2. Respondent educational level	.447**
3. Household size	-.242**
4. Household annual income	.677**
5. Healthcare expenditure	-.119
6. Environmental sanitation	.421**
7. Malaria control information	-.552**
8. Accessibility of health services	-.156
9. Living density	-.468**

**Correlation is significant at p < 0.05 level (2-tailed)*
***Correlation is significant at p < 0.01 level (2-tailed)*
Source: Field Survey Data, 2003

A positive correlation between household income and preventive strategies (r = +. 677, p < 0.01) suggests that high household income increase the disposable income and purchasing power of a household, making it potentially possible to adopt recommended preventive

measures such as nets, insecticide sprays, coils. On the other hand, low-income households hardly adopt such measures due to high costs involved.

Both household size and living density show negative significant association with preventive strategies ($r = -.242$, and $r = -.468$, $p < 0.01$). Large household size increases demand and consumption of healthcare amongst other competing needs (food, clothing, education) in a household. This in turn reduces the likelihood of the household to adopt preventive strategies, especially those that require substantial financial resources such as bed nets, insecticide sprays, coils and repellants. In a similar way, high living density (crowding) limits adoption of effective preventive strategies such as bed nets. This is because crowding and lack of sleeping beds are often not compatible with effective use of mosquito preventing nets.

Both respondents' educational level and access to malaria information show positive association with adoption of preventive strategy ($r = .447$ and $r = .552$ at $p < 0.01$). A higher education level of respondent, not only increases household's income (via gainful employment), but also raises awareness of malaria prevention and hence higher adoption of preventive strategies. Similarly, increased access to malaria control information not only exposes respondents to a wide range of preventive measures but also stimulates the likelihood of adoption of effective preventive strategies at household level. On the other hand, poor environmental sanitation exposes inhabitants of a household to malaria vectors (mosquitoes) and therefore stimulates the need to adopt preventive strategies to avoid infection of the under-fives with malaria ($r = .421$, $p < 0.01$).

On regressing malaria prevention strategy index (dependent variable) on the socio-economic items, only five showed significant relationships (Table 19). These are: education level, household income, access to malaria information, environmental sanitation, and living density. It is clear that the above-identified socio-economic variables significantly determine the adoption of the malaria preventive strategies by the sample households in the study area.

Table 19. Regression of Prevention Strategy on Socio-economic Variables

Socio-economic Characteristics	Standardized Beta Coefficient
1. Respondent age	.205
2. Respondent educational level	.450*
3. Household size	-.203
4. Household annual income	.651*
5. Healthcare expenditure	.107
6. Environmental sanitation	.552*
7. Malaria control information	.420*
8. Accessibility of health services	.048
9. Living density	.466*

R^2 =0 .606
**Beta is significant at p < 0.05 level (2-tailed)*
Source: Field Survey Data, 2003

From the correlation analyses (Tables 12, 15 and 18), it can be concluded that the identified socio-economic variables are significantly associated with each category of malaria response strategies. Subsequent regression analyses of the socio-economic variables and the response strategy indices confirmed most of these associations and identified the most significant of the socio-economic variables for each category of response strategies (Tables 13, 16 and 19).

On the basis of the evidence adduced in Tables 12 through 19, showing the relationship between socio-economic characteristics and the response strategies adopted, the study hypothesis 2, which states, "socio-economic characteristics do not significantly influence the malaria response strategies" is therefore rejected. This finding is supported by the fact that about 61 percent adoption of response strategies by the sample households are influenced (accounted for) by the combined effect of the socio-economic namely; respondent's education level, household income, accessibility of health services, knowledge on malaria control and household size and living density.

5.4 Hypothesis 3.

Malaria response strategies (home treatment, health-seeking and prevention) have not significantly reduced malaria prevalence at household level.

Pearson's coefficient of correlation (r) was used to assess the influence of the malaria prevention strategies on malaria prevalence at the household level in the study area. To articulate this relationship, prevention strategy index (section 4.4.3) and malaria prevalence indices were correlated. Table 19 presents the bivariate correlation between the prevention strategy index and malaria prevalence.

Table 20. Correlation of the Prevention Strategies and Malaria Prevalence

Variable	**Pearson Coefficient of Correlation (r)**	
	Malaria Prevalence	Preventive Strategy Index
Malaria Prevalence	1.00	
Preventive Strategy Index	.221**	1.0

*** Correlation is significant at p < 0.01 significant level (2-tailed)*
***Source**: Field Survey Data, 2004*

From Table 20, it is observed that the malaria prevalence shows a positive correlation with malaria prevention strategy index. Data further shows that the prevention strategy index significantly correlate with malaria prevalence index at p = 0.01 significance level (2-tailed test). On the basis of information in Table 20 hypothesis 3, which states that "the malaria prevention strategies have not significantly reduced malaria prevalence among the sample households", is therefore not rejected. This suggests that adoption of the prevention strategies by households has not significantly reduced malaria morbidity in the study area. The implication of this is that there is need to examine further the effectiveness of such prevention strategies in order to identify and strengthen those that are cost-effective in the study area.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 Chapter Introduction

The following narrative presents summary findings and conclusions from this study with a view to highlighting findings that are most relevant to policy and programming decisions in the study area and Kenya in general. This chapter identifies specific policy and programming implications and recommendations that flow from these conclusions, as well as areas in which follow-up research might be most useful in confirming and elaborating this study's findings.

6.1 Summary Findings

Malaria is a major cause of morbidity as well as a principle cause of death among children aged below five years in Kakamega district. This notwithstanding, not much is known about the disease burden and response strategies at the household level. This study thus sought to achieve the following objectives; (a) determine malaria prevalence among children aged below five years, (b) document response strategies adopted by households, (c) determine the influence of household socio-economic characteristics on the response strategies and (d) determine the impact of response strategies on malaria prevalence. Based on the above objectives, the study tested validity of the following hypotheses; (a) household socio-economic, characteristics do not significantly influence malaria prevalence among children in the study area, (b) socio-economic characteristics do not significantly influence adoption of response strategies against malaria by households in the study area and (c) malaria response strategies (treatment and prevention) have not significantly reduced malaria prevalence at household level.

Data collected was then analyzed using both descriptive and inferential statistics. Based on the study objectives, hypotheses and the research methodology, the following findings are presented:

The study findings revealed that malaria incidence and prevalence are quite high in the study area. On average, children aged below five years in the study area usually experience two to six malaria episodes per year, each lasting from three to seven days. This estimates of perceived malaria is higher than clinical cases in Africa, of one case per year in African children aged under five (Greenwood, *et al*. 1991) and 0.2 cases per person per year (WHO, in Shepard, *et. al*. 1991). Further, prevalence of malaria in the study area is characteristically seasonal with two malaria peak periods between the months of May-July and September-November every year. This period coincides with wet rainy seasons, constrained household resource base (food and income) and accessibility to health services is greatly hampered due to impassable road network.

Further, the study established that when faced with malaria morbidity, affected households adopt variety of response strategies to manage malaria and its related impacts. Such strategies broadly range from home-based treatment and prevention to seeking medication outside home for the sick children. The study found out that home-based treatment of malaria cases by use of anti-malaria or other drugs was the most commonly adopted response strategy by 82 percent of the respondents in the study area. The anti-malaria drugs commonly used are obtained locally from local shops, drug vendors, private clinics and pharmacies located within reach of the study respondents. Generally, malaria treatment-seeking behaviour patterns in the study area vary greatly, with constant interchange between formal and traditional health providers.

The study also established that, the recommended prevention measures such as insecticide-treated nets and sound environmental management were marginally adopted in the study area. Adoptions of such measures are believed to be hampered by factors such as lack of awareness on causes and transmission of malaria and lack of financial resources.

The study findings revealed that there were variations in malaria prevalence and adoption of the malaria response strategies among the sample households. From data analysis and hypothesis testing, socio-economic characteristics such as household income, environmental sanitation, cost of health services, and accessibility to malaria control

information are significant factors adoption of various response strategies at the household level.

In view of the high malaria prevalence and high costs related to treating and controlling malaria, survival of the affected households depend on the household's ability to minimize such impacts. The study shows that a range of coping strategies are summoned to enhance access to healthcare and cope with morbidity. These strategies are categorized into two groups namely; (a) those that minimize costs related malaria (foregoing treatment for some malaria episodes, purchasing less than full doses of medication or least expensive medication perceived to be effective, and undertaking no prevention to save cash for treatment when needed), (b) those that secure financial resources to pay for malaria treatment (sale or barter of disposable assets, donations (*Harambee*), loans and intra-household transfers and insurance cover).

6.2 Conclusion

This study has attempted to assess malaria prevalence among children aged below five years and response strategies at the household level in Kabras division. In addition, the study has also attempted an explanation on how socio-economic characteristics influence malaria morbidity and adoption of response strategies in the study area. Such an assessment is useful in providing a clearer understanding of the malaria morbidity burden and how the affected households cope with the problem. The concerned agencies can use this information for intervention. Based on the survey findings, the study makes the following conclusions:

Malaria prevalence among children aged below five years each year at the household level is quite high. Such estimates of malaria prevalence, though higher than those reported at health facilities, represent a reality check on the malaria morbidity situation at household level in the study area. This scenario suggests a policy shift from healthcare facility-based malaria management and control, to household and community approach. Moreover, to the extent that estimates based on malaria cases reported at household level will overstate

the incidence of true (clinical) malaria, such estimates will also overstate the benefits to be derived from better management and control of malaria. Consequently, as an indicator of the common diseases that children face, malaria can also be used as an indicator to strengthen primary health care and child survival services more generally.

Owing to the low utilization of health facilities for malaria treatment and control in the study area, home management of malaria cases will greatly increases the proportion of sick children who receive prompt anti-malaria treatment. In addition, the study has identified the female respondents (especially mothers) as the primary healthcare providers for the under-fives in the study area. Similarly, the study has highlighted the important role of the local drug distribution channels (shops, drug vendors and drug shops/chemists) in malaria treatment and control. This implies that malaria control interventions should appreciate the role of the above important stakeholders in order to increase access to prompt and effective treatment of malaria in the study area.

Evidence from this study suggests that the cost related to treatment and prevention of malaria is not only substantial, but also constitutes a considerable financial burden among affected households. The study has further established that poverty is evident in the study area and is closely tied to the lack of access to quality healthcare during malaria morbidity. This is even more evident by the affected households often adopting various coping mechanisms to minimize the costs and secure financial resources to pay for malaria control. This calls for interventions that alleviate poverty and policies that encourage adoption of coping strategies which are sustainable for effective treatment and prevention of malaria at household level.

Finally, the study appreciates the influence of socio-economic characteristics (such as educational level of respondent, income, malaria control information, accessibility to health services, environmental sanitation and living density) on adoption of response strategies in the study area. This suggests that malaria interventions in the study area should take into consideration each factor's role in predisposing the children to malaria and thus formulate appropriate measures to reduce malaria morbidity at the household level.

Given the impact that malaria morbidity has on the health of individuals, the affected households, and national productivity, there is a strong economic and health justification, for urgent intervention.

6.3 Study Recommendations

As indicated by the study findings, malaria morbidity among children aged below five years is evidently high in Kabras division. This therefore makes it imperative for elaborate and specific policy recommendations to be formulated that can address malaria morbidity at the household level more effectively.

1. Access to Prompt and Effective Malaria Treatment

In order to ensure prompt effective treatment of malaria among children, home-based malaria treatment strategy should be promoted and strengthened through educational campaign among the primary health providers (parents/mothers), local shop-keepers, drug vendors and community health workers in the study area. Such an approach should be directed towards improving malaria diagnosis, and appropriate response at the household level.

To further support home-based management of malaria, pre-packaged kits containing full-course treatment with appropriately written instructions should be made available to the local drug distributors such as shops, pharmacies and drug vendors. To ensure safe and correct use, the distributors of the treatment kit should be monitored and evaluated by trained health personnel in the study area. In addition, this study recommends that the anti-malaria drug should be effective, affordable, with minimal side effects and non-toxic. Preferably, having a different drug for home use would reduce the potential of development of resistance to the drugs that are used in health facilities

2. Effective Malaria Prevention and Control

To improve coverage of insecticide-treated bed nets, the study recommends that control interventions should endeavour to overcome the socio-cultural and economic barriers in the study area. For instance, the initiatives should use the information, education and communication (I.E.C) strategy that ensures that messages on malaria and ITNs are

integrated into community beliefs and practices for acceptability and sustainability. In addition, other innovative distribution strategies (such as social marketing and discounting) could be explored to improve affordability of treated nets.

In order to enhance the environmental management and control of malaria vectors (mosquitoes), techniques such as reducing breeding habitats through improved drainage or water flow, biological larvae control, better housing and sanitation should be promoted especially at household level. Such initiatives should embrace education and participation of the primary healthcare providers (mothers) and the community at large. Furthermore, such initiatives should build on the existing control practices and local circumstances.

3. Appropriate Malaria Response and Coping Strategies

Owing to gender responsibility within the household, child healthcare especially malaria diagnosis and treatment has been left to women or female guardians in the study area. They face constraints such lack of access to financial resources, decision-making power regarding healthcare of the children among others. General empowerment and removal of such constraints will go along way in improving management of malaria and health of children in the study area.

The coping strategies adopted determine whether the affected households are capable of surviving the impact of malaria illness. Most of the strategies may enhance or erode the subsistence base and compromise possibilities attaining good health for its members especially children. In this study, strategies such as (foregoing treatment, purchasing less than full doses of medication, and undertaking no prevention to save cash) if not checked can continuously predispose children to malaria infection. On the other hand, coping strategies (such as asset sale, credit, loans transfers) if not checked can erode the subsistence base of households and lock them in a vicious cycle of poverty and ill-health. This study, however, recommends that other coping strategies such as health insurance cover, community insurance schemes should be strengthened and reinforced.

Malaria control interventions can build on the demonstrated willingness to pay on the part of households to provide information and create incentives to allocate spending for cost-effective combinations of treatment, prevention, and control measures. For instance, malaria control efforts should encourage reallocation of household health spending to preventive interventions rather than treatment in order to minimize cost of medication.

Evidence of malaria's strong economic impacts on households in the study area implies that malaria control interventions mitigate the economic, as well as the health impacts of malaria. In such cases, strategies that alleviate poverty should thus target groups (women/mothers) on whom the greater morbidity burden falls directly benefit most from planned malaria interventions.

6.4 Follow-up Research

The subject of malaria morbidity among children aged below five years strategies has attracted limited attention in Kabras division, Kakamega district. This study provided relevant information on malaria morbidity among children aged below five years and the response strategies at the household level. It is important that more research is carried out to assess the magnitude and distribution of malaria's economic impacts at the household level, so as to identify specifically where the disease burden falls most heavily. Further, research should also endeavour to assess the cost-effectiveness of the response strategies and coping patterns in order to develop alternatives that minimize the economic impacts of malaria in the study area.

REFERENCES

Aikins, M. K; Pickering H; Greenwood, B. M, (1994). Attitudes to Malaria, Traditional Practices and Bednets [mosquito nets] as Vector Control Measures: A Comparative Study in Five West African Countries. *Journal of Tropical Medicine & Hygiene 97:2 81-86*

Ahorlu, C. K; Dunya, S. K; Afari, E.A; Nkuruma, F. K, (1997). Malaria-Related Beliefs and Behaviour in Southern Ghana: Implications for Treatment, Prevention and Control. *Tropical Medicine & International Healt*h, 2, 488-499.

Baume, C; Helitzer, D; Kachur, S. P, (2000). Patterns of Care for Childhood Malaria in Zambia. *Social Science and Medicine, 51(10): 1491-1503.*

Binka, F. N; Adongo, P, (1997). Acceptability and Use of Insecticide Impregnated Bednets in Northern Ghana. *Tropical Medicine & International Healt*h, 2, 499-507.

Biritwum, R. B; Welbeck, J; Barnish, G, (2000). Incidence and Management of Malaria in Two Communities of Different Socio-economic Level, in Accra, Ghana. *Annals of Tropical Medicine and Parasitology, 94(8): 771-778.*

Breman, J. G; Campbell, C. C, (1988). Combating Severe Malaria in African Children. *Bulletin of the World Health Organization, 66(5): 611-620.*

Chitsulo, L, M; Ettling, A; Macheso, R; Steketee, L; Schultz, C. Z, (1992). Malaria in Malawi: Knowledge, Attitudes and Practices. *Vector Biology and Control Project Report No. 82240*

Choi, H. W; Breman J. G; Teutsch S. M; Liu S; Hightower, A. W; Sexton J. D, (1995). The Effectiveness of Insecticide-Impregnated Bed nets in Reducing Cases of Malaria Infection: A Meta-analysis of Published Results. *American Journal of Tropical Medicine and Hygiene. 52: 377-382.*

Collins, F. H; Kamau, L; Ranson, H; Vulule, J.M, (2000). Molecular entomology and prospects for malaria control. *Bulletin of World. Health. Organization.78, 1412-1423. Health Organization, 69:349–363.*

Collins, F. H; Paskewitz S. M. (1995). Malaria: Current and Future Prospects for Control. *Annual Review of Entomolog*y, 40:195-219.

Costello, M. A; Lieno, L.C; Jensen, E. R, (1996). Determinants of Major Childhood Diseases and Their Treatment in Philippines; Findings from the 1993 National Demographic Survey**.** *Asian Pacific Population Research Reports No. 9*

Davis, F; Scott, J. M; Csuti, B; Noss, R; Butterfield, B; Groves, C, (1989). Monitoring Selective Components of Vaccination, Diarrhoea, and Malaria Practices in Conakry, Guinea. *Bulletin of the World Health Organization, 67: 675–684.*

Defo, B. K. (1993). Epidemiology and Control of Infant and Early Childhood Malaria in Africa. *A competing risk-analysis CDE. Paper 93-*

Deming, M. S; Gayibor, A; Murphy, K; Jones, T. S; Karsa, T, (1989). Home Treatment of Febrile Children with Antimalarial Drugs in Togo. *Bulletin of the World Health Organization, 67: 695–700.*

Ettling, M., D; Shepard W, (1991). Economic Cost of Malaria in Rwanda. *Tropical Medicine and Parasitology, Supplement I, Vol. 42. Ed. D. Shepard.*

Foster Susan, (1991). Pricing, Distribution and Use of Anti-malarials. *Bulletin of the World Health Organization, 269: 349-363.*

Frankfort – Nahamias, C; Nachamias, D, (1996). Research Methods in the Social Sciences (5th Edition). St. Martins Press, London

Fungladda, W. (1991). Health Behaviour and Illness Behaviour of Malaria: A Review in Bangkok, Thailand. *Social and Economic Aspects of Malaria Contro*l, 89. Faculty of Tropical Medicine, Mahidol University.

Gall, M. D; Borge, W. R; Gall, J. P, (1996). An Introduction to Education Research (6th Edition). Long man, New York.

Gessler, M. C; Msuya, D. E; Nkunya, M . H; Schar, A; Heinrich, M; Tanner, M (1995). Traditional Healers in Tanzania: The Perception of Malaria and Its Causes. *Journal of Ethnopharmacolog*y, 48, 119-130.

Ghulam, M. L. (1996). *Mother's Health-Seeking Behaviour and Childhood Mortality in Pakistan.* Pakistan Press

Greenwood, B. M. (1987). Mortality and Morbidity from Malaria Among Children in a Rural Area of the Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 81(3): 478-486.*

Haak, H. (2000). Access to Antimalarial Medicines: *Improving the Affordability and Financing of Artemisinin-based Combination Therapies, (in preparation*).

Hobb-Craft, J. S; McDonald, S. Rutsterm, (1984). Socioeconomic Factors in Infant and Child Mortality: A Cross-National Comparison. *Population Studies* 38:193

Holtz, T .H. (2001). Healthcare Seeking Behavior and Home Treatment of Febrile Illness in Blantyre District, Malawi. *American Society of Tropical Medicine and Hygiene, 50th Annual Meeting November 11-15, Atlanta, GA: Abstract 536.*

Huntsberger, D. V; Billingsley, P, (1997). *Elements of Statistical Inference*, 4th Edition. Allyce and Bacon, Inc.

Institute of Medicine, (1996). *Vaccines Against Malaria*: Hope in a Gathering Storm.

Kathuri, G. N; Pals, A. D, (1993). Introduction to Education Resaerch. Egerton University Education Media, Njoro (Kenya)

Kengeya-Kayondo, J. F; Seeley, J. A; Kajura-Bajenja, E, (1994). Recognition, Treatment-Seeking Behaviour and Perception of Cause of Malaria Among Rural Women in Uganda. *Acta Tropic*a, 58, 267-273.

Kenya, Republic of, R.O.K (2004). *Household Health Expenditure and Utilization Survey Report*. Government Printer: Nairobi

_____**(2003).** *Kenya Demographic and Health Survey (KDHS).* Government Printer, Nairobi.

_____**(2002a).** *Kenya National Health Accounts Report.* Government Printer, Nairobi.

_____**(2002b).** *Kakamega District Development Plan (2002-2007).* Government Printer, Nairobi

_____**(2001).** *National Development Plan (2002-2007).* Government Printer, Nairobi.

_____**(1999a).** *National Council for Population and Development*, Micro International inc. Kenya.

_____**(1999b).** *Population and Housing Census*. Ministry of Finance and Planning. Government Printer, Nairobi.

_____**(1998a).** *Kenya Demographic and Health Survey,* Government Printer, Nairobi.

_____**(1998b).** *National Guidelines for Diagnosis, Treatment, and Prevention of Malaria for Health Workers.* Ministry of Health, Government Printer, Nairobi.

_____**(1996).** *Kakamega District Development Plan (1997-2001).* Government Printer, Nairobi

Kidane, G; Morrow, R. H. (2000). Teaching Mothers to Provide Home Treatment of Malaria in Tigray, Ethiopia: A Randomized Trial. *Lancet, 356:550-555.*

Lipowsky, R; Kroeger, A; Vazquez, M. L, (1992). Socio-Medical Aspects of Malaria Control in Colombia. *Social Science & Medicine,* 34, 625-637.

Massele, A. Y; Mpundu, M. N; Hamudu, N. A. S, (1993). Utilization of antimalarial drugs by pregnant women attending the antenatal clinic at Muhimbili Medical Center, Dar es Salaam *East African Medical Journal 74(1): 28-30*

Mburu, F. M; Spencer, H. C; Kaseje, D. C, (1987). Changes in Sources of Treatment Occurring After Inception of A Community-Based Malaria Control Programme in Saradidi, Kenya. *Annals of Tropical Medicine and Parasitology*, 81, Suppl-10.

McCombie, S. (1996). Treatment Seeking for Malaria; A Review of Recent Research**.** *Social Science & Medicin*e, 43(6) 933-945.

Mosley, W.H; Chen, I. C, (1984). An Analytical Framework of Child Survival in Developing Countries. *Population and Development Reviews Supplement to Vo*l. 10 (28-48)

Mugenda, O. M; and Mugenda, A. G, (1994). *Research Methods: Quantitative and Qualitative Approaches*. African Centre for Technology Studies (ACTS) Press. Nairobi, Kenya

Mwabu, G. (1986). Healthcare Decision at Household Levels. Results from Rural Survey in Kenya**.** *Social Science and Medicine 22:315-319.*

Mwabu, G. and Mwangi, W. (1986). Healthcare Financing in Kenya: Simulation of Welfare Effects of User Fees. *Social Science and Medicine 22 (7) 763-767.*

Mwenesi, H; Harpham, T; Snow, R.W. *(*1995). Child Malaria Treatment Practices Among Mothers in Kenya. *Social Science and Medicine, 40(9): 1271-1277.*

Nevill, C. G; Some, E. S; Mungala, V.O; Mutemi, W; New, L; Marsh, K; Lengeler, C; Snow, C.W (1996). Insecticide-treated Bednets Reduce Mortality and Severe Morbidity From Malaria Among Children On The Kenyan Coast. *Tropical Medicine and International Health, 1: 39–146.*

Nicoll, A. (2000). Integrated Management of Childhood Illness in Resource-poor Countries, an Initiative from the World Health Organization. *Transations of the Royal Society of Tropical Medicine and Hygiene, 94(1): 9-11.*

Okonofua, F. E; Feyisetan, B. J; Davies A; Adetugbo, Y. O, (1992). Influence of Socio-economic Factors on the Treatment and Prevention of Malaria in Pregnant and Non-pregnant Adolescent Girls in Nigeria. *Journal of Tropical Medicine and Hygien*e, 95, 309-315.

Raham, S. H; Mohamedani, A. A; Mirgani, E. M; Ibrahim, A. M, (1995). Gender aspects and women's participation in the control and management of malaria in central Sudan. *Social Science & Medicine 42:10 1433-1446*

Ruebush, T. K; Kern, M. K; Campbell, C. C, Oloo; A, J (1995). Self-treatment of Malaria in a Rural Area of Western Kenya**.** *Bulletin of the World Health Organization, 73: 229–236.*

Silva, K.T (1991). Ayurveda, Malaria and the Indigenous Herbal Tradition in Sri Lanka *Social Science and Medicine, Vol. 33, No.2, 153-160.*

Snow R. W; Peshu, N; Foster. D; Mwensi, H; Marsh, K. (1992). Malaria treatment practices among mothers in Guinea. Journal of Health and Social .....

Slutsker, L. (1994). Treatment of Malaria Fever Episodes Among Children in Malawi: Results of a KAP Survey. *Tropical Medicine and Parasitology, 45(1): 61-64.*

Théra, M..A. (2000) Child Malaria Treatment Practices Among Mothers in the District of Yanfolila, Sikasso Region, Mali. *Tropical Medicine and International Health, 5(12): 876-881.*

Tanner, M; Vlassof, C. (1998). Treatment-seeking behaviour for malaria: a typology based on endemicity and gender. Social Science & Medicine 73(1): 97-104

Van der Geest, S. (1999). Training Shopkeepers and School Children in Medicine Use, Experiments in Graphed Medical Anthropology in East Africa. *Medical Anthropology Quarterl*y, 13(2): 253-255.

Van Geldermalsen, A. A. (1999). Chloroquine Sensitivity Confirmed. *Central African Journal of Medicin*e, 45(2): 49-51.

Vlassoff, C; Bonilla. E. (1998). Gender-related differences in the impact of tropical diseases on women: what do we know. *Journal of Biosocial Science 351: 372-373*

Vundule, C; Mharakurwa, S. (1996). Knowledge, Practices, and Perceptions About Malaria in Rural Communities of Zimbabwe: Relevance to Malaria Control. *Bulletin of the World Health Organizatio*n, 74(1): 55-60.

World Health Organization (2002). Monitoring Antimalarial Drug Resistance**.** *Report of a WHO consultation, (document WHO/CDS/RBM/2002.39)* Geneva, Switzerland.

_____ **(2002).** *Malaria Fact Sheet*, WHO, Geneva.

_____**(2001).** Antimalarial Drug Combination Therapy. *Report of a WHO Technical Consultation (document WHO/CDS/RBM/2001.35),* WHO, Geneva.

_____**(2000).** WHO Expert Committee on Malaria, *Twentieth Repor*t. WHO, Geneva

_____**(2000).** The African Summit on Roll Back Malaria. *Abuja Summit, (WHO/CDS/RBM/2000.17). WHO,* Geneva.

_____**(1996).** Assessment of Therapeutic Efficacy of Antimalaria Drugs, for Uncomplicated Falciparum Malaria in Areas With Intense Transmission. (Document WHO/MAL/96.1077), WHO, Geneva

_____**(1995).** Malaria. The Current Situation. WHO; Geneva

_____**(1993).** A Global Strategy for Malaria Control. WHO; Geneva,

Yenneneh, H. T. W; Gyoskos, L.; Joseph, J.; Pickering; Tedla, S. (1996). Antimalaria Drug Utilization in Ethiopia: Knowledge-Attitude Practices Study. *Bulletin of the World Health Organization* 71(6): 763-772.

Ziwa, C; Nwayamor, O. C; Sketekee, R. W; Etttling, M; Macheso, A; Nyasulu, Y. (1994). Use of Malaria Prevention Measures in Malawian Households. *Tropical Medicine and Parasitolog*y, 45, 70-73.

APPENDIX A: HOUSEHOLD QUESTIONNAIRE

This questionnaire seeks to gather information on malaria prevalence among the under-five children household response mechanisms in Kabras Division, Kakamega District. Your sincere and correct information is important towards attaining this noble goal. All the information will be treated with utmost confidentiality. Your co-operation will be highly appreciated.

BACKGROUND INFORMATION

1. Name of the respondent (optional)……
2. Residence (Location/ Sub-location)----------
3. Age (Complete years). …….
4. Gender: 1. Male 2. Female
5. Identity of actual respondent: 1. Head 2. Spouse 3. Other (specify)----------
6. Marital status 1. Single 2. Married 3. Divorced/Separated
7. Religion: 1.Catholic 2. Christian/protestant 3. Muslim 4.No religion 5. Other (specify)_____
8. Highest level of school comppleted. 1. None 2. Primary 3. Secondary 4. College 5. University
9. Highest (standard/form/year) completed: 1. Standard---------- 2. Form-------- 3. Year----------
10. Employment status: 1. Salary-employed 2.Self-employed 3. Un-employed
11. If employed (including self-employment), specify your main occupation:

Type of Occupation	Tick (√) if applicable
1. Farmer	
2. Business	
3. Civil servant	
4. Casual labourer	
5 Housewife	
6. Other (specify)	

12. Total number of people in the household: _____
13. Number of children under age of five years _____

HOUSEHOLD ASSETS AND INCOME SOURCES

1. Type of land ownership: 1. Owner-occupied 2. Lease-hold 3. Communal
2. Total acreage of household land: _____Acres
   Type of farming practiced; 1. Cash crop 2. Subsistence 3. Mixed farming
3. Type of Livestock kept:

4.

TYPE	Tick (√) if available	Quantity
1. Cattle		
2. Goats		
3. Sheep		
4. Donkey		
5. Poultry		
6. Other (specify)		

4.What is the main purpose for livestock kept?

Purpose	Tick (√) if applicable
1. Food	
2. Income source	
3. Cultural reasons	
4. Ornamental	
5. Other (specify)	

5. Household assets :

Asset	Tick (√) if available
1. Bicycle	
2. Hand/ox-cart	
3. Radio	
4. Television	
5. Car	
6. Tractor	
7. Motorcycle	
6. Other (specify)	

6. What was the main source(s) of household income in the last 1 month?.

Source	Amount (Ksh.)
1.	
2.	
3.	
4.	
5	
TOTAL	

7. Total household income range per year (Ksh):
   1. Below 3000
   2. 30000 – 60000
   3. 60001 - 120000
   4. 120001- 180000
   5. Over 180000
8. Proportion of annual income devoted to the following items during the past one year.

Type of expenditure	Percentage of annual income
Food items	
Healthcare	
Other non-food items (education, clothing, shelter etc.)	

HOUSING AND ENVIRONMENTAL SANITATION

1. What type of house do you live in? 1. Permanent 2.Semi-permanent
3. Traditional hut 4. Other (specify) _____
2. What material was used for the floor? 1. Earthen/Dung 2. Wooden 3. Cemented
3. What material was used for walls? 1. Mud 2. Wooden/Timber 3. Plastered
4. How many rooms are there in your house? _____
5. On average how many people share a sleeping room? _____

6. What is the main source of water for drinking/washing?

Source	Tick (√) if applicable
1. River/stream/spring	
2. Well/Borehole	
3. Pond	
4. Rain water	
5. Piped/tap water	

9. How far is the main source of water for the household? 1. 200-500 Metres 2. 500-1 Km 3. 2-5 Km 4. 6-10 Km 5. >10Km
10. How would you assess the level of environmental sanitation around the household?

	Very adequate	Adequate	Inadequate	V.Inadequate
1. Bushes/grasses				
2. Stagnant water				
3. Solid waste disposal				

EPIDEMIOLOGICAL DATA

1. Malaria is a disease locally diagnosed from observed symptoms such as high body temperature, chills/fever, shivering, headache and vomiting. Has any of your child or children below five years suffered from malaria in the last one month? Fill information in table.

Child	Age (Years)	Tick (√) If suffered	Duration of Illnes (Days)	No. of episodes In last 1month	Average No. Of episodes In the last 12 months
1.					
2.					
3.					
4.					

2. What do you think is the main cause of malaria among children in the household?

Cause	**Tick (√) if applicable**
1. Cold weather	
2. Sorcery/witchcraft	
3. Mosquito bites	
4. Curses	
5. Other (specify)	

3. During which month(s) of the year is malaria most frequent among the under-five children in the household? _____,_____

4. What other diseases have children below age of five in your household commonly suffered from during the last 1 month? 1._____ 2._____ 3._____ 4._____

5. In case of malaria among children aged below five years in your household, what step do take? 1. Administer treatment at home 2. Seek treatment outside home 3. Do nothing. Incase of home teatment, what particular treatment therapy do you adopt?

Type of remedy	**Tick (√) if applicable**
1. Anti-malarial drugs from shop/chemist	
2. Traditional herbal medicine	
3. Religious prayers	
4. Other (specify)	

6.Incase of treatment sought outside home, which of the following options(s) do you frequently use?

Type of health provider	**Tick (√) if applicable**
1. Public hospital/healthcenter	
2. Private hospital/clinic	
3. Traditional healer/witchdoctor	
4. Religious healer	

7. After how long do you seek medication (of whatever sought) when faced with malaria illness among your under-fives? 1. One day 2. Two days 3. 3-4 days 4. Four day and above.

8. Which of the following measures do you take? 1. Seek medication after home treatment 2. Seek medication without home treatment 3. Do not seek medication at all.

9. How far is nearest health facility? 1. 1Km 2. 2-5 Km 3. 6-8 4. 9-10 Km 5. 10Km and above

11. How do you access the nearest health facility?

Mode of Transport	**Tick (√) if applicable**
1. Public matatu, Bus, Taxi	
2. Bicycle/motorcycle	
3. Walking	
4. Other(s) (specify)	

12. What is the most common type of roads used to access your nearest health facility?

1.Tarmac 2.Earth 3.Murram

13. How would you rate the general accessibility of health facilities and services in your area?

Accessibility of Health services	**Tick (√) if applicable**
1. Very accessible	
2. Moderately accessible	
3. Inaccessible	
4. Very inaccessible	

14. Which of the following malaria prevention measures do you commonly use for your children below five years?

Type of preventive measure	**Tick (√) if applicable**
1. Immunization/prophylaxis	
2.Insecticide-treated bednet	
3. Mosquito sprays/repellants	
4. Destroying mosquito breeding places	
5. Burning leaves or wood	
6. Other (specify)	

15. What is your main source of information on malaria prevention and treatment?

Source	**Tick (√) if applicable**
1. Mass media (radio, Tv, Newspapers)	
2. Social networks (friends, relatives)	
3. Public baraza	
4. Community Health workers	
5. Local NGOs	
6. Other (specify)	

THANK YOU FOR YOUR CO-OPERATION

APPENDIX B: INTERVIEW SCHEDULE FOR KEY INFORMANTS

DIVISION:_____

LOCATION: _____

DATA COLLECTOR'S INFORMATION:

NAME_____

INSTITUTION_____

DATE: _____

Introduction

The purpose of this interview is broadly, to provide a forum for discussing the issues of malaria morbidity among under-fives and household response strategies in Kabras Division, Kakamega District. Specifically, the interview seeks to:

- Examine malaria morbidity burden in the study area.
- Identify the existing response strategies and efforts to combat malaria.
- Document the strength and constrains of malaria control interventions and suggestions on how to minimize the effects of malaria morbidity in the area.

The information we collect will remain confidential and will compiled together with information collected from other sources in a report.

KEY INFORMANT DATA

1. What is your Name? _____
2. How old are you? _____
3. What kind of work do you do? _____
4. What service do you give to the community? _____
5. For how long have you been working? _____
6. Tell us a little about your education and training.
7. In your view, how serious is the problem of malaria morbidity, especially among children aged below five years in your area?
8. What factors contribute to the widespread of malaria morbidity in the area?

9. What is your role or responsibility in the fight against malaria morbidity?
10. In your own view, what are the successes and constraints of malaria control efforts in the area?
11. What, in your view, can be done to address the problem of malaria morbidity?
    a) At household level
    b) At the community level
    c) At the government level

Thank you most sincerely for your time and the information.

Appendix C: Operationalization of StudyVariables

Age of Respondent: No. of complete years of respondent, grouped into categories: 1. (15-25); 2. (26-35); 3. (36-45); 4. (46-55); 5. (56-65); 6. (65 and above)

Education Level: Highest level of education attained by respondent and further grouped into ordinal categories: 0-None; 1-Primary; 2-Secondary; 3-College; 4-University

Religion: 1-Catholic, 2-Protestant, 3-Muslim, 4-Traditional sect, 5-Other (Holy spirit)

Household size: Total number of persons within household. Grouped into ordinal categories: 1. (1-3) Persons, 2. (4-5), 3.(6-7), 4.(8-9), 5.(10 and above)

Living Density: Ratio of number of persons per unit living rooms. Classified into ordinal categories: 1-3 "Low", 4-5 "Moderate", 6 and more "High"

Annual Income (Wealth Index): Total amount (Kshs) accrued to household per year: Below Kshs.14,880 "poor", Kshs.14,881-60,000 "second poor", Kshs. 60,0001-144,000 "middle", Kshs. 144,001-240,000 "second rich", Kshs.240001 and above "rich"

Health Expenditure Index: Proportion of money spends on healthcare per year. Grouped into ordinal categories: Less than 10% "poor", 20-30% "second poor", 40-50% "middle", 50% and above "Rich".

Environmental Sanitation:

(a) Bush: Open land (recently ploughed) – 1; Tall grass – 2; Shrubs – 3; Maize/cane field – 4; Forest – 5
(b) Stagnant water surface: No water surface – 1; Lakes – 2; Moving water (Rivers/streams) - 3 Still water (springs/swamps) - 4; Water puddles/ponds - 5
(c) Solid waste disposal: No solid waste – 1; Litter/rubbish- 2; Small containers – 3; Large open containers- 4

Malaria control Information: Level of accessibility to appropriate information related to malaria causes, treatment, and prevention. 1-"Very inaccessible", 2- "Satisfactory", 3- "Very accessible"

Malaria prevalence: (0-2 episodes) – "Low"; (3-4 episodes) – "Moderate:; (5-7 episodes) – "high"

Distance to the nearest health facility: (0-4Km) – "Near"; (5-10Km) – "Far"; (11-20Km) – "Farthest"

Overall Accessibility of health services:. 1-"Poor", 2-"Satisfactoy", 3-"Good"

Appendix D: Correlation Matrix of the Variables

	Education	Age	Family size	Environmental Sanitation	Expenditure	Household income	Information	Living Density	Accessibility of health Services
Education	1.00								
Age	-.347**	1.00							
Family size	-.371**	.61**	1.00						
Environmental Sanitation	.011	.122	.052	1.00					
Expenditure	.458**	-.014	-.168*	.322**	1.00				
Household income	.337**	.049	.072	.061	.504**	1.00			
Information	.034	.34**	-252**	.021	.241**	.552*	1.00		
Living Density	-.384**	.137	.180*	-.071	-.533**	-.404**	-.122	1.00	
Food price	-.156	-.137	-.143	-.021	-.217**	-.441**	-.419**	.116	
Accessibility of health Services	.001	-.057	.019	-.046	.062	.172*	-.175*	.093	1.00

*** Correlation is significant at p < 0.01 significant level (2-tailed)*

** Correlation is significant at p < 0.05 significant level (2-tailed)*

Source: Field Survey Data, 2004

Appendix E. Estimates of Poverty by Constituency in Western Province

Constituency	No. of Poor	% of individuals below poverty	Poverty Ranking (National)	% Contribution to Provinces' Poor
Butula	61,271	68.4	168	3.4
Mt. Elgon	69,841	54.4	94	3.9
Funyula	48,277	67.0	161	2.7
Nambale	85,566	67.1	164	4.7
Amagoro	78,220	49.8	74	4.3
Sirisia	98,074	57.4	109	5.4
Bumula	65,260	51.3	84	3.6
Mumias	83,515	63.4	147	4.6
Kimilili	124,764	59.7	122	6.9
Khwisero	55,401	63.4	148	3.1
Malava/Kabras	102,761	54.1	92	5.7
Butere	62,144	61.5	135	3.4
Matungu	63,612	59.4	121	3.5
Vihiga	40.805	55.1	100	2.3
Ikolomani	62.902	69.6	120	4.8
Webuye	86,867	59.0	120	4.8
Lurambi	101,801	62.0	141	5.6
Kanduyi	66,005	56.6	103	3.7
Lugari	100,321	63.1	145	5.6
Shinyalu	88,197	66.7	159	4.9
Emuhaya	87,329	57.9	112	4.8
Sabatia	61,085	58.6	117	3.4
Hamisi	77,843	58.4	116	4.3
Butalangi	30,976	67.8	166	1.7

NB: National Poverty = 56%; Provincial Poverty = 58% ; District Poverty = 60%
Source: CBS, 2004